Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Region 5/Plumas National Forest

April 2025

Tributaries Forest Recovery Project

Draft Initial Study Mitigated Negative Declaration

Blakeless Meadow and Turner Ridge (Photo credit: Plumas Corporation October 11, 2022)

Prepared by:

Plumas Corporation
418 N. Mill Creek Rd
PO Box 3880
Quincy, CA 95971

For:

USDA – Forest Service, Plumas National Forest

General Information about This Document

What's in this document?

The United States Department of Agriculture (USDA), Forest Service (USFS), Feather River Resource Conservation District (FRRCD) and Plumas Corporation have prepared this document which serves as an Initial Study/ Mitigated Negative Declaration and draft Environmental Assessment, examining the potential environmental impacts of the proposed project located on Plumas National Forest system lands in Plumas County, California. USFS is the lead agency under the National Environmental Policy Act (NEPA) and Feather River Resource Conservation District (FRRCD) is the lead agency under the California Environmental Quality Act (CEQA). This document tells you why the project is being proposed, what design options we have considered for this project, how the existing environment could be affected by the project, the potential impacts of the preferred action alternative, and the proposed avoidance, minimization, and/or mitigation measures.

This document has been prepared in accordance with current CEQA Statutes (Public Resources Code §21000 et seq.) and current CEQA Guidelines (California Code of Regulations [CCR] §15000 et seq.) An initial study is prepared by a lead agency to determine if a project may have a significant effect on the environment (14 CCR § 15063(a)), and thus, to determine the appropriate environmental document. In accordance with CEQA Guidelines §15070, a "public agency shall prepare…a proposed negative declaration or mitigated negative declaration…when: (a) The initial study shows that there is no substantial evidence…that the project may have a significant impact upon the environment, or (b) The initial study identifies potentially significant effects but revisions to the project plans or proposal are agreed to by the applicant and such revisions will reduce potentially significant effects to a less-than-significant level." In this circumstance, the lead agency prepares a written statement describing its reasons for concluding that the proposed project will not have a significant effect on the environment and, therefore, does not require the preparation of an environmental impact report. This IS-MND conforms to these requirements and to the content requirements of CEQA Guidelines § 15071.

The purpose of this IS-MND is to present to the public and reviewing agencies the environmental consequences of implementing the proposed project and to describe the adjustments made to the project to avoid significant effects or reduce them to a less-than-significant level. This disclosure document is being made available to the public and reviewing agencies for review and comment. The IS-MND is being circulated for public and state agency review and comment for a review period of 30 days as indicated on the Notice of Intent to Adopt a Mitigated Negative Declaration (NOI). The 30-day public review period for this project begins on April 9, 2025 and ends on May 10, 2025.

What you should do?

- Please read this document.
- The Tributaries Forest Recovery Project Draft Initial Study/ Mitigated Negative Declaration and supporting documents are available for public review at the FRRCD office at 422 North Mill Creek, Quincy CA, 95971. Additionally, it is possible to view the documents at the State Clearinghouse website www.ceqanet.opr.ca.gov.
- The publication date on the CA State Clearinghouse Website/ Plumas County Recorder's Office is the exclusive means for calculating the 30-days to file comments. Those wishing to submit comments should not rely upon dates or timeframe information provided by any other source.

- Electronic comments must be submitted to mhall@frrcd.org. Attachments to comments must be submitted in one of the following three formats only: Microsoft Word (.doc or .docx), rich text format (.rtf), or Adobe portable document format (.pdf). Comments may be mailed, delivered, or faxed to Feather River RCD, Attn: Michael Hall, District Manager,422 N. Mill Creek, Quincy, California 95971 (Monday-Friday 8:00 a.m. to 4:30 p.m. (530) 927-5299).

FRRCD has elected to utilize posting the NOI at a physical location at 422 N. Mill Creek, Quincy, CA as well as at: https://ceqanet.opr.ca.gov/ . If submitted prior to the close of public comment, views and comments are welcomed from reviewing agencies or any member of the public on how the proposed project may affect the environment. Written comments must be postmarked or submitted on or prior to the date the public review period will close (as indicated on the NOI) for FRRCD's consideration. Written comments may also be submitted via email (using the email address that appears below), but comments sent via email must also be received on or prior to the close of the 30-day public comment period.

After comments are received from the public and reviewing agencies, FRRCD will consider those comments and may (1) adopt the mitigated negative declaration and approve the proposed project; (2) undertake additional environmental studies; or (3) abandon the project.

Common Acronyms

ADI	Area of Direct Impact
AGOS	American Goshawk
APE	Area of Potential Effects
BA	Biological Assessment
BDA	Beaver dam analog
BE	Biological Evaluation
BMP(s)	Best Management Practice(s)
CAA	Clean Air Act
CARB	California Air Resources Board
CAAQS	California Ambient Air Quality Standards
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CSOW	California Spotted Owl
CWE	Cumulative Watershed Effects
DN	Decision Notice
EA	Environmental Assessment
EO	Executive Order
ERA	Equivalent Roaded Acres
FRRCD	Feather River Resource Conservation District
FESA	Federal Endangered Species Act
FFRA	Federal Fire Protection Responsibility Area
FONSI	Finding of No Significant Impact
GHG	Greenhouse gases
GGERP	Greenhouse Gas Emissions Reduction Plan
HIP	Heritage Implementation Plan
IPaC	Information for Planning and Consultation
IS	Initial Study
LOP	Limited Operating Period
LRMP	Land and Resource Management Plan
LWD	Large Woody Debris
MBTA	Migratory Bird Treaty Act
MCAB	Mountain Counties Air Basin
MIS	Management Indicator Species
MND	Mitigated Negative Declaration
NAGPRA	Native American Graves Protection and Repatriation Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFS	National Forest System
NHPA	National Historic Preservation Act

NRHP	National Register of Historic Places
OHV	Off Highway Vehicle
PALS	Post-assisted Log Structures
PNF	Plumas National Forest
PRC	Public Resources Code
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SHPO	State (California) Historic Preservation Officer
SNFPA	Sierra Nevada Forest Plan Amendment
SSC	Species of Special Concern
SWRCB	State Water Resources Control Board
TES	Threatened and Endangered Species
TEPS	Threatened, Endangered, and Protected Species
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TRL	Timber Resource Land
UFRW	Upper Feather River Watershed
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VHFHSZ	Very High Fire Hazard Severity Zone
VMS	Visual Management System
VQO	Visual Quality Objective

TABLE OF CONTENTS

List of Figures:

List of Tables:

List of Attachments:

CHAPTER 1. PROPOSED PROJECT

1.1 Introduction

The Plumas National Forest (referred to as PNF, or the Forest, hereafter) (Figure 1) is beginning the environmental analysis process for the proposed Tributaries Forest Recovery Project (Tributaries Project). This project proposes activities across the 163,248-acre Tributaries Project planning area (Figure 1) to expedite recovery of forest landscape values in burned and partially burned areas. The intent of this project is to reduce fuel loads to improve forest resilience and initiate conifer regeneration, where appropriate; establish shaded fuel breaks; restore functional processes in riparian corridors and meadows; enhance recovery of ecological processes, habitats, and specific species; acknowledge and protect cultural resources; and control invasive species.

This Environmental Assessment/ Initial Study (EA/IS) was prepared to determine whether implementation of activities to expedite recovery of forest landscape values in burned and partially burned areas in the Tributaries Project Area may significantly affect the quality of the environment and thereby require the preparation of an environmental impact statement and environmental impact report. This EA/IS was prepared in compliance with the National Environmental Policy Act (NEPA) and Forest Service regulations at 36 CFR 220, and California Environmental Quality Act (CEQA) and the State CEQA Guidelines (California Code of Regulations, Title 14, Chapter 3, Sections 15000-15387), respectively. The term “proposed project”, as used herein, is the same as the term “Proposed Action” used under NEPA. For more details of the proposed project, see the Proposed Project section of this document.

1.2 Background

The PNF has experienced multiple catastrophic wildfires in recent years. In total, 65% of the Forest has burned, critically impacting both the landscape and local communities. There is a need to protect communities from future wildfires and to accelerate the re-establishment and enhance the resiliency of forest ecosystems. This work is a critical priority for our Forest.

1.3 Proposed Project Location

The 163,248-acre Tributaries Project encompasses areas from Grizzly Ridge to Lake Davis and Delunga Peak up to Antelope Lake, Lights Creek, and Taylor Lake within the East Branch North Fork Feather River Watershed in northeastern Plumas County (Figure 1). The Project Area includes private and National Forest System lands of the PNF within both the Beckwourth and Mt. Hough Ranger Districts.

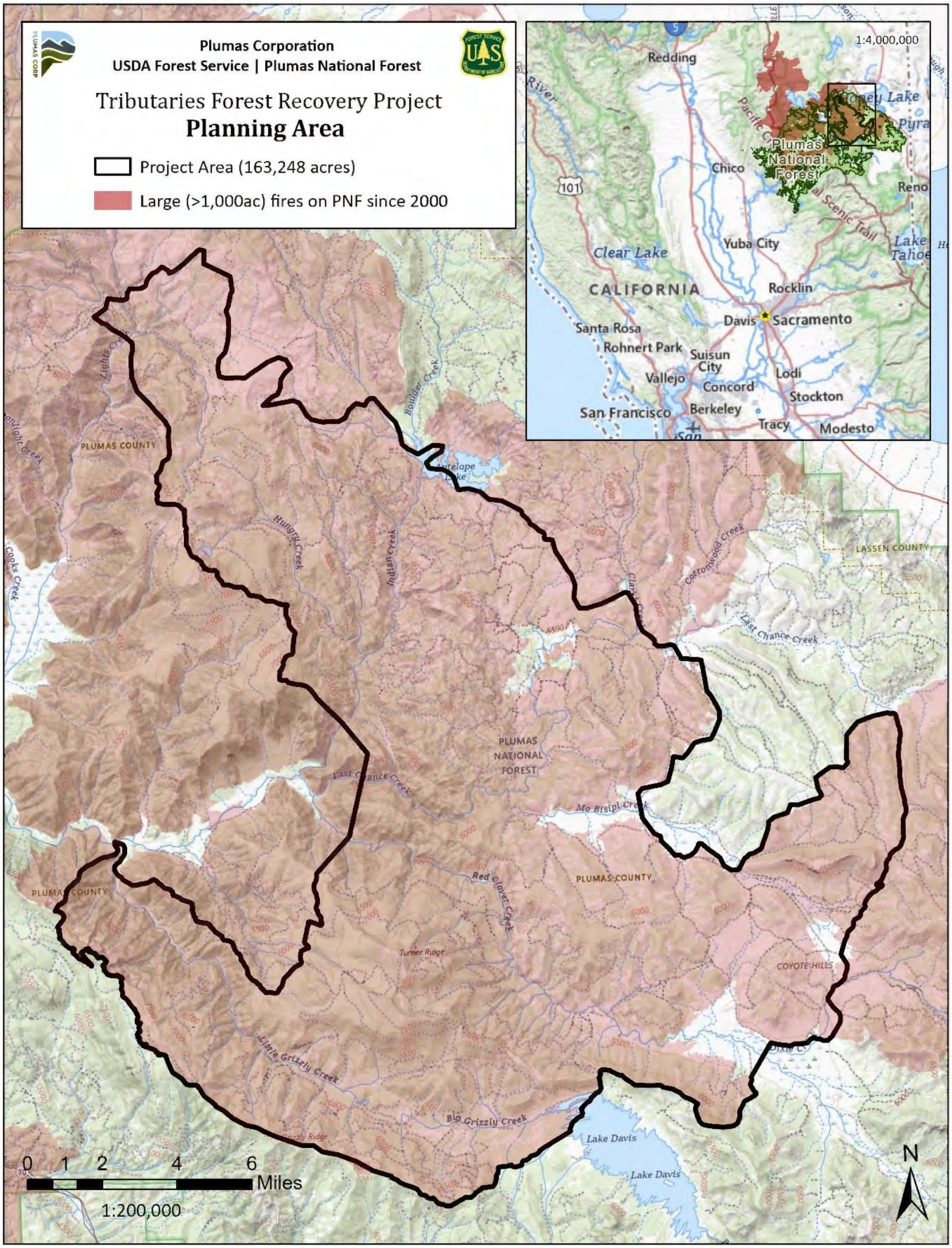

Figure 1. Tributaries Project Planning Area and Vicinity Map.

CHAPTER 2. PURPOSE AND NEED

2.1 Purpose of Project

The purpose of the Tributaries Project is to expedite the recovery and resilience of forest ecosystem values. Wildfires influence the long-term trajectory of ecosystems in ways that affect multiple National Forest System (NFS) management objectives, including ensuring public safety; providing favorable flows of water and a sustainable supply of timber; supporting rural economies; restoring degraded or damaged ecosystems; and maintaining habitat for threatened, endangered, and other species of conservation concern. Other objectives affected by wildfire include providing safe and environmentally responsible public access, recreation, interpretation, and educational opportunities; restoring and maintaining the ability of forested stands to sequester carbon by improving the establishment and survival of conifers; retention of forested landscapes that are resilient to changing climatic conditions; and maintaining functional riparian and meadow ecosystems. Coupled with ecosystem changes in response to wildfire, forest resources will face additional stressors from projected increases in average daily mean temperature and alterations of the hydrologic cycle. These shifts in the climatic environment can promote insect infestations and disease, impacting the health of stands. While conifer stands can adapt to climate change with moderate changes in temperature over time, projected temperature increases and reductions in water availability may exceed the ability of conifer stands to adapt. Mortality rates would be greater in more dense stands. Therefore, any resilience, recovery, or reforestation actions should consider future environmental conditions to develop and manage healthy, climate-adapted forests.

The Proposed Actions are consistent with the goals and objectives outlined in the PNF Land and Resource Management Plan (LRMP, or Forest Plan), as amended by the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNPFA ROD), and the California Water Action Plan (CA Natural Resources Agency 2014).

2.2 Need for Action

There is a need to expedite the recovery of forest conditions and values on a landscape scale commensurate with the scale of recent wildfires. The Tributaries Project contains large areas that were subjected to high severity, stand replacing fire. The Proposed Action represents a suite of activities to replace lost forest conditions, while incorporating the predicted effects of future conditions: conduct site preparation and conifer planting in strategic locations; improve the resilience of remaining green forest stands to future wildfire by fuel reduction and thinning from below; restore and enhance wildlife and botany with an emphasis on elk (*Cervus canadensis)*, California spotted owl (CSOW, *Strix occidentalis occidentalis*), and aquatic resources; identify, assess and develop treatments for road crossings that are impairing water quality and/or are barriers to aquatic organism passage; develop restoration alternatives to restore meadow function for multiple benefits; and develop a suite of maintenance activities to ensure the investment in the recovery of forest values is sustained.

1. **Reduce future wildfire intensities**

   There is a need to reduce and maintain reduced fuel conditions over the long term through thinning, prescribed fire use, and other tools. There is an additional need to develop and maintain shaded fuelbreaks in strategic locations to slow the spread of high severity wildfire and provide firefighters with pre-planned, safer, and more effective locations for fire suppression efforts.

   Areas that burned in recent wildfires exhibit a range of post-fire conditions and include stands with high densities of fire-killed trees, as well as stands with a mix of snags, green trees, and understory vegetation. Forest stands in these conditions are highly conducive to the spread of crown fire under extreme fire weather conditions and increase the potential for future large, high-severity, stand-replacing fire events. Fire behavior of this type increases the opportunity for high intensity fire to move out of more remote areas and threaten nearby communities and infrastructure. Both fire-killed and live vegetation can contribute to hazardous fuel accumulations. Reducing stand densities to historic levels minimizes competition for water and nutrients, while improving water infiltration and forest health. Healthy, fire-adapted ecosystems are more resilient to stressors (e.g., drought, insects, and disease) exacerbated by changing climatic conditions that increase the risk of stand replacing wildfires.

2. **Restore, improve, and maintain forest resource conditions**

   There is a need to re-establish forest cover within large, high-severity burn patches to forestall the conversion to chaparral. Additionally, climate adaptation measures are needed to create the necessary resilient and healthy habitats crucial to maintaining species biodiversity across the landscape.

   While conifer forests are adapted to fire, only five to fifteen percent of the landscape is anticipated to burn at high severity under an historic fire regime of frequent, mostly low-severity fire. In recent fires, however, 50 percent of conifer forest has burned at high severity, and 203,000 acres on the PNF (17 percent of PNF land) are in patches that exceed 100 acres in size.

   Large, high-severity patches lack a natural seed source and may take centuries to naturally re-establish as forested stands. There is also the distinct possibility that these large, severely burned patches may never recover and instead convert to non-forest vegetation types such as chaparral—essentially large brush fields. Simply stated, without trees, there will be no forests, resulting in reduced carbon sequestration. Minimizing conversion of lands from forest to non-forested vegetation types helps maintain carbon sequestration levels and supports greenhouse gas reduction goals (November 2021).

   Post-fire conditions have resulted in a vast increase in standing dead trees on the 203,000 acres within large, severely burned patches on the PNF. While the consumption of surface and ladder fuels in high severity burn patches temporarily reduces the risk of high severity reburn, this effect is short-term in nature. These areas are at high risk of reburning at high severity over the next several decades. Standing dead trees coupled with near-term shrub growth will result in accumulations of dead and live fuels that influence wildfire behavior and hamper fire suppression actions. These standing dead and down fuels also present a hazard and challenge to natural regeneration and reforestation efforts. Any natural regeneration or planted seedlings will be threatened by the present and potential future fuel loading. Without reducing these fuels, the odds of these seedlings surviving the next fire are very low, minimizing the potential for establishment and development into a mature forest.

Areas where low to moderate severity fire occurred within overly dense stands contain fire-created fuels. This is a condition that characterizes many of the 263,000 acres of conifer forest that are outside the large severely burned patches, but within the perimeters of recent fires on the PNF. In these stands, pre-fire ladder and surface fuels may have been killed, but not consumed by the fire. These standing dead trees will fall over time adding to the existing fuel load.

Remnant green conifer stands occur throughout the fire footprints and are vulnerable to future high severity fire, particularly where they are surrounded by patches with high fuel loading. These surviving green stands serve as important local seed sources for natural regeneration. Additionally, they contribute to species and structural diversity and heterogeneity in a burned landscape. They often represent mid to late seral forests in a landscape that is now severely lacking such stand types.

Late seral habitat within the burn area, including areas within and adjacent to occupied protected activity centers (PACs) for CSOW and American (formerly Northern) goshawk (AGOS, *Astur atricapillus*) were impacted from the recent wildfires and are at risk from future wildfire. Additionally, habitat for existing populations of threatened and endangered frog species and for known populations of Forest Service Region 5 Sensitive plant species were impacted by the recent wildfires and remain at risk from future wildfires. Shifting climate conditions, such as drought, extreme fires, and warming temperatures, are stressing habitats throughout the Sierra and Cascade ranges, decreasing the availability of suitable habitat for some wildlife, insect, and plant species.

Special landscapes containing visual elements such as geological features, scenic grandeur, and/or other unique attributes such as high biodiversity and natural resilience, remain at risk from future wildfires.

3. **Control non-native invasive species and re-establish of native plant species**

   There is a need to help re-establish native plant species in some areas which are highly disturbed and/or infested with non-native invasive plants.

   Infestations of non-native, invasive plant species within the fire footprint remain uncontrolled. Disturbance caused by fire, fire suppression, and even recovery activities are known to introduce and/or increase the presence of noxious and invasive plants. These species are problematic in that they can dominate landscapes and lead to loss of biodiversity, increase hazardous fuels, threaten culturally significant gathering areas, and may cause harm to wildlife as well as livestock. Invasive species can also negatively impact aesthetic qualities of natural areas and may spread into adjacent lands if not controlled.

4. **Improve watershed conditions**

   There is a need to restore function and complexity to degraded and burned meadows, riparian areas, and stream channels for watershed health as well as for habitat and climate mitigation and resilience. There is a need to rehabilitate fire suppression lines and unauthorized (non-NFS) roads and trails that degrade water quality and aquatic habitats. There is a need to improve trail function, location, sustainability, interpretation, and safety. Road and trail signs that were burned need to be replaced.

Wildfires have major impacts on watersheds resulting in greater susceptibility to increased erosion, flooding, and water quality issues. The extent of vegetative cover loss, timing and intensity of precipitation, and topography along with soil type all influence the degree to which erosion and flooding, and associated sediment delivery to streams and waterbodies, are exacerbated post-fire. Healthy, functioning meadows and riparian areas can absorb flood flows, lessening flooding, while filtering nutrients and sediment, improving water quality, and sequestering carbon.

Watershed issues are apparent across the forest landscape and are most readily observed and reported as road issues (full and/or partially damaged blown-out stream-road crossings, rills/gullies, blocked culverts, overtopped stream crossings, slumps, and landslides). Although some areas were identified and road issues resolved under Burned Area Emergency Rehabilitation (BAER) or other post-fire activities, most were not assessed nor eligible for BAER treatments. Approximately 500 miles of roads –National Forest System (NFS), County, and private— lie within the Project Area. All roads need to be in suitable condition for accessing, implementing, and maintaining the Tributaries Project, while withstanding the impacts from normal forest visitor use and the normal range of weather conditions.

Fire suppression lines and unauthorized (non-NFS) roads can contribute to water quality issues by intercepting stream flow, creating rills/gullies, initiating slumps and landslides, as well as causing channelization and gullying in meadows. Rehabilitation of fire suppression lines can help protect the watershed and habitats from further degradation. User-created routes to active dispersed camping sites may be considered as candidates for addition to the NFS transportation system, allowing mitigation measures to be implemented to protect watershed and forest health and to remove hazard trees for improved visitor safety.

Trail corridors (motorized and non-motorized), including tread, are damaged and degraded. Hazard trees along trails can impact visitor safety and visual experience for years to come. Encroaching brush requires annual maintenance on every trail and impacts the ability to keep routes open. Hazard tree removal and silvicultural treatments can assist with long term trail sustainability where feasible. Realignment and/or relocation of poorly located trails can help to avoid sensitive locations or to reduce steep grades.

Restored existing and realigned trails, some culturally significant areas, and areas renamed with culturally appropriate names may provide opportunities to establish interpretive signage and Indigenous acknowledgement.

5. **Improve safe conditions for the public and forest workers**

   There is a need to reduce the hazards posed by dead and dying trees located along roadsides, trails, and near infrastructure. There is also a need to reduce the danger and difficulty of suppressing future wildfires in areas with high snag density. There is a need to develop site remediation plans for burned infrastructure to safely remove these hazards from the environment.

Forest visitors and workers are at risk from dead and dying trees located along roads, property lines, buildings, trailheads, and other infrastructure and facilities. The trees deteriorate, become unstable, and eventually fall without warning at any time. Falling trees may strike individuals or their vehicles, or may block road access, trapping people in the area. In addition to roadside hazards, dead trees pose hazards to firefighters suppressing future wildfires, hikers, loggers, slash crews, tree planters, and workers conducting future prescribed burns or other resource management projects on both public and private lands. Dead and dying trees also pose hazards to public and private infrastructure.

High snag densities in a complex of fallen trees, broken tops and branches intermixed and suspended within an increasingly heavy shrub component, create hazardous conditions that limit the ability of firefighters to control future wildfires safely and effectively. In addition, burned infrastructure exposes hazardous materials to both forest visitors and workers.

6. **Provide diverse economic opportunities & invest in and maintain community partners**

There is a need to contribute to the economic viability of local communities. There is a need for assistance from multiple external partners, including tribal governments, that have previously partnered with the USFS on multi-jurisdictional projects, to facilitate recovery at the landscape scale.

Healthy forest ecosystems are the foundations of healthy, sustainable communities. Forest watersheds provide reliable and clean water supplies for downstream users. The PNF encompasses much of the headwaters of the Feather River, supplying high quality water throughout California via the State Water Project, as well as clean energy from hydroelectric dams on the Feather River.

A healthy forest yields sustainable products that provide economic viability and support to local infrastructure and to the restoration work needed to recover forest and watershed health. Industry depends on a predictable and economical supply of timber products from USFS land to provide jobs within rural communities, to provide useful wood products to the public, and to help fund recovery efforts from payments for the wood products generated.

Economic viability is particularly important to disadvantaged communities, commonly defined as a community with an annual median household income that is less than 80 percent of the statewide average. Several Plumas County disadvantaged communities are adjacent to the Project Area. Restoration and recovery of National Forest ecosystems support economic and recreation opportunities for local disadvantaged communities and the recovery of industries that rely on National Forest lands.

Authorized recreation businesses also meaningfully contribute to the economic base of communities and counties that rely on National Forest recreation for employment, wages, and taxes. Projected population growth in California and increasing tourism in this region, along with other factors, contribute to increasing demand for recreation facilities and services throughout the Sierra Nevada.

Enhancement of existing dispersed recreation opportunities contributes to economic stability and accommodates increasing numbers of forest visitors.

Managed livestock grazing is another forest use that contributes to economic viability. Grazing has occurred for many decades on several Forest Service allotments within the Project Area and is an important component of livestock production for several local ranchers. Components of the infrastructure that support these Forest Service allotments were impacted by recent wildfires and need repairs.

The USFS's limited capacity, along with reductions in personnel, creates challenges to efficiently complete and implement large, landscape scale projects at a pace and scale necessary to address the wildfire crisis and to effectively recover from the recent major wildfires. Partnering with external organizations and Tribal governments will facilitate treatments across all ownerships within the Forest's administrative boundary and expand opportunities for public involvement. Investing in these partnerships ensures that the public's natural resources can be managed. Additionally, partnering with local natural resource management firms on fire recovery, long-term maintenance, and management activities expands local capacity while interjecting economic value to local economies.

2.3 Desired Condition

Existing conditions consist of low, moderate, and high severity fire effects on forest stands, riparian and meadow areas, recreation resources, road systems, and cultural resources. Recognizing the degraded nature of the existing conditions, the desired conditions are derived from ecosystem strategies, goals, and standards presented in the 2004 SNFPA ROD, modified to incorporate best available data on the future effects of climate change. Where applicable, Forest Plan amendment(s) will be sought (see Appendix D), to allow for forest composition and structure variances to canopy closure and diameter limits. Desired condition attributes are listed below with page numbers from the 2004 SNFPA ROD cited in parentheses for reference.

- Modify expected fire behavior (USDA 2004a, p. 3, 4, 48) and improve the overall survival rate of trees/forested stands.
- Flame lengths at the head of the fire are less than 4 ft (USDA 2004a, p. 41).
- Where treatments may affect tribes or tribal communities, or plants culturally important to them, they will be consulted on the development of burn plans, consideration of approaches that accommodate traditional scheduling and techniques of fire (USDA 2004a, p. 26).
- Stand densities are within the site's ability to sustain forest health from insects, disease, and drought conditions (USDA 2004a, p. 35, 41).
- Forested stands vary in size, species composition, and structure (USDA 2004a, p. 41).
- Vertical heterogeneity with multi-tiered canopies and horizontal diversity exist in high levels across the landscape (USDA 2004a, p. 41).
- Tree species composition is managed to promote shade intolerant pines and hardwoods (USDA 2004a, p. 52).

- Following large scale, stand-replacing disturbance events, forest species composition and structure are restored (USDA 2004a, p. 31) and biodiversity is encouraged.
- Specific habitat conditions for special status plant and wildlife species are restored, promoted, and maintained (USDA 2004a, p. 36-44).
- During landscape analyses and similar activities, vegetation community conditions where a specific area has an identified importance to an affected tribe or tribal community are assessed and affected tribes, or tribal communities are consulted to ensure traditional and contemporary uses and needs are considered and maintained (USDA 2004a, p. 25).
- Traditional Native American vegetation management strategies and methods are integrated into ecosystem restoration activities, where appropriate (USDA 2004a, p. 25).
- Native species and ecosystems are protected from the introduction, establishment, and spread of invasive species (USDA 2011a, p. 9).
- Restored areas are self-sustaining and resistant to the establishment of invasive species (USDA 2011a, p. 9).
- Invasive plant species treatments maintain or promote, if appropriate, the availability of traditionally used plants by Native Americans. Tribes are consulted on vegetation management, identifying areas of new or worsening weed infestations, and developing plans for appropriate weed control (USDA 2004a, p. 26).
- Water quality and riparian habitat are restored or enhanced via road management and maintenance actions (USDA 2004a, p. 34), including removal of unauthorized roads, and other restoration measures.
- Flow connectivity and aquatic organism passage is restored and maintained at identified roads that intercept, divert, or disrupt natural surface and subsurface water flow paths (USDA 2004a, p. 63).
- Road-induced diversion, disruption, and interception of streamflow and natural flow patterns, at road crossings and wetlands are minimized (USDA 2004a, p. 59).
- Roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, and day use sites are located and/or restored to minimize impacts to water quality or habitat for aquatic and riparian-dependent species (USDA 2004a, p. 65), forested habitat, and cultural resources.
- Affected tribes and tribal communities are consulted regarding access to culturally important resources and culturally important areas when proposing management that may alter existing access, so appropriate access to sacred and ceremonial sites and to tribal traditional use areas is maintained (USDA 2004a, p. 26).
- Firefighting hazards are reduced by managing hazard trees and snags along roads and shaded fuel breaks likely to be utilized for control of prescribed fire, fire suppression efforts, and ingress and egress routes for fire personnel and the public (USDA 2004a, p. 41).
- For public safety, well-used roads and trails are free of hazard trees in accordance with Region 5 Hazard Tree Guidelines (USDA 2022a).
- Decisions for recreation activities are made at the local level to reflect site-specific conditions (USDA 2004a, p. 11).
- Public lands play a vital role in providing a wood supply for local manufacturers and sustain an employment base in rural communities (USDA 2004a, p. 4).

- The Forest Service is committed to building on existing relationships and creating new partnerships to place fuels and forest health treatments in the right places and at the pace and scale needed to change the trajectory of wildfire risk to people, communities, and natural resources and to restore forest health and resilience (USDA 2022b).
- The Forest Service will work with Federal, Tribal, State, local, nonprofit, and other partners to build the multijurisdictional coalition needed for successful stewardship of public lands (USDA 2022b).

2.4 Proposed Action (Federal Action Alternative, CEQA Proposed Project)

The PNF, Beckwourth and Mt. Hough Ranger Districts, in partnership with Plumas Corporation, proposes a suite of integrated actions to expedite the recovery of montane forest and riparian values in the 163,248-acre Project. Collectively these actions represent the Federal Action Alternative or CEQA Proposed Project, and the phrases Proposed Action, Action Alternative, Proposed Project, Tributaries Project, Project, and proposed project actions, are used interchangeably throughout this document. The Action Alternative would employ a variety of restoration actions across the landscape, as described below and presented in Figures 2 and 3 (see section 2.4.1 and 2.4.2) as well as Appendix A, Figures A-3 through A-5 and A-7 through A-10. Proposed treatment activities may be used alone, in conjunction with other treatments, or following another treatment. Some treatment activities may require multiple applications for successful effectiveness, long-term maintenance, and to meet project objectives over time. Project implementation funds will likely be secured from a combination of federal, State, and/or non-governmental sources.

2.4.1 Silvicultural Treatments

To reduce wildfire risk, improve forest resilience, and retain forested conditions, silvicultural treatments including thinning, burning, and replanting conifers are proposed. Objectives of silvicultural treatments are to achieve and maintain healthy and appropriate stand densities, realign species composition by stand type, enhance forest structure, reduce fuel loads, create and maintain fuelbreaks, and jumpstart forest regeneration (see Figure 2 and Appendix A, Figures A-2 through A-4, and A-7 through A-10). Silvicultural treatments were developed based on post-fire stand conditions and will be implemented on a site-specific basis considering physical characteristics (e.g., slope/aspect), access, PNF projected climate analyses, AGOS and CSOW Protected Activity Centers (PACs) and CSOW Home Range Core Areas (HRCAs) and Territories. Other on-the-ground factors such as tree health and meadow-like conditions will be considered during layout. Descriptions of proposed silvicultural treatments are provided below with more details regarding examples of treatment types and methods for varied Forest conditions available in Appendix B, Table B-1. Implementation of silvicultural treatments will seek to promote a complex mosaic of vegetation and structural compositions that are key to developing resilience to shifting climatic conditions, disturbances and/or stress from insects, disease, or wildfire. To achieve the desired resilience conditions, the Forest is pursuing a project-level Forest Plan amendment (see Appendix D). No treatments are proposed in this project within the Mud Lake Research Natural Area.

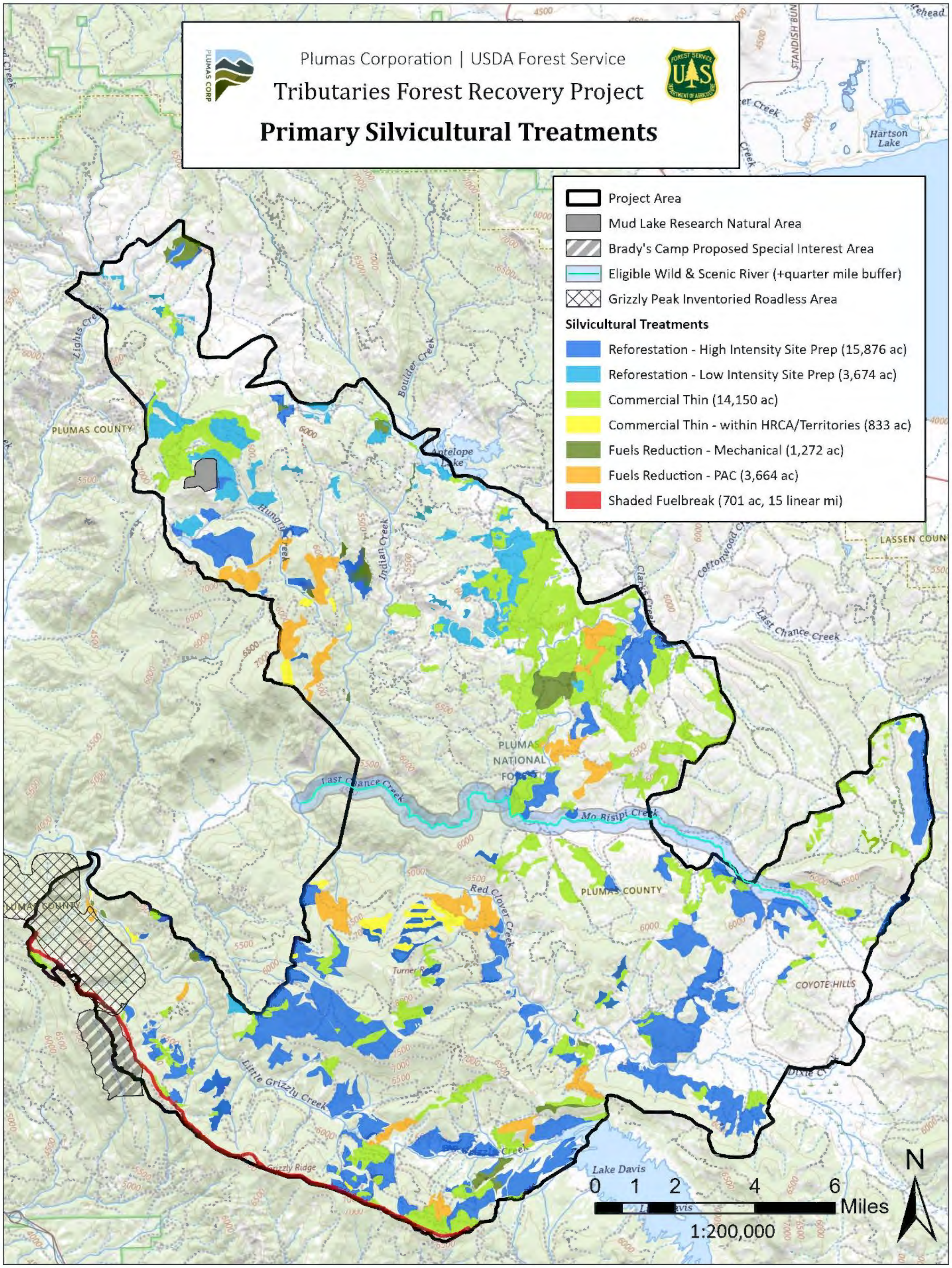

Figure 2. *Project Area and Proposed Primary Silvicultural Treatments.*

Mechanical treatment units that maximize the acreage planned under funding and capacity limitations and minimize impacts to other resources generally occur on slopes less than 35%. These units are referred to as primary treatment units and are delineated in Figure 2 (and Appendix A, Figure A-3). Secondary silvicultural treatments may be done outside of the primary treatment units (see Appendix A, Figure A-4) to enhance connectivity between primary treatment units. Connectivity of treatments would increase resilience to future wildfire on a landscape scale by minimizing pockets of dense fuel between treatments. To achieve this landscape-scale treatment effect, up to 15,000 acres of secondary, connectivity mechanical treatments may occur on slopes up to 50%. Such connectivity treatments would be strategically located and delineated as primary treatments are implemented, with consideration of soil type, vegetation cover, and best management practices (BMPs) to protect soil and water quality.

Reforestation – high and low intensity site prep

Reforestation will involve replanting conifer forest tree species with appropriate species composition by stand type in previously forested areas affected by high intensity fire. Areas where such conditions are contiguous with green stands will be prioritized for reforestation to improve treatment connectivity and landscape-level resilience. Site preparation will be required to allow for access and safe site conditions for planting workers and to efficiently and effectively facilitate seedling establishment and survival. Site preparation improves planting conditions, encourages germination and growth of seedlings, and promotes survival and maturation of planted species. Areas composed of mostly large dead trees (snags) will require higher intensity site preparation, while low intensity site preparation will occur in areas comprised mostly of shrubs and small snags (less than 12-inch diameter breast height [DBH]). At a minimum, per PNF LRMP standards and guidelines, three snags per acre greater than 15" DBH will be retained, with an emphasis on protecting large snags (greater than 24" DBH) with desirable habitat characteristics (i.e. cavities, broken tops, etc.).

Reforestation with High Intensity Site Prep will occur on up to 15,876 acres in high burn severity deforested stands composed of snags generally greater than 12" DBH. These areas held mature conifer forest prior to the wildfires and experienced complete or nearly complete mortality. This deforested, high snag density condition comprises much of the Project Area (over 100,000 acres). Large snags would be mechanically (ground-based or aerially logged) or hand felled, and mechanically piled or skidded to a landing deck for burning, commercial salvage (if and where applicable), or biomass utilization. Additional site preparation to remove shrubs and dead and downed trees less than 10" DBH include mastication, manual or mechanical uprooting, hand cut and lop, or pile and burn, machine felling/piling/burning, prescribed or cultural burn, ground-based spot or broadcast herbicide, and/or prescribed grazing (see Fuel Reduction section, below, for a detailed discussion of each vegetation reduction approach). No aerial spraying is proposed in the Project.

Reforestation with Low Intensity Site Prep will occur on up to 3,674 acres in high burn intensity stands of "open ground" that are composed of mostly shrub regrowth and snags generally less than 12" DBH. These conditions are mostly found in reburn areas that lack large, dead trees. Site preparation to remove brush and dead and downed trees include mastication, manual or mechanical uprooting, hand cut and lop, or pile and burn, machine felling/piling/burning, prescribed or cultural burn, ground-based spot or broadcast herbicide, and/or prescribed grazing. No aerial spraying is proposed in the Project.

Tree planting will occur in identified reforestation treatment areas following site preparation. Reforestation will focus on large, high-severity burn patches with high basal area mortality and low probability of natural regeneration to help accelerate restoration to historical forested conditions. Areas likely to recover naturally would not be targeted for reforestation. Reforestation stocking specifications will depend on soil types, site conditions, and expected climatic shifts. Planting densities will range from 100-300 trees per acre (TPA) with a site-appropriate composition of species, avoiding single species plantings where feasible. Planting will usually be a mixture of Jeffrey pine (*Pinus jeffreyi*), ponderosa pine (*Pinus ponderosa*), rust-resistant sugar pine (*Pinus lambertiana*), Douglas-fir (*Pseudotsuga menziesii*), and incense-cedar (*Calocedrus decurrens*), typical of Sierran Mixed Conifer (SMC) stands[1]. Lower planting densities will be favored on exposed slopes, units with thin soils, and areas that were historically Eastside Pine (EPN) forests favoring Jeffrey and ponderosa pine. Additionally, in areas predicted to have high climatic water deficit and high climatic stress in the coming decades (see Appendix C), lower planting densities and microsite cluster planting may be favored. Higher planting densities and more diverse species mixes will be used in cold-air drainages, north-facing slopes, and areas that were historically Sierran Mixed Conifer.

Release and Maintenance Activities

To ensure proper establishment, follow-up treatments may occur at 2–5-year intervals after initial reforestation. Release and Maintenance follow-up treatments are designed to free young trees from undesirable, usually overtopping, competing vegetation. This may include manual, mechanical, and/or herbicide treatments, including hand grubbing, chainsaw release on brush greater than two feet in height, mastication, or grazing, as needed, post-planting. No more than two chemical release treatments will be applied from the initial planting. If a treatment area needs to be replanted, the release schedule may need to be re-initiated. Research suggests that herbicide and manual release are the most effective methods for facilitating reforestation in the Sierra Nevada. McDonald & Fiddler (2010) found that manual release using grubbing and/or chainsaw shearing yielded advantages over an untreated control, but were three times more expensive than herbicide treatments. They found that herbicide consistently provided significant increases in height, diameter, or foliar coverage versus the untreated control. Herbicide use on the Project will involve ground application with a backpack or hand sprayer. Application will be broadcast sprayed at a select radius around each conifer seedling or spot sprayed on target shrub seedlings or noxious weed species. Appropriate spray buffers will apply (see Appendix E, HU-11, HU-12, and HU-15). No aerial spraying is proposed in the Project.

Seedling survival exams will be conducted within three years of planting to determine if follow-up interplanting is required (i.e., if overall seedling or individual species survival is below 85%). Pre-Commercial Thinning (PCT) may occur 7-10 years after planting to maintain desired stocking and/or species preference. This will lengthen the window before fuels reduction is necessary in these stands

[1] Sierran Mixed Conifer stand species composition also typically includes white fir (*Abies concolor*) and black oak (*Quercus kelloggii*). Due to white fir being an aggressive pioneer species and it's overabundance on the landscape and within the Project's live stands, it is unlikely that white fir would be included in a planting species mix. Black oak has the capacity to re-sprout in response to fire, depending on the intensity of the fire; it may be included in some planting species mixes, depending on the site.

and improve the efficiency of future fuels reduction treatments. Target residual TPA for PCT units will range between 50-150 TPA.

Commercial Thin

Remaining live, green, forested stands that did not burn or experienced low intensity fire currently support higher than historical and target tree densities. These areas have a forest health and wildfire risk-reduction need of thinning for fuel reduction and have the potential for commercial harvest of merchantable trees. Site-specific treatments in these areas would favor retention of healthy, large (>30" DBH), and shade-intolerant species, with some retention of vigorous, green, shade-tolerant species for species and stand structure diversity. Some larger trees (30-40" DBH) that are in poor health or are less suited for future climatic conditions at that site (see Appendix C), may be harvested to improve current and future stand health. Removal of these larger trees are subject to a Forest Plan Amendment (Appendix D, STD-PROJ-1B), which is described under "Commercial Thin" below, and in detail in Section 2.4.5. This approach favors retention of healthy trees and formations of stands that are more resilient to future wildfires and changing climatic conditions.

Stands receiving Commercial Thin treatments exceed target tree density levels and have a significant component of medium- and large- diameter trees. Tree density targets would vary depending on forest stand type, topographic attributes, and predicted climatic stress. Treatments will be tailored to meet the unique historical characteristics of each forest type, as well as historical and new land designations for CSOW (i.e., CSOW HRCAs and Territories). Fuel reduction to thin overstocked small trees (<10" DBH) and dense brush may also be implemented in treatment areas to promote conditions favorable for low-severity wildfire. Excess surface fuels (e.g., downed trees, brush, litter, duff) would be treated via mastication, chipping, or burning and maintained through follow-up treatments, as needed and described above for Release and Maintenance Activities. Desired stand conditions would be maintained with the application of prescribed fire at appropriate intervals over a ten-year period.

Commercial Thin treatments outside of CSOW HRCAs and Territories have been identified as appropriate in up to 14,150 acres. These treatments will be designed to bring forest stands into target ranges of relative Stand Density Index (rSDI) that replicate historic tree stand densities. This index is a measure of relative inter-tree competition (how crowded a stand is), tree growth, and vigor at the stand level. Historic rSDI densities were much lower than present-day densities (North et al. 2022). Stands will be managed to attain a rSDI of 14-36% (considered ranges of "free growth" and "partial competition", North et al. 2022), depending on stand type and site condition. This range is based on interquartile ranges for historic Sierra Nevada forests in North et al. (2022) and historic structural descriptions of true fir stands in Pitcher (1987). The expected outcomes are stands with 30-100 trees per acre in Sierran mixed conifer (SMC) and eastside pine (EPN) stands and a mosaic of cut and leave areas created in true fir stands.

Using rSDI provides flexibility in planning treatment units to allow for heterogeneity in post-treatment stand structure by leaving individual trees, clumps of trees, and openings (ICO). An ICO approach creates a mosaic of gaps and patch types that mimics natural forest spatial patterns (Larson and Churchill 2012) and improves stand resilience (Churchill et al. 2013). Greater densities will be retained in cold air drainages and concave slopes with wet areas and lower densities will be left on exposed slopes or areas with thin soils. Some dense regeneration patches of small trees (<10” DBH) will be left mostly undisturbed, but removed where they occur below a taller canopy to reduce ladder fuels. Treatments will generally increase the relative proportion of pines and favor large, healthy, site-suitable trees for retention as well as trees with characteristics useful to wildlife such as multiple tops, rot, and cavities.

Treatments in SMC stands will promote vertical and horizontal structural heterogeneity in alignment with the recommendations in North et al. (2007), North et al. (2009), and Larson and Churchill (2012). Treatments in EPN stands will promote horizontal structural heterogeneity in alignment with the recommendations in Youngblood et al. (2004) and Larson and Churchill (2012). Treatments in true fir stands will replicate the natural gap-dynamics of those stands described in Pitcher (1987). Prescriptions in cut areas (mostly of 10-22” DBH trees) may include gap creation and seed tree residual cuts. Cut areas will generally be less than 10 acres. In leave areas, dead, dying, and diseased trees may be thinned.

While silvicultural treatments will generally occur in units with slopes below 35%, some units with sustained slopes above 35% may be treated using tethered logging to minimize slope disturbance. Whole-tree logging will remove merchantable thinned trees, while mastication, machine or hand thin, pile and burn, and prescribed or cultural burns will treat smaller trees and excess surface fuels such as downed wood and brush, as needed.

If approved, in alignment with proposed Forest plan amendment (FPA) STD-PROJ-1B, outside of PACs, HRCAs, and suitable habitat within CSOW Territories, conifers greater than 30” DBH but less than 40” DBH may be removed under the following circumstances:

1. In overly dense stands that exceed the target stand density for their forest type, to favor retention or promote the growth of even larger or older shade-intolerant trees to more effectively meet project objectives for tree species composition and forest stand density;
2. To improve the growth and vigor of mid- to late-seral stage sized shade-intolerant Jeffrey and ponderosa pine, black oak (*Quercus kelloggii*), rust-resistant whitebark pine (*Pinus albicaulis*), and rust-resistant sugar pine greater than 16” DBH by reducing competition from surrounding trees;
3. When removing trees is needed for aspen (*Populus tremuloides*), oak, or meadow restoration treatments or for cultural or Tribal importance.
4. Within homogenous plantations, to reduce loss of trees 30” DBH or greater due to competition in overly dense stands.

No more than an average of one 30-40” DBH shade-intolerant tree per ten acres of Commercial Thin units will be removed.

Commercial Thin within HRCAs or Territories will not apply the abovementioned FPA with regard to removal of large trees (>30” DBH), but rather will comply with requirements of the SNFPA 2004 ROD (USDA Forest Service, 2004) and retain such trees. On the 833 acres of Commercial Thin within HRCAs and Territories, thinning will not reduce average canopy cover in mature, CSOW foraging habitat (California Wildlife Habitat Relationship, CWHR, types 4M/4D) of SMC stands to below 40% and in CSOW nesting/roosting habitat (CWHR 5M/5D) in SMC stands to below 50%, and within true fir stands to below 50%. Ninety percent of trees and brush less than 10” DBH will be cut and excess surface fuels such as downed wood and brush will be treated, as needed.

Fuels Reduction

Fuel reduction activities would also be implemented within live, green, forested areas that experienced low to moderate-intensity fire and that are currently at desired overstory tree density but have excess surface and ladder fuels. These areas exceed target rSDI, but consist mostly of small diameter trees and are where fire return intervals are not conducive to sustainable forest stand resilience. Thinning would favor retention of large and shade-intolerant species. Surface fuels would be treated and maintained to support tree survival, as needed. Desired stand conditions would be maintained with the application of prescribed fire at appropriate intervals.

Fuels Reduction – Mechanical category applies to up to 1,272 acres of stands outside of AGOS and CSOW PACs. They include both SMC and EPN forest types. The key difference between these forest types lies in canopy strata: SMC forests will often have a multi-layered canopy, while EPN forests usually have a single layer. However, stands designated for Fuels Reduction are likely early in their development, and almost universally consist of a single stratum. Therefore, fuels reduction treatments will not differ substantially between these two forest types, but target rSDI ranges will be dependent on forest type as described in Commercial Thin, above. Mostly trees under 10” DBH will be removed and small amounts of trees up to 16” DBH may be removed.

Fuels Reduction – PAC category applies to up to 3,664 acres of stands within AGOS and CSOW Protected Activity Centers. These treatments will focus on reducing ladder fuels. Hand thinning will be used to remove trees less than 10” DBH. Once trees are cut, they may be chipped, lopped, or hand-piled and burned. To manage surface fuels, prescribed understory burning may also be utilized.

<u>Treatment Techniques</u>

A variety of treatment techniques may be used for fuel reduction in green stands. They include but are not limited to the following:

Mechanical thinning would involve cutting the entire above-ground portion of the tree via cut-to-length, hotsaws, feller bunchers, yarders, or tethered logging, and removing it from the forest for fuel reduction. Tree tops and limbs, as well as whole small trees, may be chipped and sold as biomass, piled and burned, or spread for soil cover within the treatment unit. Hand thinning would be implemented in areas supporting sensitive plant or wildlife habitats, riparian habitats, and in areas susceptible to soil erosion.

Machine Piling utilizes heavy equipment to move woody debris/slash into piles. Crews would compress slash tightly in piles to ensure full consumption when burned. Piles would be placed outside the boundaries of sensitive resource areas including, but not limited to, historical or archeological sites, sensitive plant populations, perennial streams or drainages, roadside gutters and culverts, and any other known avoidance areas. It also allows treatment in topographic areas where equipment use is not feasible, such as steep slopes or rocky areas, equipment may reach into the area for mechanical removal and pile in a safe, unrestricted area.

Mastication is a mechanical process that changes the shape, size and distribution of fuels. Whole trees and large brush are broken down in-situ into small chunks and left on the forest floor. Mastication is effective for clearing trees along roadsides, ravines and places that could be difficult to reach with other equipment or on foot. Due to the lower levels of soil disturbance associated with mastication, it is a more appropriate method than Mechanical Thinning in units with numerous areas that pitch above 35% slope. Masticated slash may be scattered within the treatment area.

Hand thinning describes manually cutting small trees with chainsaws. This is a favored practice near recreation sites and in areas with sustained slopes above 35%.

Burn Methods

Pile Burning involves igniting piles of woody debris/slash resulting from thinning and fuel reduction actions. Pile location and size would be determined by site conditions, and account for minimizing damage to other timber or residual trees when burned, as well as risk of fire escaping. Sensitive areas and resources would be avoided. Piles would be burned during periods of low fire danger, typically in the late fall and winter months.

Prescribed Burn and **Cultural Burn** are the utilization of controlled ignitions to reduce surface and ladder fuels. Cultural burns are lower intensity-controlled fires much like prescribed burns with the major difference being that cultural fire was and is still used by Tribes as an essential part of culture, to cultivate materials and food and to enhance habitat essential to centuries-long traditions.

Burn methods include broadcast, understory, or jackpot burning. **Broadcast** is a burning method used in areas with little to no forest canopy present, such as grasslands, shrub fields, or oak woodlands, and is also used to enhance and/or restore wildlife habitat. **Understory burning** is a fuel reduction treatment where ignition under the forest canopy is focused on surface and ladder fuel consumption, leaving canopy fuels (i.e. larger trees) intact. Understory burning is often used as a follow-up treatment to thinning and pile burning to further reduce surface fuels. This type of burning mimics the role of frequent fire in an active fire regime to maintain the desired landscape condition of a healthy and resilient forested stand. Post mechanical and hand thin fuel reduction treatments, understory burning would be used to promote snag development and shade-intolerant species, such as ponderosa pine and Jeffrey pine, while reducing less fire resilient species, such as white fir (*Abies concolor)* and lodgepole (*Pinus contorta)*.

Jackpot burning is similar to understory or broadcast burning, but instead of treating the entire forest floor, burning occurs in target areas with high fuel concentrations (i.e. “jackpots”). Jackpot burns result in mosaic burn patterns with limited burning in adjacent low-fuel concentration areas. Jackpot burning may be an initial or follow-up treatment to other fuel reduction treatment methods.

Prescribed or cultural burns may occur independently of other treatments, or as a follow-up. This type of treatment will have little effect on overstory canopy, with no more than 20% mortality expected. Primary effects will be on surface fuels and trees less than 10” DBH. Where possible, units will be designed to connect with control features such as ridgelines, roads, and non-timbered areas. Activities associated with prescribed or cultural burning include fire control line construction along treatment boundaries following topography favorable to controlling the burn; large-tree protection raking; and reinforcement of control lines through the removal of live or dead trees and brush, limbing, bucking, and/or rearranging fuels to assist with safety and containment. Post-burn or mop up activities would include the use of hand tools to extinguish all heat to a minimum of 25 feet from the control line.

Shaded Fuelbreak

Fuelbreaks can also serve as strategic wildfire containment features. A 15-mile shaded fuelbreak is proposed along Grizzly Ridge; it would be up to 400 feet wide and coincide with existing fire control lines established during the Dixie Fire. It totals 701 acres. Removal of hazardous snags and thinning prescribed for these units will help to safely and effectively fight against a future wildfire. The shaded fuelbreak would be maintained at low overstory and understory densities to break up fuel continuity and facilitate access and anchor points for firefighting and prescribed fire activities. Site-dependent planting and thinning treatments along fuelbreaks would vary based on fire severity:

- Fuelbreak treatments located in high severity fire areas with over 80% mortality would involve site preparation, planting, and maintenance using techniques described for Reforestation, above. Replanting will occur at a reduced rate of 50-100 TPA to keep densities low and pruning may occur 7-10 years after planting to raise canopy base height.

- In areas with 30-80% mortality of standing basal area, dead trees will be felled, piled, and burned/chipped. Target density post-treatment will be 40-80 TPA.

- In low severity burn areas with less than 30% mortality, target tree densities would be thinned using techniques described in Commercial Thin to reduce the stand to a rSDI of 14-18%, which is the lower end of the interquartile range described in North et al. (2022). According to modeling performed by Keyes & O'Hara (2002), rSDI must be below 38% for a ponderosa pine stand to serve as a fuel break. These targets are well below that threshold.

2.4.2 Watershed Treatment Opportunities

Healthy mountain wetlands (meadows, riparian areas, springs, and fens) support high levels of biodiversity, provide critical habitat for wildlife and rare plants, improve water quality, attenuate flooding, provide refuge from drought and fire, provide seasonal water retention and release, and sequester carbon. When degraded, these key ecosystems lose the above functions and cannot support the diverse range of ecological services they could otherwise. Opportunities exist to restore and protect these ecosystems on the Forest.

Post-fire, the loss of cover and soil-stabilizing features can result in dramatic increases in sediment transport during and following storm events. Sediment loading to waterbodies and channels reduces water and habitat quality for aquatic species. Proposed activities along eroding stream banks, fire suppression lines, and roads can help reduce erosion and meter sediment delivery to stream channels.

Various watershed treatment opportunities are described below with more details on treatment methods in Appendix B, Table B-2 and shown in Figure 3 and Appendix A, Figure A-5.

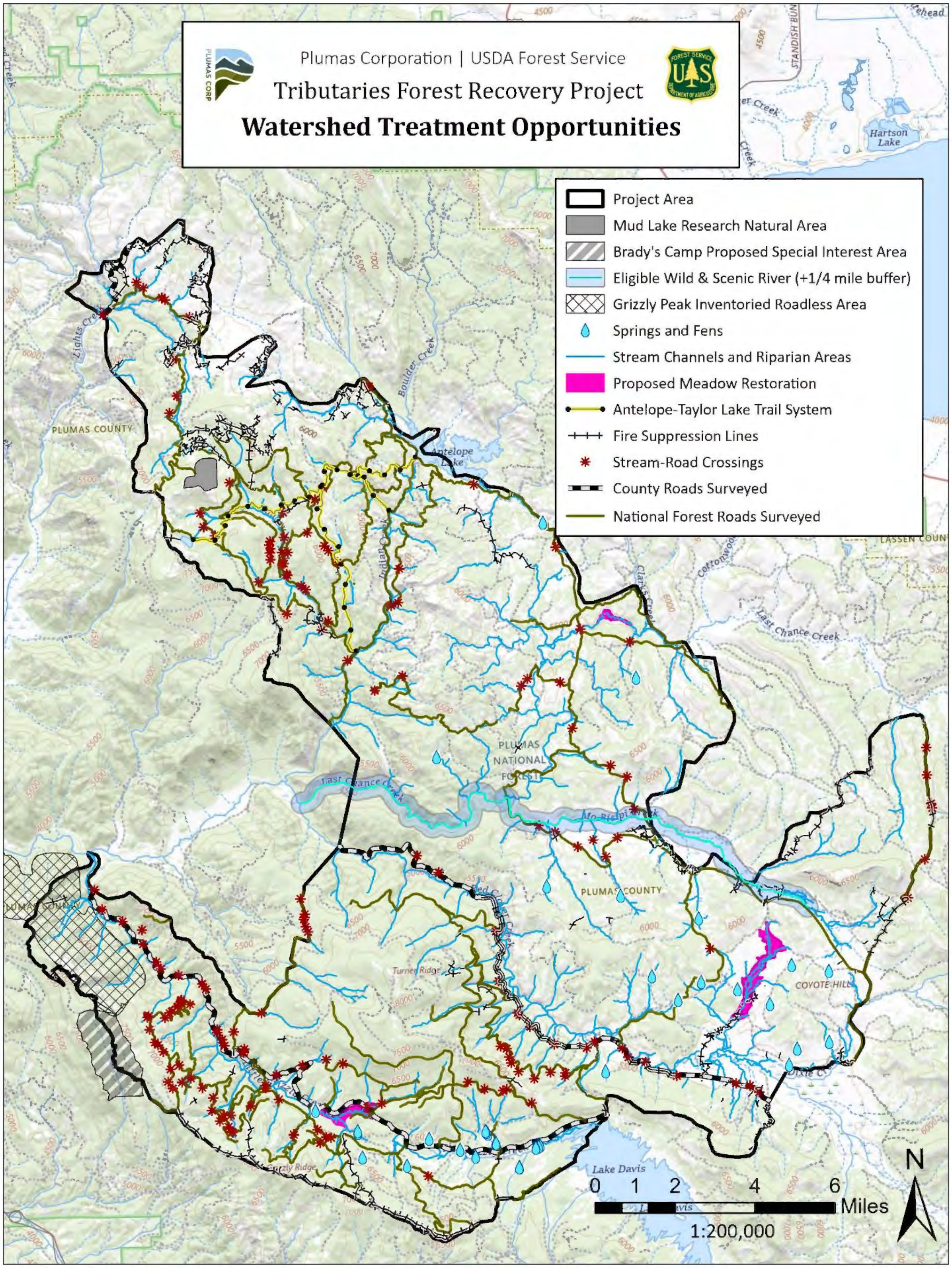

Figure 3. *Watershed Treatment Opportunities in the Tributaries Project Area.*

Meadow Restoration

Meadow restoration would be undertaken to restore degraded wetland meadows and riparian areas to improve habitat values and forage quality, reduce erosion and loss of topsoil, slow and catch sediments, and reconnect channels to the floodplain. Meadows are defined by hydrology, vegetation, soil characteristics and topography. They can vary in size from several acres to several thousand acres. Meadows are an ecosystem type with several characteristics in common: plant communities are dominated by herbaceous species; conditions support plants that prefer surface water and/or shallow soil water (<1 meter from surface); and, woody species may occur but do not dominate (Weixelman, et al., 2011). Most meadows of concern are riparian meadows with a stream channel or dry meadows with subsurface and seasonal sheet flow; with each type exhibiting low, middle, and high gradient slopes. Meadow edges are defined by topography with a change in slope and elevation relative to the meadow surface. Vegetation transitions (from wetland to upland species, from herbaceous dominated to shrub or tree dominated) can assist in identifying meadow edges.

Meadows in the Tributaries Forest Recovery Project area share several significant traits. Channel incision has altered the hydrology of most meadow areas within the Project. This has reduced/eliminated surface water and lowered shallow groundwater below the one-meter threshold—often several meters below the surface. This altered hydrology leads to significant plant community fragmentation or complete change to dry site species, often to the point of unrecognizability (lost meadows). Most meadows in the Project area typically contain deep alluvium consisting of fine-grained, poorly-drained soils which are more conducive to sagebrush community conversion. Where sandy or gravelly, well-drained soils predominate, conifer encroachment is more typical. Irrespective, the underlying driver of meadow loss is altered hydrology. Without addressing the degraded hydrology, vegetation manipulation alone is unlikely to lead to a restored meadow vegetative community.

Three meadows (McReynolds Valley Meadow, Blakeless Meadow, and Headquarters Flat Meadow), totaling 934 acres, are proposed for hydrologic restoration (Figure 3 and Appendix A, Figure A-5). Approximately 294 acres proposed for restoration is on private lands (McReynolds Valley Meadow), and an estimated 640 acres is on public lands (Blakeless Meadow – 258 acres; Headquarters Flat Meadow – 98 acres; and McReynolds Valley Meadow - 284 acres) managed by the USDA Forest Service. Meadow project objectives to restore floodplain function may utilize a variety of techniques, including complete or partial (“pond-and-plug”) channel fills; riffle augmentation with rock, gravel, and/or sod; grade control structures; and instream structures, such as debris jams, beaver dam analogs (BDAs), and post-assisted log structures (PALS) made with onsite materials (i.e., trees and willow cuttings).

Complete or partial channel fill is a restoration technique typically used in deeply incised meadow channels (> 3 ft), where the channel is filled with soil material using excavators, wheel loaders, and track loaders, and active streamflow is redirected back on to the historic floodplain. Complete fill leaves no voids in the treated channel and fill is either sourced on-site from meadow margins and/or uplands, or is transported in from off-site. Partial fill, also known as “pond-and-plug”, utilizes on-site or off-site material to fill stream segments (“plugs”) leaving incised channel voids between segments unfilled (“ponds”). Use of on-site material involves excavating areas within and adjacent to the degraded channel larger and deeper to fill the adjoining stream segment with the excavated material. These borrow areas frequently become ponds sustained by restored groundwater. On-site material may also be sourced from the edges of the meadow or upland, if soil characteristics are considered suitable. Streamflow is then allowed to re-occupy a stable remnant channel or a newly constructed channel, to restore floodplain function, elevate the water table to within the root zone, and support reestablishment of wet meadow vegetation. Any excavated vegetation is transplanted on the fill, around borrow sites, and along remnant channels. Follow-up revegetation activities, including seeding, planting, and staking of native wet meadow and riparian plant species is completed to jump-start vegetative growth on the fill and other disturbed areas on site. Post-restoration, meadows are monitored for both invasive plant and aquatic wildlife species. Hand grubbing, prescribed grazing, prescribed and cultural burning, and/or herbicide application may be used to control invasive plant species, dependent on the species and site-specific project objectives. Control options for non-native animals, such as bullfrogs and signal crayfish, will be assessed and addressed under a separate analysis, if needed.

Grade control structures are used to transition a new meadow gradient to the existing channel downstream and are often used at the downstream end of a degraded meadow channel that has been restored utilizing complete or partial fill. Structures are made of large rock, fill, and vegetation.

Riffle augmentation involves adding rock, gravel, or vegetation to the channel to raise the streambed elevation at specified locations within a stream channel reach. Riffles may be used to reconnect a moderately incised channel to its floodplain, create/enhance aquatic habitat, or transition a new meadow gradient to the existing channel downstream, similar to a grade control structure.

Instream structures, such as BDAs and PALS, are low-tech restoration techniques that mimic the function of a natural beaver dam or accumulation of large woody debris in a stream channel. Such low-tech restoration tools are used to reconnect stream channels to their floodplain (generally, where channel incision is <3 ft), reduce channel erosion, restore sediment metering, and enhance riparian and meadow habitat. Structures are typically built by hand and are made of native materials, generally sourced from on-site, with the exception of purchased wooden posts used in PALS. Structures are temporary and require ongoing maintenance before they become self-sustaining, requiring follow-up treatments to maintain their structural integrity and effectiveness. Maintenance activities may include adding more wood or posts to existing structures, building additional or new structures where existing ones have washed out, and building existing structures further into the floodplain.

Removal of encroaching conifers may be conducted in meadows planned for hydrologic restoration, not to include removal of all trees. Generally, conifers would be retained using the following indicators: fire-tolerant species; trees with characteristics useful to wildlife such as multiple tops, rot, and cavities; trees occurring where they do not impede the growth of aspen or riparian hardwoods; and trees that would provide future coarse woody debris input to streams. Boles may be left within the meadow as large down woody debris, provided that appropriate ground fuel loadings are not exceeded. If the PNF Fuels Specialist determines that ground fuel loadings are exceeded, woody material may be hand piled and burned or removed by hand. Depending on soil conditions, boles may be mechanically removed provided impacts to the meadow are minimal or can be mitigated or repaired. Additional fuel reduction activities such as hand piling and burning may need to occur in instances where boles cannot be removed. Conifers less than 10” DBH may be removed via mastication if impacts to the meadow are minimal or can be mitigated or repaired, by hand felling and chipping with tracked equipment, or hand felling/piling/burning. All conifer encroachment treatments within meadows may be applied up to a 150-foot buffer out from the meadow edge. Hydrologic restoration and associated conifer removal or fuel reduction activities utilizing heavy equipment in meadows would be subject to the terms and conditions of regulatory permits.

Existing, but damaged, fencing would be repaired or rebuilt; for any new fencing installed to protect recovery of meadow vegetation and soils following restoration, fence alignments and specifications would be determined by the PNF range conservation specialist, wildlife biologist, archaeologist, botanist, and hydrologist, in coordination with the permittee.

Spring and Fen Restoration

Springs and fens will be evaluated for the need for protection and/or recovery from damage or encroachment, as well as for watering site infrastructure repairs as needed. Existing, but damaged, fencing and watering infrastructure will be rebuilt; new fencing to protect springs, fens, or associated infrastructure will be developed and approved by the PNF range conservation specialist, wildlife biologist, archaeologist, botanist, and hydrologist, in coordination with the permittee.

Stream Channel and Riparian Area Restoration

Stream channels and riparian areas impacted by high severity burns would be evaluated for placement/additions of large woody debris to reestablish habitat, promote sediment capture, and improve channel stability. Large wood, or large woody debris (LWD), is present in streams and floodplains within forested areas and plays a significant role in the physical transport processes that streams support (Wohl et al. 2019), including sediment metering functions. Recent wildfires have reduced or eliminated LWD from streams within the Project Area. The main mechanisms for large wood recruitment to stream channels include recruitment from tree fall of mature riparian and upland forests, recruitment from transport of downed wood through ephemeral channels during floods, and landslides and debris flows that deliver slugs of large wood to stream corridors for transport downstream. For streams to maintain large wood recruitment, they need adequate nearby riparian and upland forests. In areas of high severity fire, much of the structural wood and riparian recruitment wood was consumed.

Due to the loss of recruitment sources in the Project Area, first and second order channels with slopes greater than 2% would be evaluated for large wood restoration. To slow sediment movement and reduce erosion, large woody debris would be added to channels exhibiting both a lack of LWD and active or potential mass sediment movement. Select snags adjacent to stream/riparian corridors would be hand-felled to re-introduce large wood back into the stream system. Wood structure types may include self-stabilizing large wood pieces dropped into stream channels, windthrow emulation, or single-piece log structures and small wood complexes. The number, size, and distribution of LWD would be site-dependent. Target areas for restoring sediment metering functions would be channel reaches upstream of road crossings and would be placed outside of the zone of influence of culverts. Riparian zones would be managed to retain live trees as well as snags leaning toward the channel for future natural wood recruitment to the stream system.

Stream-Road Crossing and Road Drainage Improvements

Roads throughout the Forest, especially those that cross stream channels, generally represent the biggest threat of sediment delivery to streams, river channels, and other waterbodies. The Project evaluated existing Forest Service and County roads for road sediment and flow delivery to channels and identified 187 road improvements to reduce the risk and amount of sediment delivery to channels (see Figure 3 and Appendix A, Figure A-5). Road barriers to aquatic organism passage (AOP) will be evaluated at perennial stream crossings and actions to facilitate passage identified.

To reduce fine sediment delivery from roads and protect water quality, a variety of drainage structures would be employed per specific site needs. Drainage structures include: critical dips, rolling dips, dips with leadoff ditches, ditch relief culverts, and out-sloping certain segments of road. Dips refer to dips or humps on road surfaces which intercept surface runoff and redirect water flow off the road surface to reduce erosion. A critical dip is used adjacent to road crossings to redirect water that overflows from a culvert. Rolling dips are used along approaches to reduce the length of connected surface for stream crossings. The approach is the length of the road surface which may direct runoff from the road to the stream crossing. Ditch relief culverts, also known as cross drains, are culverts placed in ditches to prevent erosion in the ditch and help water cross the road. Lead-off ditches are ditches used to transmit water from a drainage structure or drainage dip outlet to the natural drainage area. Out-sloping refers to angling the road so that it is lower on the outside or downhill side of the road than it is on the inside or bankside. Out-sloping lets water sheet across and off the road instead of trapping it on the road surface or directing it to an inside ditch.

Other road activities may include rocking inside ditches and rocking segments of road, improving culvert/channel system function, and facilitating AOP at perennial stream crossings through upgrading or replacing existing culvert(s), resetting existing culverts, adding rock material to raise channel elevations to pipe inverts, and clearing debris from blocked culverts.

Aquatic organism passage refers to the ability of fish and other aquatic organisms (amphibians and invertebrates) to migrate and swim freely upstream and downstream through or beneath human infrastructure such as culverts, bridges, diversions, dams, etcetera. Functional AOPs facilitate habitat connectivity for aquatic organisms.

Fire Suppression Lines

Fire suppression activities from previous fires on the Forest involved clearing vegetation, disturbing soil, and impacting waterways across the landscape. This project will identify areas disturbed by fire suppression activities and develop rehabilitation actions while reducing impacts to natural and cultural resources, reducing excessive erosion and risk, and reducing the amount of sediment delivery to channels. Fire suppression repairs may occur on fire lines (i.e., dozer lines and hand lines), roads, and potentially other areas used by suppression resources where suppression damage occurred. Typical fire suppression rehabilitation techniques may include one or a combination of the following repair types, depending upon the feature being repaired: recontouring to remove berms and restore the natural gradient of the hillside; subsoiling or scarification of soil surface to alleviate soil compaction; waterbarring to redirect water captured by fire suppression lines and roads; spreading woody debris throughout the suppression line to slow water runoff; placing woody debris or establishing boulder or berm blockades to mitigate use of fire suppression lines as unauthorized roads; installation of erosion control measures to prevent soil loss and gully/rill development; debris removal from blocked culverts (also addressed in Stream-Road Crossing Improvements); and spillway ditch repairs to restore the drainage function of the ditch where filled in by fire suppression activities.

Trail Improvements

The Antelope – Taylor Lake trail system within the Project Area has been impacted by several wildfires over the last 20 years. Encompassing approximately 16.5 miles of non-motorized multi-use singletrack, the system includes three trails that all connect: Antelope/Taylor Lake Trail (9.68 miles), Cold Stream Trail (1.7 miles), and the Middle Creek Trail (4.95 miles). Despite repeated attempts to keep the trail system open, many hazard trees still remain, brush continues to reclaim the trails, and the tread is sluffing away on the steeper side slopes. Remedial actions would be undertaken to improve public safety and recreation opportunities, and to address water quality issues caused by erosion, along the entire trail system. These actions include removal of hazard trees along the trail corridor; trail reconstruction with drain dips or break in grade at a minimum of every 200 feet; re-benching the tread to a minimum of 24 inches where the trail base has sloughed away and/or is actively eroding; hand, mechanical, and/or prescribed grazing vegetation removal (predominantly shrubs and small trees); root ball removal; sign replacement; rerouting a 1.8-mile trail segments to reduce trail grade to less than 30%, and move away from wet meadow areas on the Antelope/Taylor Lake Trail; and armoring low water crossings with rock.

Signage Replacement and New Installations

Road and trail signs were burned and need to be replaced. Restored existing and realigned trails, some culturally significant areas, and areas renamed with culturally appropriate names may provide opportunities to establish interpretive signage and Indigenous acknowledgement.

2.4.3 Habitat Enhancement

Wildlife

The Proposed Action includes measures to restore and enhance habitat values for wildlife, encourage the recovery of wildlife populations, promote vegetation recovery, and reduce the effects of invasive species on native plants and wildlife. Treatment types are described below and further detailed in Appendix B, Table B3.

Specific activities to restore, promote, and protect desired habitat conditions for CSOW and AGOS would be determined based on site-specific conditions. Fuel reduction treatments are proposed with the goal of reducing risk of high severity fire, restoring vegetation structure more conducive to historic fire regimes, and attaining habitat heterogeneity with a dynamic mosaic of individuals and tree clumps and openings at variable sizes. Vertical and horizontal structural complexity would be promoted for nesting, roosting, and foraging habitat, with staggered treatments in space and time. Areas with large patch sizes of high burn severity would be reforested with consideration of species preferred by CSOW and AGOS, such as Douglas-fir and red fir (*Abies magnifica*), in formerly SMC stands where site appropriate and natural regeneration probability is low. Hardwoods, as an important component of CSOW habitat, would be protected and promoted during site preparation and other post-fire management activities. Late-seral stage forest characteristics including tall and large trees, and snags of different heights, sizes, and decay classes would be prioritized for retention and recruitment.

Aquatic habitat enhancement priority areas include habitat adjacent and connected to known areas occupied by Sierra Nevada yellow-legged frog (SNYLF, *Rana sierrae*) and willow flycatcher (WIFL, *Empidonax traillii*). Specific activities to attain desired habitat conditions for SNYLF and WIFL would be based on site-specific conditions. The goals of these actions would be to increase floodplain connectivity, create slow water habitat, increase streambed and bank stability, improve water quality, and increase vegetative cover and roughness. Surveys to locate and monitor presence of invasive aquatic non-native species, such as bullfrogs, signal crayfish, or exotic plants, would be conducted, and removal/control efforts would be undertaken under a separate action, as needed.

Opportunities to improve habitat for other Federally and/or State identified species, and non-listed species include: protection and enhancement of early successional plant communities, oak woodland, and riparian vegetation communities to promote healthy ungulate populations; restore habitat processes and connectivity along and between high-use carnivore corridors to promote recovery of forest-dependent carnivore populations; retention and enhancement of native plant species that support pollinator species, such as bumble bees, insects, and bird species; and restoring native milkweed (*Asclepias* spp.) to select areas to support monarch butterfly (*Danaus plexippus*) habitat. Many of these activities enhance habitat for culturally important wildlife species, such as North American beaver (*Castor canadensis*) and black-tailed deer (*Odocoileus hemionus columbianus).*

Botany – Native Vegetation and Rare Plants

To revegetate and reseed disturbed and burned native grasslands, locally-sourced native species seed will be harvested from areas of low severity burn with high stocks of native grass and forb seed, and sent to a nursery to produce a reliable seed source. Commercially available native seed would be purchased if local seed sources are insufficient. Commercial seed blends will be approved by the PNF botanist, tested and free of noxious weeds, and sourced from the same ecoregion and elevation band. Seeding will be implemented in areas with inhibited natural recovery of native grass and forb species due to degradation and/or severe fire impacts.

Fire resistant vegetation communities (e.g., aspen stands, riparian areas) and adjacent habitat will be identified for potential restoration prioritization. Actions for protection and/or restoration may include fencing to reduce browsing on aspen shoots, removal of encroaching conifers in aspen stands, non-native species control and removal, large woody debris reintroduction in riparian areas, revegetation of disturbed areas, and fencing to protect rare spring and fen vegetation. Any new fencing infrastructure would be done in coordination with and approved by the PNF range conservation specialist, wildlife biologist, archaeologist, botanist, and hydrologist, in coordination with the permittee.

Habitats that support or have potential to support rare plant communities will be identified. Possible restoration activities include understory vegetation management in areas where post-fire succession is impeding native and rare plant regeneration, fuels reduction in areas surrounding species that are sensitive to fire, prescribed or cultural fire, management of non-native species in burned areas where potential habitat for rare plant communities is present, and management to enhance habitat for culturally important plant species, such as black oak, elderberry (*Sambucus sp.*), maple (*Acer macrophyllum*), and willow (*Salix* spp.).

Invasive Species Control

American bullfrog and signal crayfish populations would be identified, and where feasible, removal/control efforts would be undertaken under a separate action. To minimize the presence and spread of noxious weeds on the landscape, occurrences will be mapped and treated as soon as possible after detection. These may include, but are not limited to, Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), rush skeletonweed (*Chondrilla juncea*), or scotch broom (*Cytisus scoparius*). Weeds will be removed manually or treated with herbicide on a case-by-case basis. Where appropriate and feasible, biocontrol measures, such as mulch or prescribed grazing, will be applied in disturbed areas to suppress and control weed establishment.

2.4.4 Focus Areas

A suite of management actions that may be taken across the entire Project landscape will be analyzed through this NEPA process; however, limitations (funding, personnel, contractor availability and capacity) prohibits near-term treatment of all locations needing recovery efforts across the entire 163,248-acre Project landscape. Therefore, early **Focus Areas** were identified– i.e., geographically-specific subsets of and within the larger Project Area– to be evaluated for potential priority implementation (see Appendix A, Figures A-6 through A-10). Field surveys were conducted in and around the Focus Areas to assess current conditions of resources and to inform Project-level impact analyses. As resources and capacity become available for implementation, full NEPA/CEQA-compliant resource surveys will be completed in any area selected for implementation prior to implementation to assess current site conditions and determine the appropriate management action(s).

Taylor Lake

The Taylor Lake Focus Area (Appendix A, Figure A-7) is centered around Wilcox Valley and the East Branch of Lights Creek in the most northerly portion of the Project Area. This Focus Area also includes treatments that border the neighboring private land to help improve landscape connectivity across property boundaries. Proposed actions within this focus area include reforestation, commercial thin, and fuel reduction, as well as stream/road crossing repairs and trail work to reduce erosion issues. No treatments are proposed within the Mud Lake Research Natural Area.

Babcock

The Babcock Focus Area (Appendix A, Figure A-8) is located in the northeast portion of the Project Area and was impacted by both by the Walker (2019) and Dixie (2021) fires. This Focus Area includes proposed reforestation, commercial thin, and fuels reduction units as well as stream/road crossing fixes, a spring to assess for post-fire repairs of fencing and water infrastructure, and meadow restoration. Headquarters Flat, an approximately 100-acre meadow on Last Chance Creek has been identified as a potential meadow restoration project for water quality and elk habitat benefits. Headquarters Flat had previous assessment and design concepts developed in 2010.

Mt. Ingalls

The Mt. Ingalls Focus Area (Appendix A, Figure A-9) includes a portion of the Beckwourth-Genesee Road (CR 111) and lands adjacent and upslope of the road from Bagley Pass west to Mt. Ingalls. Many of the road crossings along this portion of CR111 experienced culvert failures with overtopping and diversions of stream channels, sediment, and debris following heavy post-fire precipitation events. While work has been done to clear the road and blocked culverts, problematic crossing issues remain and require repairs to reduce erosion and floodwaters overtopping the road and to allow for aquatic organism passage. Additionally, many of the streams above the road would benefit from the addition of large woody debris to capture sediment and debris upstream of the crossing. The Mt. Ingalls Focus Area also includes proposed reforestation, commercial thin, and fuel reduction units.

McReynolds

The McReynolds Focus Area (Appendix A, Figure A-10) is centered around the McReynolds Valley in the southeastern portion of the Project Area. It includes the McReynolds Valley Restoration Project which proposes to restore nearly 600 acres of severely to moderately degraded meadow on private and public lands. McReynolds Valley is a large prominent north-south trending meadow that is a vital habitat corridor connecting two important sub-watersheds—Last Chance to the north and Red Clover Valley to the south. A broad spectrum of proven restoration techniques ranging from low-tech handwork (i.e., beaver dam analogs (BDAs) and revegetation using site-appropriate native species) to the i.e., partial fill [“pond-and-plug”], complete channel fill, raised rock riffles, and sod riffles) will be utilized to achieve ecologically desired conditions. In addition to meadow restoration, this focus area includes springs to be assessed for any damaged fencing or water infrastructure repairs, habitat enhancements for ungulates and carnivore corridors, as well as reforestation and commercial thinning units.

2.4.5 Forest Plan Amendment

The Tributaries Forest Recovery Project proposes project-specific Forest Plan Amendments to the PNF LRMP (1988) as amended by the SNPFA ROD (USDA 2004). The need to amend the Forest Plan (36 CFR 219.13 (b)(1)) is driven by the project’s Purpose No. 2: Restore, improve, and maintain forested conditions.

The SNFPA 2004 ROD specifies basal area and canopy cover limitations in mechanical thinning treatments in mid- to late-seral stage forest habitats outside WUI defense zones (USDA 2004, p. 50). It also specifies an upper tree diameter limit of 30” DBH in mechanical thinning treatments. The basal area, canopy cover, and tree diameter requirements no longer represent the best available science and limit management actions to address forest resiliency against high-severity wildfires (Safford and Stevens, 2017, North et al., 2022). This Project proposes using the metric of relative Stand Density Index instead of basal area (BA) and canopy cover to meet forest health and resiliency goals. Additionally, the Project incorporates a suite of amendments consistent with the 2019 California Spotted Owl

Conservation Strategy (see the following subsection, Regional CSOW Project-Specific Plan Amendment Components).

While BA and rSDI both approximate tree density, rSDI is considered a more accurate indicator because it accounts for varying tree diameter sizes. For example, an undesirable, overly dense stand of small diameter trees may have a lower BA than a desirable stand composed of large, widely spaced trees. Conversely, rSDI of the small tree stand would be higher than that of the big tree stand. Put simply, rSDI measures relative inter-tree competition, or how crowded a stand is. Stands will be managed to attain a rSDI of 14-36%, depending on stand type and site condition (North et al., 2022).

The use of rSDI will facilitate replicating historic tree stand densities, which were much less than present-day densities (North et al., 2022). Forest resilience in this Project Area requires significantly reducing tree stand densities, with rSDI being used to quantifiably replicate historic forest stands with much reduced competition and vigorous tree growth. Relative SDI will also provide additional flexibility in planning silvicultural treatment units to incorporate individual trees, tree clumps, and openings (ICO). An ICO approach provides heterogeneity within stands, creating a mosaic of gaps and patch types that improve resilience to wildfire and climatic shifts (Churchill et al., 2013; Pitcher, 1987).

Based on 2023 remotely sensed data, the rSDI of stands on the Project Area slated for commercial thin ranges from 30% - 105%, with an average of 49%. This average far exceeds the historical rSDI ranges described above. The goal of the proposed amendment to the SNFPA 2004 ROD Standards and Guidelines is to establish a trajectory maximizing the likelihood that project outcomes will match historic pre-fire suppression forest conditions. In accordance with this goal, the amendment would allow for the removal of some trees between 30” and 40” DBH when needed to meet rSDI and stand structure objectives. In historic stands, large trees predominated the landscape, and protecting large trees that exist today is therefore an important part of restoration goals. However, these historic stands were not as dense as some modern stands, and removing large trees would occasionally be necessary to match historic conditions more accurately. Removing these trees increases the probability that the large, retained trees will survive the next wildfire, drought and/or insect outbreak. In practice, it is not expected that trees between 30 and 40” DBH would be removed frequently and no more than an average of one shade-intolerant tree of this size per 10 commercially thinned acres would be allowed to be removed.

Another benefit of this amendment is that it permits the removal of larger trees that are of poor health and/or are less suited for future climatic conditions. Management activities will prioritize retention of the healthiest large trees that are best suited for the site and resilient to future wildfire and climatic water deficit. Additionally, due to the ecological need to increase the presence of shade-intolerant tree species on the landscape, this amendment places a cap on the removal of large trees of this type. On the project level, for every ten acres of commercial thin, no more than one 30”-40” DBH shade-intolerant tree will be removed under this amendment (excluding those trees removed for reasons of protecting public safety). For the purposes of this amendment, “shade intolerant species” means, in order of preference, sugar pine, Douglas-fir, ponderosa pine, western white pine (*Pinus monticola*) and Jeffrey pine. An example of where such species might be removed is if a 30” DBH ponderosa pine is directly competing with a 24” sugar pine that exhibits resistance to the invasive white pine blister rust

(*Cronartium ribicola*), the ponderosa pine would likely be selected for removal. Conversely, if a 30” DBH sugar pine exhibiting symptoms of white pine blister rust was competing with a 24” DBH healthy ponderosa pine, the sugar pine would likely be selected for removal.

Proposed changes include modifying, removing, and adding specific forest plan components to improve forest resiliency and reduce the risk of catastrophic wildfires. The proposed project-specific Forest Plan Amendments, described in Appendix D, would apply only to the Tributaries Forest Recovery Project.

Regional CSOW Project-Specific Plan Amendment Components

In January 2024, Regional Forester Jennifer Eberlien directed forests with projects that contain 2019 California Spotted Owl Conservation Strategy-related amendments to work with the Regional Office on the plan amendment process and use consistent amendment language. On June 25, 2024, the Regional Office released required plan amendment components for projects that may impact CSOW habitat in the Sierra Nevada and are pursuing a project-specific forest plan amendment. In accordance with this updated direction, these additional components were added to the Tributaries Forest Recovery Project and are included in Appendix D.

The new amendment components incorporate updated, best-available scientific information based on the 2019 California Spotted Owl Conservation Strategy and the need to adapt our management approaches due to wildfire threats to spotted owl habitat. The amendment components were developed collaboratively based on forest plan content in the 2023 Sierra and Sequoia Forest Plans and modified based on lessons learned from recent project-specific forest plan amendments, feedback from internal and external engagement, and the draft USFWS CSOW Programmatic Consultation. Two important changes from the SNPFA ROD to project level content amendments include shifting from CSOW Home Range Core Areas (HRCAs) to CSOW Territories and the opportunity for more treatments within Protected Activity Centers (PACs). Additional modifications include new required components for locating treatments and landings, updates to limited operating periods, requirements for habitat conditions within and outside of territories, and optional project-level content that could improve the likelihood of persistence, and reduce impacts to CSOW individuals and habitat.

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 §§219.8 through 219.10 are directly related to the plan direction being added, modified, or removed by the proposed amendments:

- 36 CFR 219.8 Sustainability, (a) Ecological sustainability, (1) Ecosystem Integrity;
- 36 CFR 219.9: Diversity of Plant and Animal Communities, (a) Ecosystem plan components, (b) Additional species-specific plan components;
- 36 CFR 219.10: 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 § 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 in the plan area to adapt to change (§ 219.8(a)(1));

- 36 CFR 219.11: Timber requirements based on the NFMA, (d)(3) Limitations on Timber Harvest.

Each of the substantive requirements set forth in 36 CFR 219.8 through 36 CFR 219.11 provide an overarching purpose the regulation seeks to achieve, as well as specific plan components to meet that purpose. Application of the directly related substantive requirements listed above entails documenting that 1) the amended plan will meet the overarching purpose of each specific substantive requirement; 2) identifying specific plan components that ensure the purpose is met; and 3) explaining how the agency action triggering the amendments (in this case the Tributaries Forest Recovery Project) is consistent with the purpose of the substantive requirement. These components are described in detail in Appendix D, Table D-3.

2.5 No Action Alternative

The No Action Alternative takes no action and serves as a baseline for comparison for the Action Alternative. Under the No Action Alternative, no treatments would occur within the Tributaries Forest Recovery Project Area, therefore the existing conditions presented above under the “Need for Action” section would remain. This alternative would not expedite recovery of forest landscape values in burned and partially burned areas, or reduce fuel loads to improve forest resilience and initiate conifer regeneration, where appropriate; establish shaded fuel breaks; restore functional processes in riparian corridors and meadows; enhance recovery of ecological processes, habitats, and specific species; acknowledge and protect cultural resources; and control invasive species. 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.

2.6 Alternatives Considered but Eliminated from Further Discussion

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The Proposed Action includes state-of-the-art techniques for achieving the Project objectives. No public comments to the notice of the Proposed Action necessitated the development of other alternatives to include in the analysis.

CHAPTER 3. PUBLIC INVOLVEMENT AND TRIBAL CONSULTATION

The PNF engaged and consulted with community members, Tribal and Indigenous entities, organizations, government agencies, and mining claimants during the development of this EA/IS. The project was listed in the PNF Schedule of Proposed Actions on July 1, 2023. Scoping letters describing the Proposed Action and apprising the preparation of an EA/IS by USFS were mailed by the PNF to various agency stakeholders, organizations, and individuals of the public within the vicinity of the proposed project in accordance with 36 CFR 218, Subparts A and B. These actions also meet the requirements of CEQA Guidelines Section 15063 (g).

A public notice appeared in The Mountain Messenger on February 15, 2024. The scoping period was held from February 16 to March 18, 2024. Over 200 individuals, organizations, groups, Tribes, and Native American organizations were contacted with project information initiating the scoping period.

Scoping letters were sent to entities and organizations including, but not limited to: Altacal Audubon Society, American Forests, American Forest Resource Council, Back Country Horsemen of California, Bear Yuba Land Trust, Berry Creek Fire Safe Council, Butte County Fire Safe Council, Butte College, Bucks Lake Homeowners Association, Butte County Forest Advisory Committee, Butte County Forest Advisory Committee, Butte County Resource Conservation District, California Cattlemen's Association, California-Engels Mining Co., California Fire Safe Councils/Sierra Region, California Forestry Association, California Invasive Plant Council, California Native Plant Society, Mount Lassen Chapter, California State University Chico, Associated Students, California State University Chico, Ecological Reserves, California Wilderness Coalition, Camptonville Community Partners, Center for Biological Diversity, Collins Pine Company, Dobbins/Oregon House Fire Protection, Explore Butte County, Feather River Action, Feather River Land Trust, Feather River Resource Conservation District, Feather River Trout Unlimited, Forbestown Ridge Fire Safe Council, Friends of Plumas Wilderness, J.W. Bamford, Inc./Bamford Equipment, La Porte Snowmobile Club, Lassen Forest Preservation Group – Yahi Group Sierra Club/Butte Environmental Council, Mooretown Forestry Services, Mule Deer Foundation, National Wild Turkey Federation, Northern California Botanists, NRCS/Point Blue Conservation Science, Pacific Crest Trail Association, Pacific Gas and Electric Company (PG&E), Pacific Northwest Research Station/Pacific Wildland Fire Sciences, Paradise Ridge Riders, Plumas County Fire Safe Council, Plumas Forest Project, Rotary Club of Portola, Sacramento River Watershed Program, Sierra Access Coalition, Sierra Club, Sierra Club - Blue Oak Group, Sierra Forest Legacy, Sierra Institute for Community and Environment, Sierra Pacific Industries (SPI), Siller Brothers, Inc., South Feather Water and Power Agency, South Yuba Water, Southern Pacific Rail Road, Sustainable Forest Action Coalition, TCK Ecological Consulting, The John Muir Project, The Wilderness Society, Trinity River Lumber, University of California Cooperative Extension, University of California Cooperative Extension – Yuba-Butte, University of California Davis, University of California Davis/FRAP, Winter Wildlands Alliance, and the Yankee Hill Fire Safe Council.

Additionally, scoping letters were sent to government organizations such as the Board of Supervisors for Butte, Lassen, and Plumas Counties, the Central Valley Water Board, and Sierra Nevada Conservancy.

The complete list of those consulted is available in the project record, hosted by the Mt. Hough Ranger District in Quincy, CA.

Formal letters were sent out offering to engage in tribal consultation on February 16, 2024. Letters and information regarding the Proposed Action were sent to the Greenville Rancheria, Susanville Indian Rancheria, and the Washoe Tribe of Nevada and California; all are Federally recognized Indian tribes with traditional territory encompassing this area. Letters were also written to Maidu Summit Consortium, Maidu Cultural Development Group, and the Tásmam Koyóm Foundation, which are not Federally-recognized, but have traditional lands within the Project Area or consist of a variety of members representing both federally recognized and non-recognized tribes, organizations and individuals. To date, no comments have been received resulting from this engagement effort.

The Plumas National Forest and Plumas Corporation conducted information outreach within the community. Two community meetings and one Indigenous outreach meeting were held for the Project. The community meetings were published online in the Plumas News on July 24, 2023, and were held in Taylorsville on July 26, 2023, and Portola on July 27, 2023. The Indigenous outreach meeting with the Maidu Summit Consortium (MSC) was held on March 12, 2024. Engagement with MSC continues for developing Indigenously identified, and led, actions. Additionally, the Tributaries Project was among the projects presented by Plumas National Forest and discussed at a coordination meeting with Susanville Rancheria on February 11, 2025 and at a Tribal engagement meeting on February 21, 2025 with Greenville Rancheria, Enterprise Rancheria (Estom Yumeka Maidu), Berry Creek Rancheria, Mooretown Rancheria (Concow-Maidu), and the Konkow Valley Band of Maidu.

Based on community input provided during initial planning, the Proposed Action includes changes such as avoiding Inventoried Roadless Areas and providing for alternatives to herbicide use for vegetation management.

CHAPTER 4. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter summarizes the physical, biological, and social environments of the affected Project Area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives.

Affected environment and environmental consequences sections have been divided by resource areas and then by alternative. For each resource, there is a discussion of the potential environmental impacts associated with construction and maintenance of the proposed project. Potential direct and indirect effects of the proposed project are analyzed. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action but are later in time or farther removed in distance. The EA/IS analyzes the direct and indirect impacts for each resource, but does not specifically differentiate between direct and indirect for every resource. In addition, direct and indirect impacts are analyzed in association with other past, present, and probable/reasonably foreseeable future impacts (listed in Appendix I) under some resources and in Section 4.4, Cumulative Impacts.

The CEQA Guidelines were used as the basis for assessing the significance of potential environmental impacts, considering the whole of the action as required by CEQA. Agency standards, regulatory requirements, and professional judgment were also used, where appropriate. For the purposes of NEPA, the context and intensity of the significance of potential project effects was taken into consideration.

Per CEQA guidelines, mitigation measures are provided to reduce potentially significant impacts to less-than-significant levels, where applicable. A summary of mitigation measures is included in Appendix E.

4.1 Resources Eliminated from Further Analysis

As part of the scoping and environmental analysis conducted for the proposed project, several resources were eliminated from detailed analysis because no impacts from project implementation are anticipated. A description of the resources and an explanation for eliminating them from further analysis are provided in this section.

4.1.1 Aesthetics/Visual Resources

The Project Area is a natural forest setting on lands administered by the Plumas National Forest, Mount Hough and Beckwourth Ranger Districts. The Dixie (2021) and Walker (2019) fires collectively burned 59% of the Project Area (92,293 acres) at high severity, with only 28% burned at low severity (21,612 acres) or unburned (21,769 acres). State Route 70 (SR 70), which is designated as a national scenic byway, runs north / south to the west and south of the Project Area. None of the Proposed Action treatments are visible from SR 70 or any other major road or highway. The Project Area is accessed by Plumas County and Forest Service roads, and many proposed activities will be visible from these roads. The only developed recreation sites or routes in or adjacent to the Project Area are concentrated around

Antelope Lake and Lake Davis. Some proposed fuel reduction and reforestation activities will be visible from day use and campgrounds around the lakes, and from the Antelope / Taylor Lake trail system.

The proposed project is designed to fulfill the management direction specified in the 1988 PNF LRMP (USDA, 1988), as amended by the SNFPA FEIS (USDA, 2004b) and ROD (USDA, 2004a). The PNF LRMP management direction for Visual Resources calls for the USFS to maintain high visual quality on lands managed for specific uses (i.e. wilderness, wild and scenic, semi-primitive), and on areas readily apparent from recreational developments, major travel routes, and other high use areas.

CEQA establishes that it is the policy of the State to take all action necessary to provide the people of the State "with…enjoyment of aesthetic, natural, scenic and historic environmental qualities" (CA Public Resources Code [PRC] Section 21001[b]).

The Forest Service uses Visual Quality Objectives (VQOs) to describe different degrees of acceptable alteration of the natural landscape. The Objectives are the measurable standards for the management of the "seen" aspects of the land. Approximately 9,671 acres of the Project Area is designated as Retention VQO, and 8,843 acres are classified as Partial Retention VQO. Retention and Partial Retention VQOs allow for management activities that are not evident to the casual forest visitor, and activities that are evident but remain subordinate to the characteristic landscape, respectively. Retention and Partial Retention VQOs management zones within the Project Area include travel routes along Indian Creek from Genesee Valley to Antelope Lake, around Antelope Lake, along the north end of Lake Davis, and the south side of Grizzly Ridge.

The majority of the Project Area consists of land designated as Visual Quality Objective (VQO) Modification. Modification VQO allows 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. Activities should appear as a natural occurrence when viewed in the foreground or middle ground. The Project Area contains a small percentage (6,506 acres/3.98%) of Maximum Modification VQO southwest of Antelope Lake along Cold Stream, Middle Creek, and Hungry Creek. The visual character of this area has been heavily modified by past forest management and wildfires. 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.

Taylor Lake Focus Area

The Taylor Lake Focus Area has 6,422 acres of Maximum Modification VQO, 20,427 acres of Modification VQO, and 200 acres of Partial Retention VQO. No treatments are proposed within the Partial Retention VQO areas.

Babcock Peak & McReynolds Focus Areas

Both the Babcock Peak and the McReynolds Focus Areas consist of 100% Modification VQO.

Mt. Ingalls Focus Area

The Mt. Ingalls Focus Area has 959 acres of Retention VQO, 2,087 acres of Partial Retention VQO, and 117,802 acres of Modification VQO. Proposed actions within the Retention VQO include Mechanical Fuels Reduction. In the Partial Reduction VQO of this Focus Area there are 219 acres of proposed commercial thin treatment.

Over half of the Project Area was burned at high severity by wildfires in the last five years, substantially altering the existing aesthetic, natural, scenic, and historic visual qualities of the landscape. The Proposed Action will not have a substantial adverse effect on existing scenic vistas or substantially damage scenic resources. No proposed activities will occur along the SR 70 corridor, nor impact the SR 70 viewshed. The Proposed Action would not degrade the existing visual character or quality of the area, nor create any new sources of light or glare. While fuels reduction work may further open up the canopy and create greater lines of site, the proposed work would also close unauthorized routes currently causing resource damage from OHV use off designated routes. Disturbed areas within the Project Area may be bare of vegetation the first year following implementation; however, the Proposed Action includes reforestation to accelerate the establishment of vegetation in these areas. Revegetation success would be monitored to ensure reestablishment of riparian and forest cover. The Proposed Action is expected to improve visual quality characteristics in the long-term. Forest VQOs standards and Project VQO design features (Appendix E) would be applied as designated on the landscape to proposed treatment units to ensure visual elements are sustained and objectives are met. Based on the factors discussed above, no impacts or adverse effects to aesthetics or visual quality are expected.

4.1.2 Agricultural and Forest Resources

The Project Area does not contain any areas identified as important farmland (i.e. areas that include Prime Farmland, Unique Farmland, Farmland of Statewide Importance, or properties in Williamson Act contract) (CA DOC, 2016, CA DOC, 2022). Implementation of the Proposed Action would not result in any impacts to important farmland, or result in conversion of farmland to non-agricultural use. The Plumas County General Plan land use designation for the majority of the Project Area is Timber Resource Land (TRL) (Plumas County, 2013). TRL allows for the harvesting and processing of forest products. Zoning and General Plan land use designations for the Project Area and surrounding areas include timber-related management areas. These areas allow for the cutting and processing of timber products. The Proposed Action includes vegetation management activities that would involve the removal of trees. These activities would not conflict with the existing zoning and would not impact the overall timber resources throughout the Project Area. Implementation of the proposed Project would not conflict with timber designations or zones or convert forest land to non-forest use. Application of Project design features for silviculture would help protect and sustain the health of existing and treated forest resources. Based on the above, the Proposed Action would have no impact to agriculture or forestry resources.

4.1.3 Energy

The Proposed Action is a forest and watershed restoration activity that would not create an additional long-term source of energy demand. There would be no unusual equipment operation that would result in energy consumption that is wasteful, inefficient, or unnecessary during project implementation. Energy consumption would occur for a short duration during application of proposed project actions through the operation of heavy equipment. All equipment would be provided through State licensed subcontractors and rental fleets, which are required to meet California Air Resources Board (emissions) standards for diesel equipment. Further, each piece of equipment would have a dedicated function during implementation – e.g., masticating, chipping, felling/bunching, excavating, grading, placing rock, transplanting vegetation. All equipment not required for a project activity task would be turned off when not needed. Temporary implementation-related energy consumption would not conflict with or obstruct any State or local plans for renewable energy or energy efficiency. Implementation of the proposed Project would not result in an adverse impact with regard to energy resources.

4.1.4 Land Use and Planning

The proposed Project Area is located on public lands managed by the USDA Forest Service for a multitude of uses, including livestock grazing, forest productivity, wildlife habitat, recreation, and water quality. The Proposed Action would not alter any existing land uses. Existing and fire-damaged range improvements, such as fences, cattleguard wings, corrals, and spring developments would be protected and/or restored, as needed. Livestock grazing would be excluded from watershed treatment areas involving meadow or spring/fen restoration for three to five years to allow for vegetation recovery, but would continue outside of the restored sites. Any new fencing installed to protect recovery of meadow vegetation and soils following restoration would be developed and approved by the PNF range conservation specialist, wildlife biologist, archaeologist, botanist, and hydrologist in coordination with the permittee. Once vegetation is well established and the implementation areas are stabilized, grazing would be allowed in the excluded areas under management guidelines outlined by the USDA Forest Service in their annual allotment letter to the permittee. There are no established communities in the Project Area, only a few small private inholdings that are utilized seasonally. Implementation of the Proposed Action would not have an impact on land use and planning.

4.1.5 Mineral Resources

The Plumas County General Plan identifies prime mining resource production areas and advises that these locations can occur where surrounding land use and environmental setting will permit extraction without major adverse environmental impacts (Plumas County, 2013). There are no identified mineral resource areas in or near the Project Area identified in the County’s General Plan (Ibid). The Project was planned so as not to interfere with any active mining claims and operations; therefore, implementation of the proposed project would have no impact on mineral resources.

4.1.6 Population and Housing

The Plumas County population in 2020 was 19,794 (U.S. Census Bureau, 2020). The Project Area is located on public lands managed by the USFS; consequently, the Project Area does not include any communities, but has a handful of private inholdings with cabins or other infrastructure. The closest residential community to the Taylor Lake and Babcock Peak Focus Areas is Genesee, approximately 25 miles away. The closest residential community to the McReynolds Focus Area is Beckwourth, CA approximately 16 miles away. The closest residential community to the Mt. Ingalls Focus Area is Portola, CA approximately 14 miles away. The Proposed Action consists of meadow restoration, silviculture treatments, and stream road crossing improvements and would not induce population growth or displace housing or people. Therefore, implementation of the Proposed Action would not have an impact on population and housing.

4.1.7 Public Services

There are no public service facilities within or near the Project Area. The Proposed Action would not affect public service ratios or response times and would not construct or result in the need to construct new public service facilities. The Proposed Action is a restoration project in a natural setting and implementation of the Proposed Action would not have an impact on public services.

4.1.8 Utilities and Emergency Systems

There are no permanent residences within the Project Area that will be affected by implementation activities. There will be no change in water supply or electricity to local communities as a result of the project. Project silviculture operations will adhere to the Timberland Management General Order. Watershed related operations will prepare a stormwater pollution prevention plan (SWPPP) to minimize potential impacts from stormwater runoff. Permanent stream channel impacts are not anticipated as the Proposed Action will provide improved drainage conveyance and stream connectivity upon the completion of construction. Provisions will be made during construction to minimize traffic delays and to allow access and passage of emergency vehicles. Implementation activities will result in increased road usage in and around the Project Area, but this will not affect emergency evacuation routes. The Proposed Action consists of replacing or improving drainage features in the focus areas, and these actions will have no impact related to utilities and service systems.

4.2 Affected Environment, Environmental Consequences, and Avoidance, Minimization, and/or Mitigation Measures

Numerous specialist reports and supplementary analyses were prepared to evaluate the effects of the Action and No Action alternatives. These reports are summarized in the sections that follow, and are provided as Attachments to this Draft EA/IS, as follows: Biological Assessment for Wildlife and Plants (Attachment 1), Wildlife Biological Evaluation (Attachment 2), Botanical Biological Evaluation and Noxious Weed Risk Assessment (Attachment 3), Greenhouse Gas Emissions and Climate Change Report (Attachment 4), Hydrology and Soils Report (Attachment 5), Trail Assessment: Antelope/Taylor Lake Trail

System (Attachment 6), Vegetation Management Report (Attachment 7), Fire and Fuels Report (Attachment 8), Human Health and Environmental Risk Assessment (Appendix H), and Past, Ongoing, and Reasonably Foreseeable Future Actions (PORFFA; Appendix I).

Additionally, this section includes an analysis of CEQA environmental factors outside the scope of NEPA.

4.2.1 Air Quality

Affected Environment

The Clean Air Act provides the principal framework for national, state, and local efforts to protect air quality. Under the Clean Air Act, the Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The 1990 Clean Air Act is the most recent version of a law first passed in 1970. The United States Environmental Protection Agency (US EPA) and California Air Resources Board (CARB) have established ambient air quality standards for six "criteria pollutants," pursuant to the federal Clean Air Act of 1970 and the California Clean Air Act, respectively. The criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, particulate matter less than 2.5 microns in aerodynamic diameter (PM2.5), particulate matter less than 10 microns in aerodynamic diameter (PM10), sulfur dioxide, and lead (US EPA, 2024c). CARB oversees standards maintenance for three additional pollutants: hydrogen sulfide, sulfates, and visibility-reducing particles. The USEPA promulgated the General Conformity Rule on November 30, 1993 in Volume 58 of the Federal Register (58 FR 63214) to implement the conformity provision of Title I, section 176(c)(1) of the Clean Air Act (CAA). Section 176(c)(1) requires that the federal government not engage in, support, or provide financial assistance for licensing, permitting, or approving any activity not conforming to an approved CAA implementation plan. The approved implementation plan could be a federal, state, or tribal Implementation Plan (i.e., FIP, SIP, or TIP). The General Conformity Rule is codified in Title 40 of the Code of Federal Regulations (CFR) Part 51, Subpart W and Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." The General Conformity Rule applies to all federal actions except highway and transit programs. The latter must comply with the conformity requirements for transportation plans in 40 CFR Part 93, Subpart A.

The air quality of a region is determined by the climatological conditions, topography, and the types and amounts of pollutants. California is divided geographically into 15 air basins. An air basin generally has similar meteorological and geographic conditions. The proposed project is located in Plumas County, which is located in the Mountain Counties Air Basin (MCAB).

The MCAB covers the mountainous area of the central and northern Sierra Nevada Mountains. Elevations range from several hundred feet in the foothills, to over 10,000 feet along the Sierra crest. This air basin includes Plumas, Sierra, Nevada, Central Placer, West El Dorado, Amador, Calaveras, Tuolumne and Mariposa counties.

In the MCAB, regional airflows are affected by the mountains and hills, which direct surface airflows, causing shallow vertical mixing, and create areas of high pollutant concentrations by hindering dispersion. Inversion layers, where warm air overlays cooler air, frequently occur and trap pollutants close to the ground. In the winter, these conditions can lead to carbon monoxide (CO) "hotspots" along heavily traveled roads and at busy intersections. During summer's longer daylight hours, stagnant air, high temperatures, and plentiful sunshine provide the conditions and energy for the photochemical reaction between reactive organic gases (ROGs) and nitrogen oxides (NOx) that results in the formation of ozone (O_3). Because of its long formation time, ozone is a regional pollutant rather than a local hotspot problem. In the summer, the strong upwind valley air flowing into the basin from the Central Valley to the west is an effective transport medium for ozone precursors and ozone generated in the Bay Area and the Sacramento and San Joaquin valleys. These transported pollutants predominate as the cause of ozone in the MCAB and are largely responsible for the exceedances of the state and federal ozone ambient air quality standards in the MCAB (Yates et al., 2020).

The County's largest sources of particulate matter are unpaved road dust, prescribed burning, and residential fuel. Primary activities contributing to these pollutant emissions include wildfires, use of woodstoves, forestry management burns, residential open burning, vehicle traffic, and windblown dust. The varying topography of the air basin also contributes to localized air quality issues within valley areas (Caltrans 2016d). Plumas County is classified as attainment1 for all National Ambient Air Quality Standards (NAAQS): O_3, particulate matter less than 10 microns in diameter (PM10), CO, nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Plumas County is classified as nonattainment2 for particulate matter less than 2.5 microns in diameter (PM2.5).

Proposed Action

Direct and Indirect Effects

The Proposed Action would have no long-term effects on air quality. The proposed project implementation activities involve mechanical and hand felling, mastication, pile burning, prescribed burning, cut-and-fill activities, improving road conditions, along with removal and replanting of vegetation with heavy equipment. These actions may temporarily generate levels of PM10, PM2.5, and small amounts of CO, SO_2, NOx, and volatile organic compounds (VOCs) that would be of concern. These emissions would be temporary and limited to the vicinity of the operations, and minimized with implementation of BMPs for the reduction of dust and exhaust emissions.

Proposed watershed treatments in the Babcock and McReynolds Focus Areas includes methods that use excavation and grading activities to fill incised channels. Construction activities may create short-term degradation to air quality due to the release of particulate emissions (airborne dust) generated by excavation, filling, hauling, and other construction activities. Emissions from heavy construction equipment are also expected and would include CO, NOx, VOCs, PM10, and PM2.5, and toxic air contaminants such as diesel exhaust particulate matter. Estimates of equipment and usage were analyzed for greenhouse gas emissions (see Attachment 4). PM10 is the pollutant of greatest concern associated with dust. PM10 emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the implementation site. Without proper control measures dust generated from construction activities could have an adverse effect on air quality. With implementation of USFS project design criteria, fugitive dust and exhaust emissions from construction activities would not result in any adverse air quality impacts.

Proposed silviculture treatments will have short term air quality effects from fugitive dust and burning. The amounts of criteria air pollutants and greenhouse gas emissions from burning live vegetation and dead fuels varies widely depending on many variables including vegetation types and their condition, fuel loadings, fuel moistures and weather parameters. Effects to air quality with mechanical operations are largely from fugitive dust and emissions from trucks and mechanized equipment. The pollutants that would be released are the EPA criteria pollutants i.e. PM10, PM2.5, CO, NOx, VOCs and minute quantities of non-criteria air toxics. Spacing of the prescribed burning and mechanical operations would ensure compliance with Federally-mandated threshold levels for ozone precursors (VOC and/or NOx).

The effects of prescribed fire can be manipulated to reduce effects to air quality. Guidelines that would reduce the effects of prescribed burns are termed best available control measures (BACM) and are based on "Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures" (USEPA 1992). BACMs are based on avoidance, dilution, and emission reduction strategies. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, diurnal wind shifts, appropriate ignition techniques and rapid mop-up. Following these BACMs and identifying them in burn plans is critical in preventing adverse air quality effects. Temporary and short-term visibility impacts can be expected in the immediate Project Area during actual ignition and would be affected by inversions, as well as wind speed and direction. The localized effects of burning in the Project Area would be short-term degradation of air quality.

Plumas County is in attainment for all current NAAQS, except PM2.5. Implementation of project design criteria would reduce fugitive dust and exhaust emissions during construction and avoid adverse air quality impacts.

Construction activities would be localized and short-term in duration. Due to the project's remote location, it would not expose any sensitive receptors to substantial pollutant concentrations, nor result in air pollutant standard violations, or conflict with any regional or local air quality plan. Construction emissions would not violate CAAQS and would be less than significant with the implementation of the following BMPs to minimize exhaust emissions:

- All construction equipment shall be maintained in proper tune according to manufacturer's specifications.
- To the extent feasible, the use of diesel construction equipment meeting current CARB certification standards for off-road heavy-duty diesel engines shall be maximized.
- Unnecessary vehicle idling shall be restricted to 5 minutes or less.
- All off-road heavy-duty diesel equipment greater than 50 horsepower used in execution of the Project shall be registered with the Air Resources Board's Diesel Off-Road Online Reporting System (DOORS) and meet all applicable standards for replacement and/or retrofit.
- All portable equipment used in the execution of Project implementation, including generators, chainsaws, and air compressors rated over 50 brake horsepower, shall be registered in the Portable Equipment Registration Program.

- Impacts would be further reduced with implementation of project design criteria that includes watering roads and construction disturbance areas to minimize and control dust.

Cumulative Impacts

Although the USDA Forest Service is the largest organization using prescribed fire as a land management tool in the vicinity, prescribed fires are also conducted on local public and private land. Project implementation would increase the total amount of prescribed fire activities in the area. Strategic planning, monitoring, and coordination with the NSAQMD and other prescribed fire practitioners will mitigate cumulative effects of smoke and pollutants on local and regional air quality.

No Action

Under the no action alternative, no adverse effects to air quality from implementation would occur and CO, SO_2, NOx, VOCs, PM10, and PM2.5 levels/emissions within the surrounding area would remain unchanged. However, under the no action alternative, tree stands within the Project Area would continue to become dense and overcrowded and would continue to accumulate excess fuels. Deforested areas would retain dead and downed wood--as snags fall more fuel would accumulate on the ground--and continue to accumulate fuel with dense shrub growth. Excess fuels increase the risk of wildfire and re-burn as well as increase the risk of large and high-intensity fires. Wildfires release large amounts of PM2.5, NOx, ozone, aromatic hydrocarbons, or lead (WHO 2025). The no action alternative would increase the risk of release of large amounts of hazardous air pollutants in the form of wildfire smoke.

4.2.2 Biological Resources

This section discloses the effects of the Proposed Action and No Action Alternatives on wildlife resources, including direct, indirect, and cumulative effects on special status wildlife species. Analysis of Proposed Actions is organized in two sections based on species status: 1) Federal Endangered Species Act (ESA) Proposed and Candidate species, Region 5 Forest Service Sensitive species, U.S. Fish and Wildlife Service Birds of Conservation Concern, California ESA Threatened, Endangered, and Candidate species, California Department of Fish and Wildlife Species of Special Concern, Fully Protected and Watch List species; and 2) Federally-listed Threatened and Endangered species.

The Wildlife Report/Biological Evaluation, included in the project record, provides more detail on species-specific analyses (see Attachment 2). The Wildlife Report/Biological Evaluation (BE) analyzes all species in the above paragraph listed under #1, as well as Forest Service Management Indicator Species and migratory birds. The Biological Assessment (BA) for Wildlife and Plants in the project record analyzes project effects to species listed as Threatened or Endangered by the U.S. Fish and Wildlife Service under the federal ESA of 1973, as amended, and federally designated critical habitat for those species (see Attachment 1). This section includes findings from both the BE and the BA.

The California spotted owl, proposed for listing as a threatened species under the federal ESA, is addressed both in the BE and separately in a pre-listing Programmatic Biological Assessment and conferencing with the USFWS.

Table 1 summarizes all special status wildlife species that are known or have high potential to occur in the Project Area, their status, what report(s) they are analyzed in, and the "Determination of Effects" for each[1].

The analysis area for wildlife includes the 163,248-acre Project Area with a quarter-mile buffer around the entire Project Area, including all California spotted owl and American goshawk Protected Activity Centers (PACs) that intersect with the Project Area.

Table 1. *Summary of Effects Determinations for special status wildlife species in the Tributaries Project Area.*

Species Common and Scientific Name	Species Status	Report Species Analyzed	Determinations
Birds			
American goshawk *Astur atricapillus*	USFS: S; CDFW: SSC	BE	MAI
American peregrine falcon *Falco peregrinus anatum*	CDFW: SSC	BE	MAI
Bald eagle *Haliaeetus leucocephalus*	CDFW: SE; USFS: S; USFWS: BCC	BE	MAI
California spotted owl *Strix occidentalis occidentalis*	USFWS: FPT; USFS: S, MIS; CDFW: SSC	BE & PBA	MAI & MANLJCE
Greater sandhill crane *Antigone canadensis tabida*	CDFW: ST, FP; USFS: S	BE	MAI
Northern harrier *Circus cyaneus*	CDFW: SSC; USFWS: BCC	BE	MAI
Olive-sided flycatcher *Contopus cooperi*	CDFW: SSC; USFWS: BCC	BE	MAI
Swainson's hawk *Buteo swainsoni*	CDFW: ST	BE	MAI
Willow flycatcher *Epidonax trailli*	USFS: S; CDFW: SSC; USFWS: BCC	BE	MAI
Yellow warbler *Setophaga petechia*	CDFW: SSC; USFS: MIS	BE	MAI
Reptiles and Amphibians			
Foothill yellow-legged frog *Rana boylii*	CDFW: SSC; USFS: S	BA	NE
Sierra Nevada Yellow Legged Frog *Rana sierrae*	USFWS: FE; CDFW: SE	BA	MANLAA
Southern long-toed salamander *Ambystoma macrodactylum sigillatum*	CDFW: SSC	BE	MAI
Mammals			
American badger *Taxidea taxus*	CDFW: SSC	BE	MAI
Fringed myotis	USFS: S	BE	MAI

Species Common and Scientific Name	Species Status	Report Species Analyzed	Determinations
Myotis thysanodes			
Gray Wolf *Canis lupus*	USFWS: FE; CDFW: SE	BA	MANLAA
Pallid bat *Antrozous pallidus*	CDFW: SSC; USFS: S	BE	MAI
Spotted bat *Euderma maculatum*	CDFW: SSC	BE	MAI
Townsend's big-eared bat *Corynorhinus townsendii*	CDFW: SSC; USFS: S	BE	MAI
Western red bat *Lasiurus blossevillii*	CDFW: SSC	BE	MAI
Invertebrates			
Western bumble bee *Bombus occidentalis*	CDFW: SC; USFS: S	BE	MAI
Monarch butterfly *Danaus plexippus*	USFWS: C; USFS: S	BE	MAI
Fish			
Mountain sucker *Catostomus platyrhynchus*	CDFW: SSC	BE	MAI

[1]Determinations:

USFWS T & E Species:

NE = No Effect, MANLAA = May Affect but Is Not Likely to Adversely Affect the species or their designated critical habitat, MALAA = May Affect and Is Likely to Adversely Affect the species or their designated critical habitat. Proposed (P) Species: WNA = Will Not Affect, MANLJCE = May Affect but is Not Likely to Jeopardize the Continued Existence of the Species, MAILJCE = May Affect but is Likely to Jeopardize the Continued Existence of Individuals.

Proposed Critical Habitat:

WNA = Will Not Affect, NLRDAM = Not Likely to Result in the Destruction or Adverse Modification of their Proposed Critical Habitat, LRDAM = Likely to Result in the Destruction or Adverse Modification of their Proposed Critical Habitat.

FS Sensitive Species:

WNA = Will Not Affect, MAI = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability, MAILRTFL = May Affect Individuals, and is Likely to Result in a Trend toward Federal Listing or loss of viability

Analysis Overview

Both federal and state special status species were considered in the wildlife analyses, as identified above. Table 2 includes species which occur or could occur on Plumas National Forest, according to the California Natural Diversity Database (CNDDB), U.S. Geological Survey (USGS) GAP Analysis, USFS species list for Plumas National Forest (2016), USFWS Environmental Conservation Online System (ECOS) and Information for Planning and Consultation (IPaC), Audubon, eBird, iNaturalist, and consultation with local expertise. Species classified under Category 1 or Category 2, as outlined in Table 2, have low to moderate potential for occurrence in the Project Area, and Category 3 species have high potential to occur in the project. The following section summarizes direct and indirect effects to the species identified as Category 3 species. Additional information on these species and why some were not analyzed further can be found in the BE and BA in the project record.

Category 1 species do not have habitat in or adjacent to the Project Area, so they are not included in this analysis. Category 1 species include Barrow's goldeneye (*Bucephala islandica*), loggerhead shrike (*Lanius ludovicianus*), mountain plover (*Anarhynchus montanus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), Carson wandering skipper (*Pseudocopaeodes eunus obscurus*), Delta smelt (*Hypomesus transpacificus*), hardhead (*Mylopharodon conocephalus*), and Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*).

Category 2 species have habitat in or adjacent to the Project Area, but they would not be affected by the Project. Because they have a low to moderate potential for occurrence and their habitat will not be affected by the Project, Category 2 species were not analyzed in this report. Category 2 species include American white pelican (*Pelecanus erythrorhynchos*), bank swallow (*Riparia riparia*), black tern (*Chlidonias niger*), burrowing owl (*Athene cunicularia*), common loon (*Gavia immer*), golden eagle (*Aquila chrysaetos*), great gray owl (*Strix nebulosi*), harlequin duck (*Histrionicus histrionicus*), long-eared owl (*Asio otus*), purple martin (*Progne subis*), redhead (*Aythya Americana*), short-eared owl (*Asio flammeus*), Vaux's swift (*Chaetura vauxi*), yellow rail (*Coturnicops noveboracensis*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), California red-legged frog (*Rana aurora draytonii*), Cascades frog (*Rana cascadae*), northwestern pond turtle (*Actinemys marmorata*), North American wolverine (*Gulo gulo*), Pacific fisher (*Pekania pennant*), Pacific marten (*Martes caurina*), Sierra Nevada mountain beaver (*Aplodontia rufa californica*), Sierra Nevada red fox (*Vulpes vulpes necator*), Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*), western white-tailed jackrabbit (*Lepus townsendii townsendii*), and riffle sculpin (*Cottus gulosus*).

Category 3 species are special status species that would be directly and/or indirectly affected by the Project, and therefore are analyzed further in this document or the BA. These species include American goshawk, American peregrine falcon (*Falco peregrinus anatum*), bald eagle (*Haliaeetus leucocephalus*), California spotted owl, greater sandhill crane (*Antigone canadensis tabida*), northern harrier (*Circus cyaneus*), olive-sided flycatcher (*Contopus cooperi*), Swainson's hawk (*Buteo swainsoni*), willow flycatcher, yellow warbler (*Setophaga petechia*), foothill yellow-legged frog (*Rana boylii*), Sierra Nevada yellow-legged frog, southern long-toed salamander (*Ambystoma macrodactylum sigillatum*), American badger (*Taxidea taxus*), fringed myotis (*Myotis thysanodes*), gray wolf (*Canis lupus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), western red bat (*Lasiurus blossevillii*), western bumble bee (*Bombus occidentalis*), monarch butterfly, and mountain sucker (*Catostomus platyrhynchus*).

Table 2. *Special status species with potential to occur in Plumas National Forest.*

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Birds					
American goshawk *Astur atricapillus*	USFS: S; CDFW: SSC	3	Year-round range; known occurrences within the Project.	Yes	Occupies dense mature conifer and deciduous forests that are interspersed with meadows for hunting. Riparian areas are required for this species and nesting habitat includes north-facing slopes near water. Goshawks nest in the densest parts of tree stands but close to forest openings. Occupies much of Northern California including Plumas County yearlong in the mid to higher elevation ranges.
American peregrine falcon *Falco peregrinus anatum*	CDFW: SSC	3	Year-round range; known occurrences within the Project.	Yes	Occupies protected cliffs and ledges for cover and requires riparian habitat for breeding and feeding. Typically located near water sources in open areas with cliffs and canyons nearby for nesting. Uncommon breeding resident to the Sierra Nevada and other mountains within California.
American white pelican *Pelecanus erythrorhynchos*	CDFW: SSC; USFWS: BCC	2	Historic observations predating 1990.	Yes	Occupies edges of water bodies for cover and nests at large fresh or saltwater lakes typically on small islands or remote dikes. Feed in water by diving for prey and scooping up with their mouth pouch. Pelicans will travel up to 184 miles each way from breeding grounds to foraging areas and therefore, doesn't require food sources at their nest site. Could use large lakes such as Lake Davis within the Project.
Bald eagle *Haliaeetus leucocephalus*	CDFW: SE; USFS: S; USFWS: BCC	3	Year-round range; known occurrences within the Project.	Yes	Occupies lower montane coniferous forest and old growth forests. Perches in large, stoutly limbed trees, snags, and broken topped trees. Bald eagles require large bodies of water, or free flowing rivers with fish for hunting. They use live large trees for nesting, typically with open branching including ponderosa pines. Permanent resident in Plumas County.
Bank swallow *Riparia riparia*	CDFW: ST	2	Summer range; known occurrences along western edge of Project in Genesse Valley.	Yes	Typically found in riparian and lowland habitats in California west of the deserts. Spring and fall migrant and uncommon in the summer months. Uses holes dug in cliffs and riverbanks for cover and can roost on logs, shoreline vegetation, and telephone wires. Colonies persist in Plumas County.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Barrow's goldeneye *Bucephala islandica*	CDFW: SSC	1	Breeding not known to occur within Plumas County.	No	An uncommon winter resident to California and is typically found near the coast. Occupies lagoons and bays and brackish lacustrine waters and prefers tree cavities near wooded mountain lakes or large streams for nesting. May use Plumas County during migration.
Black tern *Chlidonias niger*	CDFW: SSC; USFWS: BCC	2	Summer range	Yes	Occupies emergent wetlands and was formerly a common spring and summer visitor to California. Forages in wet meadows or emergent wetlands. Will nest in vegetation anchored and floating in water as well as dry ground in muskrat houses and coot and grebe nests. Will use moist grasslands and agricultural fields as well. Fairly common migrant and breeder in the northeastern plateau.
Burrowing owl *Athene cunicularia*	CDFW: SSC; USFWS: BCC	2	No documented occurrences within the Project.	Yes	Occupies old burrows in dry grassland, desert habitats, forb and open shrubs of pinyon-juniper and ponderosa pines up to 5,300 ft elevation. Preys on insects, small mammals, and requires soft soil for burrowing. Preferred habitat is limited in the Project Area.
California spotted owl *Strix occidentalis occidentalis*	USFWS: FPT; USFS: S, MIS; CDFW: SSC	3	Year-round range; observed during survey efforts in Mt. Ingalls Focus Area.	Yes	Occurs in dense, multi-layered and old-growth mixed-conifer, redwood, and Douglas-fir habitats up to 7,545 feet in elevation. Roosts in dense, multi-layered canopies typically located near a water source. Uses tree cavities or broken topped trees as nest sites. Requires mature forests with permanent water source and suitable nesting trees or snags. Permanent resident in California along the Sierra Nevada and Cascade Range.
Common loon *Gavia immer*	CDFW: SSC	2	Outside of range; two occurrences predating 1995.	Yes	Occasionally occurs on large mountain lakes in April to May and October to December. Typically uses estuarine and subtidal marine habitats along the coast. Needs open water for feeding. Northwestern Plumas County provides winter range for this species. Lake Davis provides suitable habitat.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Golden eagle *Aquila chrysaetos*	CDFW: FP, WL	2	Year-round range	Yes	Occupies large trees, cliffs, and overhanging ledges. Open, rugged habitat with escarpments and canyons used for nesting and soars above ground for prey. Multiple nest sites are maintained, and previous nests are reused. Yearlong range throughout Plumas County. More common in Central and Southern California
Great gray owl *Strix nebulosa*	CDFW: SE, FP; USFS: S	2	Year-round range	Yes	Occupies dense forest stands for roosting and nesting. Will use large snags for nesting and will hunt around the edges of meadows. Require old-growth and second-growth forests for suitable nesting habitat. Typical prey species include pocket gophers and voles and some birds. Several unconfirmed sightings near Lake Davis in 2004.
Greater sandhill crane *Antigone canadensis tabida*	CDFW: ST, FP; USFS: S	3	Summer range; observations within the Project.	Yes	This migratory species occurs in and near wet meadows, shallow lacustrine, and fresh emergent wetland habitats. Uses treeless plains and feeds on grasses, forbs, and cereal and will probe the soil with their bill for roots, tubers, seeds, grains, earthworms and insects. They will nest in remote locations of wetlands or shortgrass prairies. Requires fresh water and avoids saline waters. Occurs within Plumas County during the summer months.
Harlequin duck *Histrionicus histrionicus*	CDFW: SSC	2	Summer range	Yes	Typically occurs along marine waters and rocky coastlines but breeds along shores of shallow, swift rivers with aquatic invertebrates present. Uses recessed and sheltered stream banks, rocks, woody debris, or low shrubs. This species feeds on crustaceans, mollusks, and aquatic insects. Current range includes the Sierra Nevada Mountains.
Loggerhead shrike *Lanius ludovicianus*	CDFW: SSC	1	Winter range; occurrences predate 1980.	No	Occupies open habitats with scattered shrubs, trees, posts, fences, utility lines and other perches throughout California. Occurs in higher densities in open-canopied valley foothill hardwood, riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Nests on branches of densely foliaged trees or shrubs.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Long-eared owl *Asio otus*	CDFW: SSC; USFWS: BCC	2	Year-round range	Yes	Occupies live oak thickets and other dense stands of trees for cover including riparian thickets with small, densely canopied trees required for roosting and nesting. Uses other bird species old nests in dense canopy cover and feeds on voles and other rodents and occasionally birds. Uncommon resident throughout California.
Mountain plover *Charadrius montanus*	CDFW: SSC; USFWS: BCC	1	Winter range	No	Occupies open areas including grasslands, plowed fields with little vegetation, and open sagebrush areas. This species does not nest in California but can occur from September through March. Feeds on large insects by searching on the ground.
Northern harrier *Circus cyaneus*	CDFW: SSC; USFWS: BCC	3	Year-long range, known occurrences within the Project.	Yes	Occupies annual grasslands up to 10,000 feet in elevation with alpine meadows. Frequently uses grasslands, open rangelands, desert sinks, and fresh and salt water emergent wetlands. This species feeds on voles and other small mammals by flying overhead and diving to capture prey. Occurs in the Sierra Nevada and Plumas County.
Olive-sided flycatcher *Contopus cooperi*	CDFW: SSC; USFWS: BCC	3	Summer range; known occurrences within the Project.	Yes	Occupies a wide variety of forest and woodland habitat including mixed conifer, montane hardwood-conifer, Douglas fir, redwood, red fir, and lodgepole pine. Uses large, tall trees for nesting and roosting and feeds on flying insects over the forest canopy, meadows, and clearings.
Osprey *Pandion haliaetus*	CDFW: WL	2	Summer range; Known occurrences within the Project.	Yes	Utilizes lacustrine and riverine habitats; includes almost any expanse of shallow, fish-filled water, including rivers, lakes, reservoirs, lagoons, swamps, and marshes. Nesting habitat must include an adequate supply of accessible fish within a maximum of about 12 miles of the nest. Uses snags, treetops, crotches between large branches and trunks, cliffs, or human-built platforms in open surroundings for nesting.
Purple martin *Progne subis*	CDFW: SSC	2	Summer range; no documented occurrences within the Project.	Yes	Occupies low elevations with wooded habitats including valley foothill and montane hardwood, valley foothill and montane hardwood-conifer and riparian habitats. Preys on insects through flying or foraging on the ground. Can be found in a variety of habitats during migration.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Redhead *Aythya americana*	CDFW: SSC	2	Year-round range; one occurrence predating 1979.	Yes	Occupies lacustrine waters and emergent wetlands and feed leaves, stems, seeds, and tubers of aquatic plants. Nests are built near tall emergent vegetation with open water nearby, preferably large lakes with extensive emergent vegetation. Low abundance rate near the Project.
Short-eared owl *Asio flammeus*	CDFW: SSC; USFWS: BCC	2	Winter range; one documented occurrence within the Project.	Yes	Occupies open areas such as annual and perennial grasslands, prairies, dunes, meadows, irrigated lands and saline and emergent wetlands. Will occasionally breed in northern California requiring dense vegetation for ground nesting. This species feeds primarily on voles and other small mammals. Winter range includes Plumas County.
Swainson's hawk *Buteo swainsoni*	CDFW: ST	3	Summer range; three documented occurrences within the Project.	Yes	Occupies open desert, grassland, or cropland containing scattered, large trees or small groves and will nest in trees using sticks, bark and fresh leaves. Swainson's hawk preys on mice and other small mammals by soaring to search for their prey. Migrates through Plumas County and has been documented in Sierra Valley.
Vaux's swift *Chaetura vauxi*	CDFW: SSC; USFWS: BCC	2	Summer range; no documented occurrences within the Project.	Yes	Occupies redwood and Douglas-fir habitats and occasionally other coniferous forests. Nests are built within hollowed out trees especially tall stubs that are charred by fire. This species will use a variety of habitats for foraging including forest openings, above burns, and above rivers. Will breed in the Sierra Nevada range.
Willow flycatcher *Epidonax trailli*	USFS: S; CDFW: SSC; USFWS: BCC	3	Nesting range; known occurrences within the Project.	Yes	Found in the Sierra Nevada from 2,000-8,000 ft (600-2,500m); rare to locally uncommon residents of montane riparian and wet meadow habitats. Most often found in open river valleys or large meadows with shrubby willows. Occurs in northern California including the PNF and is known to be present within the Project Area.
Yellow rail *Coturnicops noveboracensis*	CDFW: SSC; USFWS: BCC; USFS: S	2	Year-round range; known occurrences outside the Project.	Yes	Occupies densely vegetated marshes and breeds in montane sedge meadows where there is seasonal flooding and are bordered by coniferous forests. The full extent of this species range is unknown. Historic records in Plumas County.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Yellow warbler *Setophaga petechia*	CDFW: SSC; USFS: MIS	3	Summer range	Yes	Occupies riparian deciduous habitat in the summer including cottonwoods, willows, alders, and other small trees. This species will hover in upper canopy of trees and shrubs to forage for insects, spiders, and berries. Known to breed along the western slopes of the Sierra Nevada.
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	USFWS: FT; CDFW: SE; USFS: S	1	Outside of range; no documented occurrences within the Project.	No	Occupies California in the summer but is a rare resident to valley foothills and desert riparian habitats in scattered locations. Will use dense deciduous riparian thickets for cover and nesting. Willow is a typical dominant species. Unlikely to occur in Plumas County.
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	CDFW: SSC	2	Summer range; no documented occurrences within the Project.	Yes	Occupies fresh emergent wetlands for roosting, nesting and foraging. Will use moist, open areas for foraging and feeds on seeds and cultivated grains with some insects and spiders. Nesting is always located over water.
Reptiles and Amphibians					
California red-legged frog *Rana aurora draytonii*	USFWS: FT; CDFW: SSC	2	Edge of range	Yes	Occupies quiet pools of streams, marshes, and occasionally ponds that are almost always permanent and attached to emergent vegetation. Only occurs below 4,000 feet in elevation. Breeds March through July. Range extends to western portion of Plumas County.
Cascades frog *Rana cascadae*	CDFW: SC, SSC; USFS: S	2	No known occurrences within the Project.	Yes	Inhabits mountain lakes, small streams, and ponds in meadows up to timber line. Restricted to water and surrounding vegetation. Hibernates in mud at the bottom of ponds and lakes during the winter. Occurs in northern California including Plumas, Siskiyou, Trinity, Shasta, and Tehama Counties and up to 8,200 feet in elevation. Occurs north and west of lake Almanor.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Foothill yellow-legged frog *Rana boylii*	CDFW: SSC; USFS: S	3	Within range. Most recent known occurrences were before 1961.	Yes	Inhabits rocky streams in a variety of habitats including wet meadow, mixed chapparal, coastal scrub, mixed conifer, ponderosa pine, valley-foothill riparian, valley-foothill hardwood-conifer, and valley-foothill hardwood. Typically encountered near permanent water. Occurs in the Coast Range from the Oregon border south to the Transverse Mountains in Los Angeles County. Found west of the Sierra Nevada and Cascade Range crest.
Northwestern pond turtle *Actinemys marmorata*	USFWS: FPT; CDFW: SSC; USFS: S	2	Outside of range. No known occurrences within the Project.	Yes	Occupies permanent or almost permanent water in habitats including ponds, lakes, streams, irrigation ditches and permanent pools along intermittent streams. Feeds on plants and aquatic invertebrates. Occurs west of Quincy California and is common in western California in suitable aquatic habitats.
Sierra Nevada Yellow Legged Frog *Rana sierrae*	USFWS: FE; CDFW: SE	3	Within range. No known occurrence within the Project Area, but critical habitat overlaps Taylor Lake FA. Known in adjacent Indian Lone Rock Creek watershed.	Yes	Occupies California's Sierra Nevada mountains in lakes, ponds, marshes, meadows and streams at elevations ranging from 4,500 to 12,000 feet (1,370 to 3,660 meters), Occurs in northern California including the PNF, and is known to be present in an adjacent watershed to the Project Area.
Southern long-toed salamander *Ambystoma macrodactylum sigillatum*	CDFW: SSC	3	Year-round range. Known occurrences within the Project	Yes	Occupies alpine meadows and high mountain ponds and lakes up to 10,000 feet in elevation. Breeding occurs in temporary or permanent ponds, lakes, or meadows. These salamanders are carnivorous and eat small invertebrates. Range includes Plumas County.
Mammals					
American badger *Taxidea taxus*	CDFW: SSC	3	Permanent resident. Detected during surveys.	Yes	Occupies drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Badgers dig burrows for cover and will feed on rodents and some reptiles and insects. Young are born in burrows and are non-migratory. Occurs in Plumas County.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
North American Wolverine *Gulo gulo*	USFWS: FT; CDFW: ST, CFP; USFS: S	2	Scarce resident of the North Coast Mountains and Sierra Nevada. One known occurrence within the Project in 1975.	Yes	In northern coastal and north Sierra Nevada areas, habitat includes Douglas-fir and mixed conifer and potentially red fir, lodgepole, subalpine conifer, alpine dwarf-shrub, wet meadow, and montane riparian. Feeds primarily on small mammals and carrion and uses caves, cliffs, hollow logs, cavities in the ground, and rocks as den sites. Yearlong range in Sierra Nevada mountains and North Coast Mountains.
Fringed myotis *Myotis thysanodes*	USFS: S	3	Year-round range; known occurrences within the Project.	Yes	Occupies pinyon-juniper, valley foothill hardwood and hardwood-conifer up to 9,350 feet in elevation. Roosts in caves, mines, buildings, and crevices and uses open habitats, streams, lakes, and ponds for foraging. Widespread throughout California except the Central Valley and Colorado and Mojave Deserts.
Gray Wolf *Canis Lupus*	USFWS: FE; CDFW: SE	3	Packs known within the Project.	Yes	A generalist species that can occur in a wide range of habitats that include temperate forests, mountains, tundra, taiga, and grasslands. Seven known packs in California, including the Beckwourth Pack, Lassen Pack, and Beyem Seyo Pack in Plumas County.
Pacific fisher *Pekania pennanti*	CDFW: SSC; USFS: S	2	Year-round range; one known occurrence within the Project in 1946.	Yes	Habitat types include intermediate to large-tree stages of coniferous forests and deciduous-riparian habitats with a high percent canopy closure. Den sites include large trees, rocks, snags, logs, and slash or brush piles. Feeds on rabbits, hares, and rodents primarily. Mature dense forest stands are preferred habitat. Permanent, uncommon resident of the Sierra Nevada Mountains, Cascades, and Klamath mountains.
Pacific marten *Martes caurina*	USFS: S	2	Year-round range.	Yes	Optimal habitat includes mixed evergreen forests with greater than 40% canopy closure with large trees and snags. Red fir, lodgepole pine, subalpine conifer, mixed conifer, Jeffrey pine, and eastside pine are important habitat types. Uses stumps, logs, trees, burrows, caves, and crevices as cover and are mostly carnivorous. Occupies Northern California and Oregon.

Common Name *Scientific Name*	Listing Status[1]	Category for Project Analysis[2]	Species Range and Known Occurrences within the Project	Suitable Habitat Present	Habitat and Range
Pallid bat *Antrozous pallidus*	CDFW: SSC; USFS: S	3	Year-round range. Known occurrences within the Project.	Yes	Occupies a variety of habitats including grasslands, shrublands, woodlands, and forests. More common in open, dry habitats with rocky areas. Roosts in caves, crevices, mines and hollow trees and buildings that protect species from high temperatures. Forages in open habitats. Occurs in the low elevations of California throughout the state.
Sierra Nevada mountain beaver *Aplodontia rufa californica*	CDFW: SSC	2	Year-round range. Known occurrences within Plumas County.	Yes	Occupies riparian-deciduous and open, brushy stages of most forest types throughout the Klamath, Cascade, and Sierra Nevada Ranges. Burrows in dense understory vegetation that can provide cover.
Sierra Nevada red fox-southern Cascades DPS *Vulpes vulpes necator pop. 1*	CDFW: ST; USFS: S	2	Most recent known occurrences were before 1982 in the Project.	Yes	Inhabits alpine dwarf-shrub, wet meadow, subalpine conifer, lodgepole pine, red fir, aspen, montane chaparral, montane riparian, mixed conifer, ponderosa pine, Jeffery pine, eastside pine, and montane hardwood conifer. Preys on small to medium sized mammals and uses dense vegetation and rocky areas for den sites. Rare in the Sierra Nevada Mountains, and populations are separated in well monitored locations.
Sierra Nevada snowshoe hare *Lepus americanus tahoensis*	CDFW: SSC	2	Known occurrences within Plumas County.	Yes	Occurs in montane riparian habitats with thickets of alders and willows and in stands of young conifers interspersed with chaparral at higher elevations in the Cascades and Sierra Nevada Ranges.
Spotted bat *Euderma maculatum*	CDFW: SSC	3	Three documented occurrences in the Project.	Yes	Typically occurs in foothills, mountains, and desert regions of southern California. Roosts in rock crevices, and sometimes caves or buildings. Feeds over water and along washes.
Townsend's big-eared bat *Corynorhinus townsendii*	CDFW: SSC; USFS: S	3	Year-round range. No known occurrences within the Project.	Yes	Occupies many habitats except alpine and subalpine habitats and is abundant in mesic habitats. Roosts in caves, mines, tunnels, buildings, or other structures. Requires water and gleans from brush or trees or feeds along habitat edges. Widespread throughout California.
Western red bat *Lasiurus blossevillii*	CDFW: SSC	3	Known occurrences within the Project.	Yes	Occupies forests and woodlands from sea level up to conifer forests. Uses grasslands, shrublands, and open forests for foraging. This species will migrate between summer and winter ranges. Roosts in trees near streams, fields, and urban areas. Occurs west of the Sierra Nevada Crest.

Common Name *Scientific Name*	Listing Status[1]	Category for Project Analysis[2]	Species Range and Known Occurrences within the Project	Suitable Habitat Present	Habitat and Range
Western white-tailed jackrabbit *Lepus townsendii townsendii*	CDFW: SSC	2	Year-round range.	Yes	Occupies sagebrush, subalpine conifer, juniper, alpine dwarf shrub, and perennial grasslands along the upper eastern slopes and the crest of the Sierra Nevada Range. Prefers open areas with scattered shrubs and feeds on grasses and other herbaceous plants. More common above 8,500 feet in elevation.
Invertebrates					
Carson wandering skipper *Pseudocopaeodes eunum obscures*	USFWS: FE	1	Two known populations in Washoe County, NV and Lassen County, CA.	No	Alkali soils, salt grass and preferred flowering plants near water below 5,000 feet.
Western bumble bee *Bombus occidentalis*	CDFW: SC; USFS: S	3	No known occurrences within the Project.	Yes	Occurs from southern British Columbia to Central California. Occurs west of project.
Monarch butterfly *Danaus plexippus*	USFWS: C; USFS: S	3	Migrates through Project Area in spring and summer; No known reproduction within the Project Area.	Yes	Migrates from overwintering locations along the CA coast, north and east through Sierras and Project Area in spring and back to coast in late summer. Dependent on nectar-producing plants for food, and milkweed for reproduction.
Fish					
Delta smelt *Hypomesus transpacificus*	USFWS: FT; CDFW: SE	1	Outside of range	No	Species is endemic to the San Francisco Estuary.
Hardhead *Mylopharodon conocephalus*	CDFW: SSC; USFS: S	1	Outside of range	No	Occupies low to mid-elevations in relatively undisturbed habitats of larger streams with high water quality.
Lahontan cutthroat trout *Oncorhynchus clarki henshawi*	USFWS: FT; CDFW: SCC	1	Occur in watersheds east of the Project	Yes	Occupies cold, high-elevation mountain streams to low elevation and alkaline desert lakes. Species is not known to occur within streams on the PNF.

Common Name ***Scientific Name***	**Listing Status[1]**	**Category for Project Analysis[2]**	**Species Range and Known Occurrences within the Project**	**Suitable Habitat Present**	**Habitat and Range**
Mountain sucker *Catostomus platyrhynchus*	CDFW: SSC	3	Known occurrences in the Project Area	Yes	Occupies cool mountain streams on the eastern slopes of the Sierra Nevada Mountains and are usually found in clear waters with a moderate gradient.
Riffle sculpin *Cottus gulosus*	CDFW: SSC	2	No known occurrences within the Project.	Yes	Occupies headwater streams with cold water and rocky and gravelly substrate.

[1]**Listing Status:**

Federal – U.S. Fish and Wildlife Service (USFWS): FE = Federally Endangered; FT = Federally Threatened; FPT = Federally Proposed Threatened; FC = Federal Candidate; BCC = Birds of Conservation Concern; United States Forest Service (USFS): S = Sensitive Species; MIS = Management Indicator Species

State – California Department of Fish & Wildlife (CDFW): SE = State Endangered; ST = State Threatened; SC = State Candidate; SSC = Species of Special Concern; FP = Fully Protected; WL = Watch List

[2]**Categories for Project Analysis:**

Category 1: Species whose habitat is not in or adjacent to the Project Area and would not be affected by the project.

Category 2: Species whose habitat is in or adjacent to the Project Area but would not be either directly or indirectly affected by the project.

Category 3: Species whose habitat would be either directly or indirectly affected by the project.

Proposed Action

<u>Effects on Forest Service Sensitive, ESA Proposed and Candidate Species, and State-listed Special Status Species</u>

American Goshawk (*Astur atricapillus*)

The following CWHR types with size and density classes of 5D, 5M, 4D, and 4M, provide suitable nesting habitat for American goshawk (AGOS) within the Project Area: Aspen, Douglas-fir, Eastside Pine, Jeffrey Pine, Lodgepole Pine, Montane Hardwood-Conifer, Montane Hardwood, Montane Riparian, Ponderosa Pine, Red Fir, Sierra Mixed Conifer, and White Fir (USDA 2004b). Suitable foraging habitat classified by CWHR types are: 5P, 4P, 3D, and 3M (USDA 2001). Based on an updated post-fire CWHR vegetation layer, there is approximately 19,666 acres or 12% of the Project Area is composed of suitable nesting habitat, and 3,447 acres or approximately 2% of the Project Area is composed of suitable goshawk foraging habitat.

Direct and Indirect Effects

The Project's potential effects to goshawk habitat is analyzed on two landscape scales: 1) total suitable habitat in the Project Area; and 2) and suitable habitat within the 21 PAC areas that are within or overlap the Project boundary. Table 3 summarizes the changes to suitable goshawk habitat from the Proposed Action. In general, mechanical treatments that would occur within suitable habitat, but outside of goshawk PACs and California spotted owl (CSOW) Home Range Core Areas (HRCAs) and territories, are anticipated to maintain all 5D, 5M, and 4D habitat as nesting, and reduce 4M habitat to either foraging or non-suitable (i.e., 4S). Reforestation of high intensity burned sites and fuels reduction within PACs are assumed to have minimal to no near-term effect on the current CWHR class.

Table 3. *Summary of treatment effects on American goshawk habitat in the Tributaries Project Area.*

CWHR Class	Habitat Type	Project Area Pre-treatment Acres	Project Area Post-treatment Acres[1]	Percent Change
Nesting Habitat				
5D	Conifer Forest - Late Seral Dense Canopy	37	32	-14%
5M	Conifer Forest - Late Seral Moderate Canopy	84	183	+117%
4D	Conifer Forest - Mid Seral, Dense Canopy	8,708	5,976	-31%
4M	Conifer Forest - Mid Seral, Moderate Canopy	10,837	6,273	-42%
	NESTING SUBTOTAL	**19,666**	**12,464**	**-37%**
Foraging Habitat				
5P	Conifer Forest - Late Seral, Open Canopy	67	1,719	+2466%

CWHR Class	Habitat Type	Project Area Pre-treatment Acres	Project Area Post-treatment Acres[1]	Percent Change
4P	Conifer Forest - Mid Seral, Open Canopy	3,337	2,371	-30%
3D	Conifer Forest – Early Seral Dense Canopy	8	8	0%
3M	Conifer Forest – Early Seral Moderate Canopy	35	25	-28%
	FORAGING SUBTOTAL	**3,447**	**4,123**	**+20%**
	TOTAL SUITABLE HABITAT	**23,113**	**16,587**	**-28%**

[1] Post treatment acres are quantified based on short-term fuels treatments and site preparation and does not consider long-term habitat improvements including reforestation.

Direct effects to goshawks from the Proposed Action are expected to be minimal, as pre-implementation surveys will occur prior to any ground-disturbing activities, and nesting/roosting habitat in PACs will not be reduced by the proposed treatments (Table 4). There will be a loss of 7,202 acres of nesting habitat and a net gain of 676 acres of foraging habitat outside of PACs. The majority of this reduction would occur in eastside pine 4M habitat in and near the Babcock Focus Area. Design features would ensure late-seral stage habitat components, such as large trees, snags and down logs are retained. The Project would retain the largest, healthy overstory trees 30” DBH or greater. Suitable habitat that is reduced to unsuitable canopy cover limits for foraging (i.e., <25%) would contribute to the health and growth of the remaining “released” trees, with the expectation of accelerating these stands toward late seral forests with higher levels of structural complexity, which is currently very fragmented and/or completely lacking in many parts of the Project Area. Overall, the Proposed Action would directly increase the resiliency to stand replacing wildfires, helping to sustain and enhance existing suitable habitat for goshawks within AGOS PACs and across the landscape.

Table 4. *Summary of American goshawk suitable habitat acres in PACs in the Tributaries Project Area.*

Habitat Type (CWHR Class)	Total AGOS PAC Pre-treatment Acres	Total AGOS PAC Post-treatment Acres	Percent Change
Nesting/Roosting Habitat (4M, 4D, 5M, 5D)	1,413	1,413	0%
Foraging Habitat (3M, 3D, 4P, 5P)	49	49	0%
Total Suitable Habitat (5M, 5D, 5P, 4M, 4D, 4P, 3M, 3D)	1,462	1,462	0%

Prescribed fire activities (underburning and pile burning) would occur from late fall to spring. Direct effects of these two types of prescribed fire on American goshawks include the disturbance of individuals from smoke, noise, or some combination of these factors. As noted in the design features, LOPs will be implemented around active nests which should mitigate direct effects from prescribed fire activities; however, if deemed necessary, prescribed fire can be used within active goshawk PACs. Use of prescribed fire introduces the potential for indirect effects from localized high intensity fire. High intensity fire has the potential to impact both goshawk habitat and habitat for their prey. Pile burning and underburning would be conducted in accordance with an approved prescribed fire plan / burn plan, and applicable design features under appropriate fuel and weather conditions conducive to low- to moderate-intensity surface fires to minimize risk of impacts from high intensity fire.

There are no trail maintenance or construction activities proposed in or near goshawk PACs. Potential negative effect of reforestation efforts on AGOS is through the use of herbicides. Raptors like goshawk could prey on animals that have consumed contaminated plant material. This impact is unlikely to be significant due to reforestation treatments occurring in unsuitable habitat not typically used by goshawks for foraging. Watershed restoration activities may cause limited disturbance to AGOS individuals during implementation, but would not adversely impact habitat. Hydrological improvements may benefit AGOS during foraging when those areas are near or adjacent to occupied habitat.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual American goshawks (MAI) but is not likely to result in a trend toward Federal listing or loss of viability.

American Peregrine Falcon (*Falco peregrinus anatum*)

Direct and Indirect Effects

The Proposed Action Alternative could directly affect individual peregrine falcons from noise and smoke, or affect habitat through the removal of potential nesting trees. Peregrine falcons in and around the Project Area have all used cliffs for nesting sites. Although peregrine falcons have occasionally been documented using trees for nesting, the use of trees for nesting in the Project Area is unlikely given the availability of suitable cliff habitat. Pre-implementation surveys of known nesting sites and suitable cliff nesting habitat would mitigate potential direct disturbance effects to breeding behaviors and active nest sites. If nesting is confirmed, an LOP would be implemented within 0.25-miles of the nest from February 1 through August 31. Nest sites are generally near riparian and wetland areas. Design features (see Appendix E) for riparian conservation areas would limit activities within 300 feet of special aquatic features (i.e. lakes, wet meadows, etc.) and perennial streams. Beyond the riparian buffer, the prioritization of retaining the largest, healthiest trees and snags would protect possible nesting trees for falcons. Watershed restoration treatments would improve riparian and meadow wetland conditions, potentially benefitting the peregrine falcon indirectly through increased bird prey base in response to restored riparian and wetland habitats. Herbicide treatments as part of reforestation efforts and control of non-native plants, could impact falcons if prey species have ingested contaminated plant material; however, Project design features and PNF BMPs will mitigate the potential for this impact to individual peregrine falcons. The only proposed trail improvements are over five miles from the closest peregrine falcon observations, and are not expected to directly or indirectly impact the peregrine falcon or its habitat.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual American peregrine falcons (MAI) but is not likely to result in a trend toward Federal listing or loss of viability.

Bald Eagle (*Haliaeetus leucocephalus*)

Direct and Indirect Effects

Bald eagle nesting territories on the PNF are monitored annually for nesting activity. There are multiple active bald eagle nests and territories adjacent to the Project Area at Antelope Lake and Lake Davis. The Proposed Action Alternative could directly affect individual bald eagles from noise and smoke, or affect habitat through the removal of potential nesting trees. There are 33.5 acres of commercial thin and 35 acres of fuel reduction proposed near Lake Antelope, and another 197 acres of fuel reduction near Lake Davis. Other proposed treatments near both lakes include low and high-intensity site prep reforestation. Pre-implementation surveys of fish bearing waterbodies within a half mile of proposed mechanical treatment units would be conducted to determine presence and nesting status of bald eagles. If bald eagle nesting is confirmed, an LOP would be implemented within 0.25-miles of the nest from January 1 through August 31. This would mitigate direct effects to breeding behaviors and active nesting sites. In addition, design features for riparian conservation areas would limit activities within 300 feet of special aquatic features (i.e. lakes, wet meadows, etc.) and perennial streams. Beyond the riparian buffer, the prioritization of retaining the largest, healthiest trees and snags would protect preferred nesting and roosting habitat features for bald eagles.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual bald eagles (MAI) but is not likely to result in a trend toward Federal listing or loss of viability.

California Spotted Owl (*Strix occidentalis occidentalis*)

Management Direction and Land Allocations

On February 23, 2023, the U.S. Fish and Wildlife Service (USFWS) proposed listing the Sierra Nevada distinct population segment (DPS) of California spotted owl (CSOW) as threatened (USDI 2023). The CSOW is addressed both in the Tributaries BE and separately in a pre-listing Programmatic Biological Assessment and conferencing with the USFWS.

The 2004 Sierra Nevada Forest Plan Amendment Record of Decision provides management direction for CSOW habitat on NFS lands by establishing Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs). These established land allocations have desired conditions, management intents, and management objectives that have guided land management over the past 20 years. Currently, designated PACs and HRCAs are maintained regardless of occupancy, such that the land allocations remain in place, only being retired after a substantial habitat altering event and subsequent surveys demonstrate the site is no longer suitable or occupied (USDA 2004b). In April 2019, the Forest Service released the Conservation Strategy for the California Spotted Owl in the Sierra Nevada (USDA 2019). This Conservation Strategy provides management recommendations based on updated scientific information and management experience. The 2019 Strategy defines two additional areas of ecological significance for CSOW: territories and home ranges. The Strategy describes territories as areas defended by a resident pair of owls from other owls of the same species. Owl territories on the PNF are 1,000-acre circular areas that include the associated nest stand and PAC. Home ranges include the associated nest stand, PAC, territory, and additional areas to meet owl life-history requirements. Due to the size and severity of recent wildfires within the Project, habitat connectivity has been significantly impacted. An important variable when considering suitable habitat postfire is to analyze constraints on genetic flow and reproductive success. Home Range areas were used to classify California spotted owl connectivity viability. A 3,160-acre average Home Range (Roberts 2017) encompassing and around the PACs and Territories were reviewed to evaluate the potential for connectivity beyond individual PACs and Territories within the Project.

The USFWS recently released new management direction regarding limitations on vegetation management and other activities, which was utilized in both the development of treatments, design features, project-specific plan amendments, and the effects analysis for the pre-listing Programmatic Biological Assessment with the USFWS. The new USFWS direction requires the analysis of effects on CSOW at the territory scale. This section summarizes the effects on CSOW at the territory scale, in addition to the PAC and HRCA scales pursuant to existing and emerging direction as described above.

This Project analysis on impacts to CSOW utilizes the recommendations from the 2019 California Spotted Owl Strategy and the California Spotted Owl: Current State of Knowledge (Gutiérrez et al. 2017), with a suite of project-specific plan amendment components developed by the R5 Ecosystem Planning team incorporating the USFWS new management direction, and released in June 2024. The project-specific plan amendment components differ from the existing Forest Plan direction in the following ways:

- Uses territories, in addition to HRCAs;
- Allows more intensive treatment in territories;
- Allows for more reduction of canopy cover in territories;
- Includes a wider range of suitable habitat in the desired condition, and steers activities to produce more heterogenous habitat;
- Allows limited treatments in PACs;
- Allows for lower habitat retention thresholds in wildland urban interface (WUI) Defense Zones, fuelbreaks, and areas identified as being very high risk in fire risk assessments.

Direct and Indirect Effects

The Walker and Dixie Fires rendered 99% of the nesting habitat and 60% of the foraging habitat unsuitable in the Project Area, with a loss of 41,270 acres. The remaining 19,666 acres of suitable habitat across the Project Area is summarized pre- and post-treatment in Table 5, below. Protocol level surveys across all suitable habitat within the Project have not occurred. Once conducted, survey outcomes could result in new PACs and Territories being established prior to implementation.

Table 5. *Summary of treatment effects on CSOW habitat in the Tributaries Project Area.*

CWHR Class	Habitat Type	Project Area Pre-treatment Acres	Project Area Post-treatment Acres	Percent Change
Nesting Habitat				
5D	Conifer Forest - Late Seral Dense Canopy	37	32	-14%
5M	Conifer Forest - Late Seral Moderate Canopy	84	183	+218%
	NESTING SUBTOTAL	**121**	**215**	**+178%**
Foraging Habitat				
4D	Conifer Forest - Mid Seral, Dense Canopy	8,708	5,976	-31%
4M	Conifer Forest - Mid Seral, Moderate Canopy	10,837	6,273	-42%
	FORAGING SUBTOTAL	**19,545**	**12,249**	**-37%**
	TOTAL SUITABLE HABITAT	**19,666**	**12,464**	**-37%**

Under the proposed revised plan amendment components, treatment areas should only overlap PACs to the extent necessary to reduce the threat of habitat loss due to wildfire. Treatments shall avoid reducing habitat quality in high quality nesting/roosting habitat within PACs. The Project does not have any mechanical treatment activities planned within CSOW PACs, but does allow for hand thinning of small trees up to 10” DBH. Mechanical treatments within Territories and HRCAs are proposed to thin such areas to reduce the risk of loss to wildfire, but without reducing pre-treatment foraging or nesting habitat acres. Potential direct effects from all proposed vegetation management activities within the Project Area, such as direct harm, mortality, or displacement, would be mitigated with pre-implementation surveys, utilization of limited operating periods (LOPs), and Project design features specific to CSOW.

PAC treatments would be implemented where needed to reduce fuel loads and small tree densities. Treatments via hand thinning within CSOW and AGOS PACs would equate to 3,664 acres. There would be no change to the 1,757 acres of available suitable habitat in CSOW PACs (Table 6). These treatments would be beneficial to PACs by reducing the risk of crown fire within nest cores and protecting vital habitat structures such as nest and roost trees. Mechanical thinning treatments would occur in suitable habitat in Territories and HRCAs outside of PACs; however, suitable habitat would be maintained according to the proposed project-specific Forest Plan amendments and Project design features. Commercial thinning and fuel reduction activities within CSOW Territories and HRCAs would equate to 828 acres. All suitable habitat in PACs, Territories, and HRCAs within the Project Area (5,672 acres) would be retained. Reforestation within CSOW Territories and HRCAs addressing and impacting areas that burned at high to moderate severity and devoid of suitable habitat would equate to 830 acres.

Table 6. *Pre- and post-treatment suitable habitat acres within CSOW PACs in the Project Area.*

Habitat Type (CWHR Class)	Total CSOW PAC Pre-treatment Acres	Total CSOW PAC Post-treatment Acres	Percent Change
Nesting/Roosting Habitat (5M, 5D)	0.03	0.03	0%
Foraging Habitat (4M, 4D)	1,757	1,757	0%
Total Suitable Habitat (5M, 5D, 4M, 4D)	1,757.03	1,757.03	0%

Silvicultural prescriptions within Territories and HRCAs may thin green stands to a residual canopy cover of at least 40% within 4D and 4M, and at least 50% in 5D and 5M stands. Proposed treatments would result in some loss of canopy and related shade and forest structure, but would retain habitat suitable for foraging, interspersed with clumps that retain higher canopy closures suitable for nesting. These treatments would increase habitat resiliency for supporting future populations of CSOW (USDA 2019). Given the paucity of suitable habitat across the landscape of the Project Area, suitable CSOW habitat within PACs, Territories, and HRCAs would be maintained to retain habitat connectivity to the greatest extent possible. Per the proposed project-specific forest plan amendment STD-TERR-1A, because all CSOW Territories in the Project Area contain less than 60% High Quality Nesting and Roosting Habitat (HQNR) and Best Available Nesting, Roosting, and Foraging Habitat (BANRF), all existing suitable habitat within Territories will be retained. With regards to large tree removal (> 30" DBH) all treatments within HRCAs and Territories will comply with the SNFPA ROD (USDA 2004) requirements.

Outside of Territories and HRCAs, mechanical and hand thinning practices are proposed to occur with a target goal of 14-36% rSDI. This would result in reduced stand densities between 30-100 residual trees per acre. Mechanical treatments would provide mid- to long-term benefits to CSOW foraging habitat by increasing forest heterogeneity or forest structure within the CSOW's Home Range area (average 3,160 acres) outside of its Territory. Reducing relative SDI would have beneficial effects to forest health and ecology, reducing susceptibility to insect infestations as well as reducing potential fire effects from future wildfires (MBG 2024). Reducing relative SDI would provide less competition between trees, allowing established medium sized trees to mature and grow into large or very large trees (North et al. 2022), improving habitat connectivity within CSOW Home Range areas between Territories. Overall, the Proposed Action would increase suitable nesting/roosting habitat from 121 acres to 215 acres in the Project Area. Suitable foraging habitat will be reduced 7,296 acres in the Project Area; however, the majority of this reduction occurs in eastside pine habitat near the Babcock Focus Area. There are currently no CSOW PACs, Territories, or HRCAs in this eastern half of the Project Area. The California spotted owl is continuously distributed on the western slope of the Sierra, with fewer detections on the drier, east side of the range (Verner et al. 1992). Eastside pine habitat is technically considered suitable for nesting and foraging, however, Verner et al. (1992) documented only 0.5% of California spotted owl sites throughout their range to occur in eastside pine type habitat.

Research has suggested that mechanical thinning that results in widely and regularly spaced trees tend to be avoided by CSOW (Gallagher et al. 2019). Yet other, long-term demography studies in the Sierra Nevada have shown that a small positive effect could occur from mechanical thinning (Tempel et al. 2016). The proposed activities aim to avoid wide and regularly spaced trees with the goal of creating habitat heterogeneity with a dynamic mosaic of tree clumps and openings at variable sizes. Thus, long-term indirect beneficial effects from thinning and fuel reduction treatments to CSOW habitat in the Project Area include increasing habitat heterogeneity and reducing wildfire risk; if judiciously implemented, the Project would maintain CSOW habitat in the short term, so that any long-term benefits as a result of reductions in high-severity fire can be realized (USDA 2019).

Prescribed fire treatments would involve underburning and the piling and subsequent burning of existing and activity-generated fuels. Direct effects of prescribed fire on CSOW include possible disturbance of individuals from smoke, noise, or some combination of these factors. Limited Operating Periods in place around active CSOW nests would help mitigate these direct effects. The greatest risk for indirect effects to the CSOW from both pile burning and underburning involves the potential for localized high intensity fire, which has the potential to impact CSOW habitat as well as habitat for CSOW prey. Pile burning and underburning would be conducted in accordance with an approved prescribed fire plan and applicable design features under appropriate fuel and weather conditions conducive to primarily low- to moderate-intensity surface fires.

Herbicide treatments as part of reforestation efforts and control of non-native plants, could impact CSOW if prey species have ingested contaminated plant material. Based on Project design features and PNF BMPs, as well as lack of expected overlap between foraging CSOW and reforestation areas (>100 acres high intensity fire), we anticipate a negligible effect on individual spotted owls.

Effects to CSOW from the Proposed Action watershed treatments or recreational improvements are not expected. Use of Project design features and BMPs would minimize potential disturbance effects from noise created from watershed and recreational treatment activities. There are no CSOW PACs within the Antelope-Taylor Lake trail system where recreational treatments are proposed. Proposed watershed treatments do not occur in CSOW habitat, and therefore, would have no effect on CSOW habitat.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual California spotted owls (MAI) but is not likely to result in a trend toward Federal listing or loss of viability. The Sierra Nevada DPS of the CSOW is proposed for listing under the ESA as threatened and currently has no proposed critical habitat. While there are concerns about the short-term effects of losing high-quality habitat, the treatment of overstocked, dense (CWHR cover class 'D') stands will increase fire resiliency and bring these stands to a stocking level and species mix closer to historic conditions allowing for maximum growth and vigor of trees, as well as increasing forest heterogeneity. As noted above, treatments would not reduce suitable habitat within CSOW PACs, Territories, and HRCAs. In addition, the Project's design features, both related to treatments within PACs, HRCAs, and Territories, as well as LOPs, will minimize potential impacts. Proposed reforestation activities will help restore habitat in high-severity burned areas toward desired conditions much more quickly than the No Action Alternative.

Greater Sandhill Crane (*Antigone canadensis tabida*)

Direct and Indirect Effects

Short-term direct effects to greater sandhill cranes from noise disturbance during implementation activities, particularly proposed meadow restoration actions, is likely. Meadow restoration activities will occur in late summer, early fall when water levels are at their lowest, after nesting during the fall migration. Disturbance could curtail use of discrete meadow areas for foraging and resting; although cranes have been observed within 0.5 miles or less of construction activity on meadow restoration projects implemented in the Fall on private lands north of the Project Area in Lassen County. Cranes can be particularly sensitive to human disturbance within a mile of the nest site (Zeiner et al. 1990). Forest treatments (thinning, fuel reduction, reforestation, and prescribed fire) in surrounding valleys may disturb cranes in the area, as well; however, given the observed tolerance to human activity during Fall migration, and the valleys available within the Project Area for resting and foraging, the impact to foraging behavior is expected to be minimal. Nesting surveys would be conducted in suitable habitat within a half mile of proposed treatment areas prior to implementation to mitigate any possibility for impacts to crane nesting and colt foraging. Proposed restoration activities are expected to increase wet meadow habitat from the existing 875 acres to 1,382 acres, directly improving 507 acres of suitable nesting habitat for cranes. Indirect effects on food resources (grasses, forbs, roots, tubers, invertebrates particularly for colts in their first 5-6 weeks old) from removal of meadow vegetation and excavation of borrow areas could disrupt invertebrate (insect) populations in the short-term (6 months to 1 year). Foraging resources would remain available outside of immediate work areas. In the long-term, food items in the Project Area are expected to be more abundant than current conditions.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual greater sandhill cranes (MAI) but is not likely to result in a trend toward Federal listing or loss of viability.

Northern Harrier (*Circus cyaneus*)

Direct and Indirect Effects

Northern harriers seldom use forested habitat; therefore, proposed vegetation management treatments and recreational improvements would not have an effect on harrier habitat. Proposed meadow restoration treatments could have a direct effect from nesting abandonment and an indirect effect from habitat alterations, but restoration activities that may utilize heavy equipment in meadows will likely occur after the nesting season (March-August), when water levels are low and meadow soils are dry. Pre-implementation surveys will be conducted if heavy equipment activities are scheduled during the nesting period. Short-term noise, dust, and smoke disturbances from hauling traffic, heavy equipment, and prescribed fire activities could limit foraging use of the meadow and surrounding open sagebrush habitat. Long-term, watershed restoration treatments are expected to have indirect beneficial effects to harrier habitat, by increasing wetland grasses and forbs that would improve nesting and foraging habitat for the northern harrier and their prey.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual northern harriers (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Olive-sided Flycatcher (*Contopus cooperi*)

Direct and Indirect Effects

Potential direct effects to olive-sided flycatcher (OSFL) include noise disturbance, smoke, and removal of nest and perch trees, resulting in possible direct injury, mortality, nest abandonment, and disruption of breeding and foraging behaviors. For both nesting and foraging, OSFL use the tallest and largest trees in an area. Project design features emphasize the retention of the largest and tallest healthy trees in treatment units. OSFL prefer to nest close to water, so restrictions on mechanical activities around riparian and special aquatic features will also mitigate potential impacts to nesting habitat. Noise and smoke disturbance could directly impact breeding and foraging behavior; however, prescribed fire activities would be unlikely during the breeding period (May-August), so impacts from smoke are not expected. Commercial thin activities would thin from below and utilize a mixture of individual trees, clumps, openings and variable density retention, which would favor OSFL's habitat preference for open areas with large trees and edge habitats. Both fuel reduction and reforestation activities could impact OSFL foraging use of shrub-covered areas. Shrub removal and use of herbicides could decrease available foraging habitat; however, given the current extant of openings and shrub habitat from recent wildfires, the treatment impacts on this habitat are expected to be negligible. Watershed treatments and trail improvements will also include noise disturbance and potential loss of nesting and perching trees. Only burned trees will be used to construct LWD structures in select channels. Although these trees provide foraging habitat as perches, they are not suitable for nesting. The number of trees removed for construction of LWD structures is expected to be insignificant, particularly in light of the surplus of burned, dead trees across the Project landscape. Removal of trees used for woody material in meadow channel restoration (i.e. construction of beaver dam analogs [BDAs] or post-assisted log structures [PALS]) will be insignificant, as trees are individually hand-felled, and would be checked for nesting or denning wildlife before selected for use. Tree removal for conifer encroachment around meadows and trail improvements will be hand felled with minimal anticipated direct effects to the olive-sided flycatcher. Restoration of wet meadow and riparian habitats could increase flying insect populations for foraging flycatchers. Reducing stand densities favors habitat preferred by OSFL, and in the long-term is expected to increase the availability of large and tall trees, through reducing competition enhancing the growth and vigor of remaining trees.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual olive-sided flycatchers (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Swainson's Hawk (*Buteo swainsoni*)

Direct and Indirect Effects

Potential direct effects to Swainson's hawk (SWHA) are noise disturbance and habitat modifications from watershed restoration treatments, particularly in meadows and riparian habitats in open valleys. Proposed treatments in upland forested habitats is not expected to have any direct or indirect affects to SWHA as they typically do not occur in this habitat. Meadow and riparian restoration treatments could cause injury or mortality to nesting birds, or disrupt reproduction due to noise disturbance during the breeding season from late March to late August. Proposed in-channel treatments, whether in a meadow or along a riparian corridor, are likely to occur late-season (August-October) when water levels in stream channels are lowest, and soil conditions are dry. The possibility of felling an active nest tree for conifer encroachment or for use in a channel structure (i.e., LWD, BDAs, or PALS) is unlikely because trees will be hand felled and checked for nesting birds before selected for removal. The number of trees removed for these efforts will not impact the availability of nesting trees around a meadow or along riparian corridors. Construction of LWD structures will only remove dead burned trees in the riparian corridor. Direct effects from heavy equipment activity and noise could potentially disturb nesting birds in mid-August. Project design criteria to mitigate potential direct effects to Forest Service sensitive bird species, which includes other species that utilize meadow habitats (i.e. greater sandhill crane and willow flycatcher), will mitigate direct effects to SWHA by conducting pre-implementation bird surveys prior to initiating any restoration construction activities during the LOPs for Forest Service sensitive bird species (April 1-August 31), and protecting known nest sites (Project design feature: WILDLIFE-5). Similar to other raptors evaluated, it is expected that meadow and riparian habitats restored or enhanced by the Proposed Action will have long-term beneficial direct and indirect effects on foraging habitat for the Swainson's hawk, by improving and increasing prey habitat.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual Swainson's hawks (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Willow Flycatcher (*Epidonax trailli*)

Direct and Indirect Effects

The analysis for potential effects of the Proposed Action on the willow flycatcher (WIFL) focuses on meadow habitat within the Tributaries Project Area. Since WIFL do not utilize upland forested habitats, they are unlikely to be directly affected by proposed silvicultural treatments. Proposed meadow treatments include a variety of techniques to restore meadow habitat conditions and hydrological functions. These include removal of encroaching conifers, channel fill, and low-tech stream channel structures (i.e. post-assisted log structure and beaver dam analogs). Meadow habitats are limited within the Project Area, consisting of only 875 acres or 0.5% of the total Project Area. Pre-implementation surveys for WIFL would be completed prior to initiating any meadow restoration activities within or adjacent to suitable habitat. If surveys confirm occupancy status, a 1/8-mile buffer around the occupied site would be protected from treatment activities from May 1 through July 31 to mitigate any direct effects to individual birds or disruption of reproductive behaviors. Effects from habitat alteration and noise disturbance would be mitigated by the LOP, surveys, and other design features, including retaining riparian shrub species, such as willow, and limiting activity within Riparian Conservation Areas (RCA) to hand cutting only. Within meadows, trees greater than 10 inches DBH would be felled and left within the meadow as large woody debris, or used in channel structures. If fuel levels exceed appropriate levels than material would be hand removed within the RCA equipment exclusion zone. These protective measures are expected to substantially minimize the opportunity for negative effects in riparian and montane meadow habitats, particularly within suitable willow flycatcher habitat.

The primary objective of proposed meadow treatments is to restore hydrologic processes to enhance riparian and wet meadow habitat. Raising the water table so there is surface water during the breeding season (June-July), and increasing the density and extent of dense willow and other riparian shrubs with a vigorous tall understory of herbaceous species dominated by sedges and other graminoids is key to restoring willow flycatcher habitat within the proposed meadow treatment areas. The techniques mentioned above will be used to hasten the rate of channel/floodplain evolution through current down-cutting stage to a widening and aggradation phase (Cluer and Thorne 2014). Removal of encroaching conifers in conjunction with hydrologic treatments could result in a net increase of available wet meadow habitat for willow flycatchers. Proposed meadow treatments are estimated to increase available wet meadow habitat within the Project Area to 1,382 acres, an increase of 507 acres over current existing conditions. Seeding and planting of willow cuttings in key areas throughout the meadow treatment areas is expected to enhance suitable willow flycatcher habitat in the long-term (within five years after project implementation).

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual willow flycatchers (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Yellow Warbler (*Setophaga petechia*)

Direct and Indirect Effects

The analysis for potential effects of the Proposed Action on the yellow warbler (YEWA) focuses on montane riparian habitat (including meadows) within the Tributaries Project Area. Since YEWA infrequently utilize upland forested habitats, the potential for direct effects from proposed silvicultural treatments is anticipated to be minimal. Direct and indirect effects are expected to be similar to those described for WIFL. Potential noise disturbance and disruption to reproduction will be mitigated with pre-implementation surveys completed prior to initiating any meadow restoration activities during the species reproductive period within or directly adjacent to suitable habitat. Any active nests identified during surveys would be protected with a LOP. There is a total of 1,348 acres of montane riparian habitat within the Project Area. Proposed treatments within montane riparian habitat will affect approximately 252 acres, or 19% of the total available habitat within the Project. Given the small amount of treatment area proposed that has potential to impact YEWA, in conjunction with Project design features outlined in the WIFL effects section above and in the MIS section below, direct and indirect effects to yellow warblers will be limited in their extent across the landscape and mitigated.

Proposed hydrologic improvements will not result in a reduction in the acreage, quality, or functions of the montane riparian cover type. Short term impacts to this habitat will be offset by the expected mid- and long-term benefits to riparian habitat. These benefits include an expected increase in the amount of available high-quality riparian habitat (estimated 58 acres) increasing the density and extent of riparian shrubs in proposed treatment areas over the long term.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual yellow warblers (MAI) but is not likely to result in a trend toward Federal listing or loss of viability.

Southern Long-toed Salamander (*Ambystoma macrodactylum sigillatum*)

Direct and Indirect Effects

Potential direct effects to the southern long-toed salamander (SLTS) entails disturbance from vegetation management treatments adjacent to montane meadows, as well as, activities proposed within montane meadows to restore hydrologic function and habitat conditions. Mechanical vegetation treatments adjacent to meadows could directly injure or crush subterranean adults. Subterranean salamanders typically use small mammal burrows, such as squirrels or voles, whose burrow systems may vary between 12 to 36 inches from the ground surface (Van Vuren and Ordeñana 2012). Project design feature, HYDRO-14, only allow mechanical equipment to operate on soils that are dry to a depth of eight inches, when the ground is frozen to a depth of five inches, when the uncompacted snow depth is at least eighteen inches, or the compacted snow depth is eight inches. These limits mitigate soil compaction and reduce the potential for underground species, such as the SLTS, from being crushed by mechanical equipment.

Excavation of material for channel fill treatments along meadow edges or in upland areas near meadows could result in trampling or digging up adult salamanders. Filling incised channels could bury salamander egg-masses or larvae. During surveys for listed frogs (i.e. foothill and Sierra Nevada yellow-legged frogs) in meadow and riparian habitats, detection of any life stage of other amphibians will be documented. In particular, these surveys will provide an opportunity to detect SLT salamander egg masses or larvae. If detected, in-channel activities would cease in the vicinity of the amphibian until it is safely relocated by a qualified biologist authorized under a valid Scientific Collection Permit issued by the California Department of Fish & Wildlife. If a suitable relocation site is not available, the amphibian will not be moved and the area will be flagged and avoided. Meadow restoration activities generally occur late season when water levels are low and soil conditions are dry, and after the SLTS breeding migration period, eliminating the potential to trample breeding adults. Equipment exclusion zones for RCA's, including special aquatic features such as ponds, will also lessen the potential of direct impacts from trampling. However, hand treatments within these zones could result in similar impacts through crushing or injury of individuals from felling trees. Because most surface movements to and from breeding ponds, and the dispersal of juveniles away from ponds, are associated with sustained rainfall, particularly at night when treatment activities will not occur, it is anticipated that the potential risk of direct injury or mortality to migrating or dispersing SLTS is low.

Potential indirect effects of meadow restoration treatments to SLTS habitat could be beneficial and detrimental. Both channel fill and in-channel structure restoration techniques could expand and enhance ponded water habitat for breeding salamanders. However, increased ponded water habitat could also be detrimental due to the propensity for invasive aquatic species, such as bullfrogs and signal crayfish, to occur in this habitat type. Identified sites for proposed meadow restoration treatments are in the Red Clover, Last Chance, and Little Grizzly subwatersheds. Based on Plumas Corp amphibian surveys from past meadow restoration projects, bullfrogs and crayfish are known to occur in the Last Chance Creek watershed, and only crayfish have been documented in the Red Clover Creek watershed. Presence of either species in the Little Grizzly Creek watershed is unknown. Within the Project Area at large, bullfrogs and crayfish both occur in Indian Creek and crayfish have been observed in Mo Bisipi Creek (GIS data from PNF Invasive Species Inventory Data 2015-2018). Given the fairly widespread occurrence of bullfrogs and crayfish in the Last Chance and Indian Creek watersheds, it is probable they could eventually inhabit the Red Clover Creek and other subwatersheds in the Project Area. If bullfrogs were to colonize the entire Wildlife Analysis Area, they would likely preclude any potential colonization of special status amphibians, as bullfrogs specifically are known to out-compete, and prey upon, native amphibians and other aquatic species (CDFW 2024).

Long-term direct effects of restoring hydrologic function in degraded meadows would result in meadows staying wetter for longer periods in the spring and early summer, potentially benefitting breeding amphibians. Design features to retain down woody debris in riparian areas would provide cover for migrating adults during the breeding period. Restored meadow habitat is expected to improve habitat conditions for insect fauna indirectly benefitting the SLTS. Other Proposed Action activities with potential to affect the SLTS (trail improvement, reforestation, and prescribed fire) near riparian areas will be mitigated by pre-implementation amphibian surveys, and riparian and aquatic habitat buffers established for these treatments. Prescribed fire treatments will occur in the winter and early spring period when the species is expected to be subterranean (i.e. outside of breeding migration activity).

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual southern long-toed salamanders (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

American Badger (*Taxidea taxus*)

Direct and Indirect Effects

Short-term direct effects to badgers from noise disturbance during implementation activities is likely; however, the species is somewhat tolerant of human activities (Ziener et al. 1990). They are generally most active at night, so equipment noise during the day could potentially disturb sleeping badgers in underground burrows. Badger holes have been observed along dry meadow edges and in sagebrush fields. Because badgers prefer dry, friable soils it is unlikely they would burrow in proposed meadow treatment sites where soils tend to be finer textured and moist. This lessens the probability of accidentally excavating a badger den in a meadow if utilizing the channel fill restoration technique; however, removal of soil material from upland forested sites could potentially disturb undetected badger burrows. Expansion of wet meadow habitat from proposed watershed restoration activities would result in long-term indirect effects to badgers by reducing dry meadow and sagebrush habitat. Forest treatments (thinning, fuel reduction, reforestation, and prescribed fire) would directly impact preferred shrub habitat through mechanical removal and control of shrub and herbaceous vegetation with herbicides and prescribed fire. Due to their mostly nocturnal activity and their burrowing nature, direct impacts to individuals from these activities is not expected. Indirect impacts to habitat would be potentially beneficial, as the species prefers the more open stages of shrub, forest, and herbaceous habitats (Zeiner et al. 1990). The proposed vegetation treatments would also impact prey species habitat, resulting in indirect effects to the American badger. Impacts to prey base species (rats, mice, chipmunks, and pocket gophers) and their habitat would be short-term and is unlikely to affect prey abundance in the long-term within the Project Area, particularly as they will shift their diet in response to prey availability (Ibid).

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual American badgers (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Bats: Townsend's Big-eared Bat (*Corynorhinus townsendii*), Pallid Bat (*Antrozous pallidus*), Fringed Myotis (*Myotis thysanodes*), Spotted Bat (*Euderma maculatum*), Western Red Bat (*Lasiurus blossevillii*)

Direct and Indirect Effects

The Proposed Action with design features, habitat prescriptions, and protection measures for late seral species such as CSOW and AGOS, include the retention of large trees, hardwoods, snags and large logs, and maintaining aquatic/riparian ecosystem processes; all of which provide many of the habitat attributes necessary to support special status bat species. Direct effects are possible through the destruction of active roosts through felling or removal of trees with hollows or loose bark, especially older snags. Recent fire-killed snags are less likely to have loose bark and roosting bats present. Design features (see Appendix E, CSOW-10) require thinning treatments to minimize the loss of and recruit large and very large trees and snags, thus mitigating impacts to existing and future roosting bat habitat. Prescribed fire treatments are not expected to impact large snags and large live hardwoods with cavities or potential roosts, or potential day and maternity roosts in caves, mines, buildings, and rock outcroppings. The use of prescribed fire treatments following thinning and fuel reduction activities, could impact Western red bats that may roost in leaf litter during cool temperatures. The use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment resulting in lowered reproductive success. These effects would be most severe during the breeding season (May 1 to August 15) when the potential exists for disturbance to active breeding females and maternity colonies. If any of these sensitive bat species breed in the area, project activities during the breeding season could affect individual bats, including direct mortality. These effects would be highly localized and would not impact the population-level reproductive rates of these species. Project design features including limited operating period buffers around known roosts will help mitigate these potential impacts.

Proposed treatments will have short- and mid-term negative impacts to special status bat species through reduction in complex forest vegetation structure. Commercial thinning prescriptions will retain clumps and large snags, increasing stand heterogeneity while maintaining some denser, complex forest structure and roosting habitat features. These changes can result in the increased distribution of floral resources for insects in openings within forested stands and the prevalence of high-contrast forested edges, likely benefitting these bat species. Reforestation treatments in the long-term will be beneficial, creating habitat structure within large openings created by the wildfires.

Disruption of existing insect populations from the removal of meadow/riparian vegetation and shrubs may temporarily reduce prey availability. Over the long-term, once restored meadows and riparian areas develop flora and fauna, they will provide additional foraging habitat that indirectly benefits these bat species.

Given the limited scope and extant of proposed trail improvements, these activities are expected to have minimal direct or indirect effects on bat species. Herbicide use for reforestation and invasive species management are expected to have a negligible direct effect on bats due to riparian/aquatic habitat buffers and other herbicide use restrictions on application quantities, conditions, and type (i.e. hand spray only; no aerial spraying). The possibility of indirect effects on insect prey is slight, and would be limited in scope and intensity where potential interactions could occur.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individuals (MAI), but is not likely to result in a trend toward Federal listing or loss of viability for the Townsend’s big-eared bat, pallid bat, fringed myotis, spotted bat, or Western red bat.

Western Bumble Bee (*Bombus occidentalis*)

Direct and Indirect Effects

The Proposed Action treatments are expected to enhance foraging habitat in the mid- to long-term for the western bumble bee. Although there will be a short-term loss to flowering plants during ground disturbing activities, these plants will recover quickly post-treatment. Loss of nesting and overwintering sites may occur in treatment units; however, throughout the Project, both spatially and temporally, there will be habitat refugia for western bumble bees via untreated areas and RCA equipment exclusion zones. Prescribed fire activities will likely occur outside of the active bumble bee period (April-Sept). Furthermore, design features will mitigate impacts to burning within RCAs during the winter and early spring period. Bumble bees can nest above ground in logs, so burning or other removal of large ground fuels has the potential to directly disturb or destroy individuals if conducted during the breeding period. However, studies indicate that underground sites are predominately favored in both nesting and overwintering site selection (Xerces 2023). Herbicide use for reforestation and invasive species management can negatively impact western bumble bees primarily through indirect effects by reducing the availability of flowering plants which provide essential pollen and nectar, leading to decreased food sources and potentially impacting colony health and survival (Mola et al. 2021; Xerces 2025). Direct exposure to herbicides may also affect bee behavior, learning abilities, and overall survival, especially if exposed to higher concentrations (Helander et al. 2023; Motta and Moran 2023; Thompson et al. 2022).

Broadcast spraying would not be conducted reducing risk for potential direct impacts from herbicide drift to individuals and non-targeted flowering plants. Although there are risks from exposure on treated plants, treatments will focus on select grasses, sapling shrubs, and non-natives. The possibility of bumble bees coming into direct contact with treated plants would be limited in scope and intensity where potential interactions could occur, particularly because most treatments will be focused in proposed reforestation areas, totaling 19,550 acres or 12% of the total Project Area. While herbicide applications would have negative direct and indirect effects, they can also benefit bumble bees by reducing invasive plants that directly compete with the native nectar and pollen plants they rely upon (Xerces 2025).

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual western bumble bees (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Monarch Butterfly (*Danaus plexippus*)

Direct and Indirect Effects

Direct and indirect effects to monarch butterflies within the Project Area would occur when the species is migrating across the Sierras in the early spring and late fall. Potential direct and indirect effects are similar to those described for the western bumble bee. Ground disturbing activities will reduce availability of flowering plants in the short-term, but are expected to increase the diversity of meadow and forest understory flowering plants in the long-term. Project actions may cause potential short-term direct and indirect effects to this species by increasing chances of mortality to individuals and loss of flowering plants from thinning and prescribed fire. Direct impacts from prescribed fire to monarch eggs and caterpillars would be unlikely due to the likely timing of these activities. As with the western bumblebee, the temporal and spatial distribution of treatments across the Project Area and the presence of untreated areas, including within RCAs, provides extensive refugia habitat for monarchs. Riparian Conservation Areas also provide migration corridors across the Project Area that serve to connect suitable foraging and migrating habitat, reducing the potential impacts of the Proposed Action. Herbicide application design features for the protection of special status plants would be applied to milkweed (Project design feature: HU-12), as well, protecting key habitat features (larval host plant) for the monarch butterfly.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual monarch butterflies (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

Mountain Sucker (*Catostomus platyrhynchus*)

Direct and Indirect Effects

Direct effects to mountain suckers would result from watershed restoration treatments that will impact perennial stream channels, including: restoring hydrologic function in meadows; reintroducing large woody debris (LWD) for habitat, sediment retention, and channel stability; removing aquatic organism passage (AOP) barriers at road crossings; and implementing road improvements and rehabilitating fire suppression lines to reduce sediment delivery to stream channels. All of these proposed activities could directly impact the mountain sucker by stressing fish due to degraded water quality conditions, burying fish when filling channels, stranding fish in dewatered channel reaches, or causing injury or mortality to eggs during the spawning season (May through mid-August). The likelihood of these effects will be mitigated through the removal and relocation of all fish species prior to any in-channel construction activities within fish-bearing streams, and the implementation of best management practices to protect water quality. In addition, it is likely most in-channel activities will occur late in the summer or early fall when water levels are at their lowest, reducing the occurrence of impacts during the spawning season.

Indirect effects from the creation of ponds could create habitat for predatory invasive species, such as bullfrogs and signal crayfish. Identified sites for proposed meadow restoration treatments where ponds could potentially be created are in the Red Clover, Last Chance, and Little Grizzly subwatersheds. Based on Plumas Corp amphibian surveys from past meadow restoration projects, bullfrogs and crayfish are known to occur in the Last Chance Creek watershed, and only crayfish have been documented in the Red Clover Creek watershed. Presence of either species in the Little Grizzly Creek watershed is unknown. Within the Project Area at large, bullfrogs and crayfish both occur in Indian Creek and crayfish have been observed in Mo Bisipi Creek (GIS data from PNF Invasive Species Inventory Data 2015-2018). Given the fairly widespread occurrence of bullfrogs and crayfish in the Last Chance and Indian Creek watersheds, it is probable they could eventually inhabit the Red Clover Creek and other subwatersheds in the Project Area. If bullfrogs were to colonize the entire Wildlife Analysis Area, they could potentially reduce the number of mountain suckers, but it is unlikely they would eliminate the population.

Species Determination

The Tributaries Forest Recovery Project Proposed Action may affect individual mountain suckers (MAI), but is not likely to result in a trend toward Federal listing or loss of viability.

<u>Effects on Federally Listed Species and Designated Critical Habitat</u>

Foothill Yellow-legged Frog (*Rana boylii*), Sierra Nevada Yellow-legged Frog (*Rana sierrae*), and Designated Sierra Nevada Yellow-legged Frog Critical Habitat (Boulder/Lone Rock Creeks Subunit)

Prior to implementation, protocol-based amphibian surveys will occur on all suitable habitat throughout the Project Area. This will help guide buffers used, provide baseline occupancy data, and prevent impacts to individuals and occupied habitat. Currently, approximately 245 miles of the 583 miles of intermittent and perennial stream habitat have been surveyed within the analysis area. Foothill yellow-legged frog is not known to currently occupy the Project Area, and one population of Sierra Nevada yellow-legged frog (SNYLF) is known to occur within the Project Area, within designated critical habitat (Boulder Creek - Lone Rock Creek subunit) for the species.

Direct, Indirect and Cumulative Effects

Direct impacts from the proposed action may occur where treatment activities are implemented within or adjacent to occupied habitat. Direct effects could include harm or death to individual frogs, young, or eggs through crushing or burial when implementing vegetation treatments within riparian zones, excavating and filling for partial or complete fills in meadow floodplains, building post-assisted log structures, beaver dam analogs, or felling trees into waterways to create in-stream large woody debris structures. Other direct impacts include injury or death from burning or exposure to herbicides. Though quantifiable data regarding sub-lethal effects is not well known, it is assumed that some level of behavioral modification (e.g., breeding, basking, foraging) could occur due to noise and other disturbances from mechanized equipment (heavy machinery, chainsaws, pumps) and human presence, even at some distance from occupied habitat. Behavioral disruptions could also result in temporary displacement of frogs, which could increase predation risks. Water drafting also has the potential for direct impacts to individual frogs, young, and eggs within stream channels.

Miles of suitable intermittent and perennial habitat within the Project Area that overlap with proposed actions are shown in Table 7. Use of heavy equipment and active ignitions would not be permitted within 82 feet of perennial and intermittent streams that have suitable habitat for frogs, unless surveys conducted prior to implementation confirm listed amphibians are not present. In unoccupied suitable habitat, heavy equipment is excluded within 25-feet of perennial or intermittent streams. Piling of material is not allowed within 82 feet of perennial and intermittent suitable stream habitat, unless surveys confirm the habitat is unoccupied, then the pile-exclusion buffer can be reduced to 25 feet. These equipment exclusion zones (EEZs) are also applicable to ephemeral, as well as other aquatic features (e.g. lakes, bogs, fens, wetlands, vernal pools, springs, and meadows). Within EEZs only hand treatments and backing fire (no active ignitions within stream buffers) is allowed. Although these treatment methods are less likely to result in injury or mortality than mechanical treatments, there is still potential for impacts from falling trees, trampling, and disturbance from noise and human presence in upland habitats.

Table 7. *Suitable listed amphibian habitat overlap with Proposed Action treatments. All intermittent and perennial streams within the Project Area were considered “suitable” until further protocol level surveys can determine the status of each stream reach.*

Proposed Action Treatments	Total Stream Miles	Stream Miles in Critical Habitat
Commercial Thin	24.47	0.55
Fuel Reduction	8.87	0.15
Reforestation – High Intensity Site Prep	20.33	0.98
Reforestation – Low Intensity Site Prep	5.50	0.01
Fuelbreaks	0.02	0.00
Fire Suppression Line Repairs	2.89	0.12
Meadow Floodplain Restoration	13.85	0.00
Road Crossing/Culvert Replacement/Aquatic Passage	5.65	0.00
Large Woody Debris and Other In-Stream Structures	10.00	0.00
Project TOTALS	**91.58**	**1.81**

Proposed in-channel work is mostly in areas where stream habitat is degraded (i.e. incised, lacks vegetative cover, and/or streambed substrate is heavy with silt from sediment deposition) and provides low quality habitat for YLFs. The BA concludes that the potential short-term direct effects of stream and meadow restoration treatments, are outweighed by the benefits of restoring hydrological function, which ultimately would enhance and increase suitable habitat. Benefits include increased riparian vegetation, expansion of wet meadow habitat, decreased water temperatures and sediment, and extended base stream flows later into the season.

Most proposed vegetation treatments will not affect YLF suitable habitat, but there still remains potential for temporary increases in sediment, changes in riparian vegetation and microclimates, loss of sheltering habitat, and accidental introduction of herbicides into streams. It is possible that prescribed fire could burn into and impact streamside vegetation or cause increased sediment flow. Removal of upland vegetation, whether it be thinning, fuel reduction, or reforestation site prep, could also increase overland flows resulting in sediment spikes in suitable amphibian habitat. Road maintenance and crossing improvements, trail improvements, and repairs to fire suppression lines could all increase the potential for soil movement and sedimentation into aquatic habitats, as well. However, with the implementation of project design features, BMPs, and permitting requirements under both the State’s Porter-Cologne Water Quality Control Act and the federal Clean Water Act sediment impacts from all of these activities will be mitigated.

Loss of sheltering habitat and changes in riparian vegetation could occur if prescribed fires burn into streamside vegetation. Prescribed fire treatments would occur under prescriptive conditions that would result in low to moderate fire intensities, minimizing the potential for modifying riparian vegetation, retaining some duff layer, and allowing for the retention of large woody debris that may be utilized by YLFs for sheltering habitat. Thinning and fuel reduction treatments could result in microclimate changes to the air and water through the reduction of canopy cover. Canopy cover reduction could have a beneficial or adverse effect on suitable habitat for YLFs depending on site-specific circumstances. Thinning activities could be beneficial by opening up basking sites in over-stocked stands and fuel reduction activities could have an adverse effect by removing sheltering habitat. Given treatments within riparian zones are limited and implementation of design features are anticipated to accelerate recovery of riparian vegetation, the extent of changes to suitable habitat are not expected to alter habitat availability for listed amphibians within the Project Area.

Use of herbicides in the vicinity of occupied habitat could impact amphibian prey species directly or indirectly through the reduction of vegetative habitat on which prey may depend. However, design features restrict the use of herbicides within 500-feet of occupied habitat and require a biological monitor to be present to ensure no effect to listed species. Design features also restrict herbicide use within unoccupied suitable habitat and Riparian Conservation Areas. Herbicide use would not occur within 107-feet of the stream. These design features are expected to mitigate herbicide effects on amphibian prey to a negligible level.

In general, effects of the Tributaries Proposed Action will reduce fuels, improve forest stand health, enhance stream structure, reduce bank and bed erosion, expand wet meadow habitat, decrease sediment flow, and augment aquatic passage in the watershed. All of these actions will aid in mitigating climate change effects. Project design features will mitigate potential risks to FYLF and SNYLF. Increased sun exposure and groundwater levels may provide long-term benefits to both species. Fuel reduction and prescribed fire will reduce the risk of high intensity wildfire, which is a greater risk to the frogs and their habitat than the mitigated proposed treatments. Pre-implementation surveys will determine occupancy status prior to implementation of any proposed hydrologic improvement activities. If listed amphibians occur within proposed activity areas, activities will be halted and locations/actions will be re-assessed in coordination with USFWS. Re-initiation of consultation with USFWS would occur if altering a proposed action may result in effects to individuals or occupied habitat.

The Boulder Creek – Lone Rock Creek SNYLF critical habitat subunit overlaps 5,176 acres of the Project Wildlife Analysis Area. A total of 398 acres of this habitat is proposed for vegetation management treatments, i.e. thinning, fuel reduction, and reforestation treatments, as well as 10 miles of fire suppression line repairs. There are no treatments that would directly impact or modify riparian or meadow habitats within the Boulder Creek – Lone Rock Creek critical habitat subunit. Potential direct and indirect impacts to critical habitat from upland vegetation management treatments would be the same as those described above; however, Project design features and SNYLF Conservation Measures will ensure that the frog and its critical habitat is protected and maintained.

No final critical habitat has been designated for the FYLF. The USFWS has recently released proposed critical habitat, but it is still under review (USFWS 2025).

Cumulative effects under the Endangered Species Act (50 CFR 402.02) are those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the Wildlife Analysis Area (federal Action Area) of the federal action subject to consultation. Future federal actions will be analyzed through separate section 7 consultations. Only 8% (13,865 acres) of the Federal Action Area (182,318 acres) is under non-federal jurisdiction. Quantifiable data regarding activities on private, State, local, and tribal lands was not available, but it is reasonable to assume that activities such as grazing, timber harvesting, fuel reduction, and recreational uses which are currently ongoing and/or may occur will incrementally add to the effects of the proposed action on suitable FYLF and SNYLF suitable habitat. Due to uncertainty of how these non-federal actions impact listed frogs, their habitat will be regulated, while specific effects to individuals or suitable habitat cannot be determined. Impacts of past wildfires in the last twenty years has likely been more detrimental to listed amphibians, resulting in loss, fragmentation, and degradation of habitat, and/or injury and mortality to individual frogs. Given the preponderance of unoccupied habitat within the majority of the Action Area, the potential of cumulative effects on these species is expected to be minimal. The proposed action would maintain and improve the quality of riverine habitat by reducing conifer competition, improving overall riparian vegetation vigor and water quality, thereby creating more resilient riparian and forest habitats which will aid in reducing adverse cumulative effects.

Species Determinations

Based on the absence of FYLFs in the Project Area and because the Project design features will protect the majority of suitable habitat, the Tributaries Forest Recovery Project will have no effect (NE) on the foothill yellow-legged frog.

The Tributaries Forest Recovery Project may affect but is not likely to adversely affect (MANLAA) the Sierra Nevada yellow-legged frog. Surveys will be conducted prior to implementing any treatments. Design features will be implemented in areas of both suitable and occupied habitat. Based on lack of known occupancy throughout the majority of the Project Area, with the exception of the population within the designated critical habitat, and the implementation of Project design features, direct and indirect effects to SNYLFs is expected to be minimal.

The Tributaries Forest Recovery Project may affect but is not likely to adversely affect (MANLAA) designated critical habitat for the Sierra Nevada yellow-legged frog. The Tributaries Forest Recovery Project overlaps designated critical habitat for the Sierra Nevada yellow-legged frog, but implementation of Project design features and species Conservation Measures will protect suitable habitat and SNYLF habitat primary constituent elements.

If FYLFs are detected or new populations of SNYLFs are discovered within the Project Area, coordination with USFWS will occur and consultation will be reinitiated.

Gray Wolf (*Canis lupus*)

All habitat within the Tributaries federal Action Area is considered suitable for the gray wolf. There is no critical habitat for the gray wolf in the Action Area. There are three currently known wolf packs (Lassen, Beyem Seyo, and Beckwourth) whose home ranges overlap the Project Area.

Direct, Indirect, and Cumulative Effects

Wolves defend large home ranges (ranging from 30 – 400 square miles, depending on location, Kovacs et al. 2016) and exhibit considerable daily movements (>5 miles/day, Kovacs et al. 2016), making it difficult to determine if a gray wolf might occur in or near Project treatment areas during the projected implementation period (2025-2035). Gray wolf space use is dynamic, depending on motivation (e.g., feeding versus denning) and wolf pack boundaries frequently shift, as does annual den site selection (Kovacs et al. 2016). If present in the Project Area during implementation, the direct effect from all Project activities will be disturbance from human presence and actions. Wolves' typical reaction to human disturbance is avoidance (Kovacs et al. 2016), and wolves have been documented to relocate pups out of areas of heavy equipment disturbance (Theil et al. 1998). Wolves highly mobile nature may lessen direct disturbance impacts, but could cause wolves to temporarily utilize habitats or sites that are less desirable.

Wolf packs are sensitive to human disturbance near den sites and may abandon the site (Ballard et al. 1987). Subsequently, most den sites are located away from trails and backcountry campsites. Wolf dens have been identified on PNF, as well as the adjacent Lassen National Forest. It is assumed that wolves are currently denning within the Project Area and will in the future. Project design features will ensure active den or rendezvous sites will be avoided and disturbances that could disrupt reproductive success and result in adverse effects will be minimized. This will be accomplished through close coordination with both CDFW and USFWS and implementing a limited operating period from April 1 through July 15 within a mile of known active reproductive sites or newly discovered sites during implementation. Active treatment units will be dispersed temporally and spatially. Temporally implementing actions over a ten-year period will result in disturbance impacts throughout this period; however, annually focusing treatments in discrete locations will reduce the risk of short-term avoidance behaviors from the Project. Due to the implementation of design features that protect known or newly discovered den and rendezvous sites, and the spatial distribution of proposed treatments, disturbance-caused effects will be reduced. The Project overall will not make any habitat unsuitable for wolves, other than disturbance-caused short-term avoidance of otherwise suitable habitat.

Potential indirect effects to the gray wolf are altered behavior from the Proposed Action's potential effect on prey resources. Improved wet meadow conditions could have a beneficial effect on some small prey species such as voles. The expected increase in vegetation and improved water access due to proposed stream and meadow restoration actions is expected to improve habitat and forage for large ungulate prey, such as mule deer (*Odocoileus hemionus*) and elk. Reforestation and fuel treatments could reduce ungulate browse, but untreated areas of brush will remain available. In addition, prescribed burning activities could enhance browse and forb availability for prey. Proposed trail improvements could increase use of the Antelope -Taylor Lake trail network, increasing human presence and noise within the trail corridor, resulting in changes in wolf activity and use patterns. However, coordination with CDFW and USFWS to avoid the most sensitive active wolf sites through trail closures, if needed, will minimize potential disturbance impacts from possible increased recreational use. The Project's overall objective to create more resilient forests and riparian areas, and reduce the risk of high-intensity wildfire, in the long-term will benefit the wolf, its prey species, and their habitats.

There are 182,318 acres of suitable habitat for the gray wolf in the Wildlife Analysis Area, with 41,291 acres proposed for treatment. Foreseeable non-federal actions on private, State, local, or tribal lands within the Action Area are unknown, but it can be assumed that habitat modifications through vegetation management activities and recreational uses have the potential to add to the Project's disturbance effects to wolves. These actions could also result in direct effects to wolves such as injury or mortality, as well as indirect effects of habitat alteration. Current planned and foreseeable Forest Service projects could create additional disturbances in the analysis area, but have or will be submitted for formal or informal consultation, as necessary. Ongoing activities and programs on the Forest such as grazing, fuelwood gathering, and recreation are expected to continue at current levels, resulting in no change to the already existing disturbance impacts to gray wolves and their habitat. Although these activities in conjunction with the proposed Project will result in increased human presence and disturbance across the landscape, the duration of the effects will be limited and dispersed temporally and spatially; therefore, the Project is not expected to result in an adverse cumulative effect to the gray wolf.

Species Determination

The Tributaries Forest Recovery Project may affect, but is not likely to adversely affect (MANLAA) the gray wolf. It is anticipated that wolves will avoid treatment areas during implementation. Any negative direct or indirect effects to wolves that may develop during implementation will be reduced through Project design features and ongoing coordination with CDFW. If future wolf activity patterns indicate potential project impacts are no longer discountable, consultation with USFWS will be reinitiated.

Management Indicator Species

Management Indicator Species (MIS) for the PNF are identified in the 2007 Sierra Nevada Forests Management Indicator Species Amendment (USDA 2007). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS (Table 8). In addition to identifying the habitat or ecosystem components, the CWHR type(s) defining each habitat/ecosystem component, and the associated MIS, the table discloses whether the MIS habitat is potentially affected by the Tributaries Project.

Table 8. *Selection of MIS for Project-Level Habitat Analysis for the Tributaries Project.*

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	3
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Oak-associated Hardwood & Hardwood/conifer	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	3
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	3
Wet Meadow	wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree (chorus) frog *Pseudacris regilla*	3
Early Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures	Mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures	Mountain quail *Oreortyx pictus*	3
Late Seral Open Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	Sooty (blue) grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		Pacific marten *Martes caurina*[3]	
		northern flying squirrel *Glaucomys sabrinus*	
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	3

[1] All CWHR size classes and canopy closures are included unless otherwise specified;
dbh = diameter at breast height;

Canopy Closure classifications: S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure);
Tree size classes: 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)($\geq$24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988).
[2] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.
[3] Identified as American Marten (*Martes americana*) in original MIS designation. Later classified as a separate species by Dawson and Cook (2012).

The MIS whose habitat would be either directly or indirectly affected by the Tributaries Project, identified as Category 3 in Table 8, are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the proposed action and no action alternative on the habitat of these MIS. The MIS selected for project-level MIS analysis for the Tributaries Project are: aquatic macroinvertebrates, fox sparrow (*Passerella iliaca*), mule deer, yellow warbler, Pacific tree (chorus) frog (*Pseudacris regilla*), mountain quail (*Oreortyx pictus*), sooty (blue) grouse (*Dendragapus obscurus*), California spotted owl (CSOW), Pacific marten, northern flying squirrel (*Glaucomys sabrinus*), hairy woodpecker (*Picoides villosus*), and black-backed woodpecker (*Picoides arcticus*). Table 9 summarizes the pre- and post-treatment acres of MIS species habitat. While the Proposed Action may affect MIS habitat, the relationship of project-level habitat impacts to the habitat trends at the bioregional-scale is expected to be negligible for each of the category 3 MIS species habitat.

Table 9. *Summary of Pre- and Post-treatment Terrestrial MIS Habitat Acres.*

CWHR/MIS Habitat type	Pre-treatment Acres (same as No Action)	Post Treatment Acres (Action Alternative)	Change in MIS Habitat Acres
Lacustrine	474	474	+0
Riverine	544	544	+0
Shrubland (montane chaparral, MCP, and mixed chaparral, MCH)	82,003	68,356	-13,647
Montane Hardwood & Hardwood-conifer (MHW, MHC)	386	386	+0
Riparian (montane riparian, MRI)	1,348	1,406	+58
Wet Meadow	875	1,382	+507
Early Seral Coniferous Forest (tree sizes 1-3, all canopy closures)	1,324	15,507	+14,183
Mid Seral Coniferous Forest (tree size 4, all canopy closures)	54,400	52,647	-1,753
Late Seral Open Canopy Coniferous Forest (tree size 5P & 5S)	454	2,119	+1,665
Late Seral Closed Canopy Coniferous Forest (tree size 5M & 5D, 6)	121	215	+94

No Action

If a No Action Alternative is taken, habitat conditions within the Tributaries Forest Recovery Project Area will remain as they are and continue to evolve along the same trajectory. This assessment of the No Action Alternative considers the effects on wildlife species and their habitats under current and anticipated future conditions within the Project and Wildlife Analysis areas without any land management intervention, including the potential for landscape-level disturbances, such as wildfire, insect, or disease outbreaks.

This section addresses the direct and indirect effects of the No Action Alternative on Category 3 wildlife species in relation to current conditions of habitat types utilized by the species within the Project Area, including early and late-seral forests, shrub habitats, montane riparian areas, and meadows. Cumulative effects for the No Action Alternative are not addressed as the lack of activity will not add to any existing or reasonably foreseeable future actions within the Project's Wildlife Analysis Area.

Areas that burned during the 2019 Walker Fire and 2021 Dixie Fire vary in their existing conditions and, if left untreated under the No Action Alternative, are expected to develop along different trajectories into the future. Fifty percent of the conifer forest habitat on Plumas National Forest (203,000 acres) has burned at high severity in patches that exceed 100 acres in size. These areas are characterized by vast numbers of standing dead trees and many are transitioning to shrub dominated habitats with little natural conifer regeneration. The high fuel loads resulting from the Walker and Dixie Fires increase the risk of catastrophic reburn and threaten the success of what little conifer regeneration has occurred. Low to moderate severity fire occurred within overly dense stands on much of the 263,000 acres of conifer forest that are outside the large, severely burned patches, but within the perimeters of recent fires. In these stands, fire-created surface and un-consumed ladder fuels exist. Without active post-fire management standing dead trees in these areas will fall over time, creating a fuel pulse to the existing fuel load. The existing condition of areas that burned in a mosaic pattern within the Walker and Dixie Fire footprints more closely resemble historic or natural conditions versus the large, high severity patches. These areas consist of a mosaic of smaller, high severity burn patches interspersed among unburned and low to moderate burn severity patches. Due to pre-fire conditions, it is likely that overstocking and excessive fuels accumulations within these mosaic landscapes exist, which are expected to continue without proactive post-fire management actions.

Remnant green forest stands are vulnerable to future high severity fire, particularly where they are surrounded by patches with high fuel loading. These surviving green stands serve as important local seed sources for natural regeneration, and contribute to species and structural diversity and heterogeneity in a burned landscape. Often these remnant stands represent mid to late seral forests, which due to the fire are now severely lacking across the landscape.

If untreated, high severity burned areas may not fully regenerate to forested habitat, likely converting to other ecotypes, such as shrub fields and oak dominated stands. Mosaic burned areas would still have persistent overstocked and heavy fuel loads remaining from pre-fire conditions. Densities and stand structure in unburned areas would continue to depart from historical conditions and become increasingly less resilient. Forested stands within the Project Area would continue to be disrupted by overstocked conditions increasing competition, reducing crown development, and preempting regeneration. Risks to forest health would expand as stand densities and ladder/surface fuels increase, resulting in low resistance to insects and disease outbreaks and high potential for mortality under wildfire conditions. These impacts would be especially detrimental to the large tree component and future recruitment of large trees. Because water availability in the Sierra Nevada is so critical to tree growth and vigor, these impacts would likely intensify during periods of prolonged drought.

Direct effects of falling dead trees and limbs could cause harm or mortality to individuals in large and mosaic burn patches. The indirect effect of not removing snags within these burned landscapes would be the retention of roosting and perching sites for special status species such as bats, American goshawk, and the olive-sided flycatcher. This would be most beneficial along edges of burn patches, providing foraging habitat into shrub fields and open forested stands. All the bat species, with the exception of the spotted bat, utilize snags, hollow trees, or live trees for roosts. The abundance of snags and hollow trees would likely increase in the short-term under the No Action Alternative, benefiting these species. As ground cover and mid-story vegetation regenerates, these snags will begin to naturally fall. Within burned areas, high accumulations of fuel loads over time would increase the risk of stand-replacing wildfire ignitions that could spread to unburned areas, resulting in the potential loss of habitat and direct impacts to all wildlife species. In existing dense forested stands, the No Action Alternative would maintain these areas as unsuitable for foraging by species who require an open mid- and understory canopy for unencumbered flight while feeding (i.e. pallid and Townsend’s bats, olive-sided flycatcher, and northern goshawk). Overstocking and high fuel accumulations in most forested stands would probably result in high intensity wildfire causing large patches of near complete tree mortality, not preferred foraging habitat for these species.

For species dependent on late-seral habitat, such as the CSOW and AGOS, indirect effects of No Action would be the persistence of lost habitat and habitat connectivity across the landscape from the Walker and Dixie Fires. Pre-fire suitable habitat areas were converted to completely unsuitable habitat for these species, fragmenting habitat and reducing the availability of habitat across the landscape. Many of these areas are not expected to regenerate to late-seral forests without post-fire reforestation interventions. Late seral forest stands that remain across the Tributaries landscape are minimal (i.e. CWHR size class 5). If the existing overstocked mid seral stands (CWHR size class 4) are left untreated, they would continue on their current trajectory of delayed and degraded growing conditions. Slowing and possibly impeding the development of late-seral forest, thus promulgating a landscape lacking in late-seral forest habitat. Late-seral Forest habitat availability is directly correlated to late-seral species, occupancy, and in some cases their survival and reproduction. Thus, the No Action Alternative could impact the long-term viability of these species in the Project Area.

Indirect effects of the No Action Alternative in burned forests on special status invertebrates, western bumble bee and monarch butterfly, will be an increase in foraging resources due to a surge in flowering plants in burned areas. Particularly in low to moderate burn areas, native flowering plants quickly reestablish. In high severity burn areas high soil temperatures and damage could delay the reestablishment of flowering plants, but these areas may also experience an increase in flowering plants post-fire. Untreated green forest stands will maintain availability of overwintering sites for queen bees. Lack of forest heterogeneity is expected to persist, resulting in reduced foraging resources for bees due to the continuation and decrease in high-contrast forest edge habitats. For monarchs, foraging resources may decrease due to the inability for flowering ground vegetation to thrive in remaining dense forested stands.

For species dependent on drier, more open shrub habitats such as the American badger, vegetation succession conversions in high intensity burn areas, will increase the amount and extant of available habitat. Potential indirect effects of shrub habitat expanding is increasing prey abundance of small mammals that also utilize these habitats. Increases in small mammal prey could benefit special status raptor and mammal species, including the northern harrier, Swainson’s hawk, American badger, and gray wolf. Increased shrub habitats will bolster the risk of catastrophic wildfire to surrounding existing coniferous forest, riparian, and meadow habitats.

Riparian and meadow habitat dependent species, including amphibians (FYLF, MYLF, and SLTS), willow flycatcher, yellow warbler, sandhill crane, and the mountain sucker, could be impacted from increased stream and meadow sedimentation rates. Burned areas in close proximity to aquatic habitats that lack sufficient vegetative cover may result in disproportionate sedimentation rates during heavy precipitation or spring run-off periods. High sedimentation pulses could significantly change the structure and growing conditions within these habitats, as well as degrade water quality conditions. Increases in sedimentation rates under the No Action Alternative are likely to persist into the future in stands that experienced excessive tree mortality. Tree roots degrade, contributing to greater surface erosion. Existing degraded meadow habitat conditions will continue to transition to drier vegetation species, as opposed to more mesic, wetland species. Habitat surrounding and within valley areas will remain susceptible and less resilient to wildfire. All of these factors are expected to decrease habitat quality and possibly result in habitat loss for these species within the Project Area.

Overall, the No Action Alternative will allow fuels to continue to accumulate across the landscape and existing green stands will remain in overstocked conditions. This will create a landscape that is at a high and increasing risk of another widespread, stand-replacing wildfire, such as the Dixie Fire. Other increased risks include insect and disease outbreaks, and high erosion rates from loss of vegetative cover. This could be equated to complete habitat loss across forested habitat areas, as that which occurred in the Walker and Dixie Fires. Such an occurrence is expected to decrease occupancy, fragment habitat, and create barriers for movement and dispersal across the landscape. The future viability of forest-dependent species will ultimately be threatened by the resultant segmented, disjunct, small populations that manage to survive another catastrophic wildfire event. The long-term potential outcome of the No Action Alternative will be more devastating to wildlife species versus the short-term impacts from implementation of the Proposed Action.

4.2.3 Botanical Resources

This section discloses environmental impacts of the Proposed Action and No Action alternatives on botanical resources, including direct, indirect, and cumulative effects on special-status species and non-native and invasive species. The complete Botanical Biological Evaluation and Noxious Weed Risk Assessment can be found in Attachment 3.

Effects on Rare Plant Species

Proposed Action

The purpose of this assessment is to review the potential effects of the Proposed Action on Federal or State listed Endangered, Threatened, Proposed/Candidate species, Forest Service Region 5 Sensitive plant, lichen, and fungi species and their habitats (referred to collectively as TES botanical species), and California Rare Plant Rank List 1 and 2 species. Approximately 72,250 acres have current botany survey coverage (i.e., surveyed within 15 years). Most areas impacted by the Walker and Dixie Fires have not been surveyed for status post-fire. Surveys for the appropriate rare plants will occur prior to any implementation. Management Prescriptions and Design Features for conservation of rare species will be followed during implementation. The survey information used in the analysis (covered in the Botanical Biological Evaluation and Noxious Weed Report) is from previous or ongoing projects within portions of the Project Area, as well as California Natural Diversity Database (CNDDB), CalFlora, California Native Plant Society Rare Plant Inventory, and California Invasive Plant Council (Cal-IPC).

Tables 10 and 11 outline the rare species found in the Project Area, and those that have high habitat potential to occur within the Project Area. There are no Federally Threatened or Federally Endangered species known to presently occur within the Project Area. Four Federally Endangered or Threatened species were considered for effects in the Biological Assessment (Attachment 1). There are 22 rare species known to occur within the Project Area. There are 30 sensitive species known to occur near the Project Area, or to have known habitat within the Project. They are summarized in the tables below.

Table 10. *Rare species that occur in the Project Area and are analyzed for effects in this document.*

Species	Global Rankings	Forest Service Listing Status	CRPR List with Threat Code Ext.
Astragalus lentiformis (Lens-pod milk vetch)	G2	Sensitive	1B.2
Astragalus pulsiferae var. *coronensis* (Modoc Plateau milk vetch)	G4T3	Sensitive	4.2
Botrychium crenulatum (Scalloped moonwort)	G4	Sensitive	2B.2
Botrychium minganense (Mingan moonwort)	G5	Sensitive	4.2
Bruchia bolanderi (Bolander's bruchia)	G3	Sensitive	4.2
Carex sheldonii (Sheldon's sedge)	G4	Watchlist	2B.2
Epilobium palustre (Marsh willowherb)	G5	-	2B.3
Hesperocyparis bakeri (Modoc cypress)	G3	Watchlist	4.2
Ivesia sericoleuca (Plumas ivesia)	G2	Sensitive	1B.2
Juncus luciensis (Santa Lucia dwarf rush)	G3	Sensitive	1B.2

Species	Global Rankings	Forest Service Listing Status	CRPR List with Threat Code Ext.
Lewisia kelloggii ssp. *hutchisonii* (Sierra Valley lewisia)	G3G4T3Q	Sensitive	3.2
Lomatium roseanum (Adobe lomatium)	G2G3	Sensitive	1B.2
Meesia uliginosa (Broad-nerved hump-moss)	G5	Sensitive	2B.2
Penstemon sudans (Susanville beardtongue)	G4	Sensitive	4.3
Pinus washoensis (Washoe Pine)	G3	Sensitive	-
Poa sierrae (Sierra blue grass)	G3	Sensitive	1B.3
Potamogeton praelongus (White-stemmed pondweed)	G5	Watchlist	1B.2
Pyrrocoma lucida (Sticky pyrrocoma)	G3	Sensitive	1B.2
Rhamnus alnifolia (Alter buckthorn)	G5	-	2B.2
Scutellaria galericulata (Marsh skullcap)	G5	-	2B.2
Trichodon cylindricus (Trichodon moss)	G4G5	Watchlist	2B.2
Trifolium lemmonii (Lemmon's clover)	G3	Watchlist	4.2

Table 11. *Sensitive species that are not known to occur in the Project Area, but either occur in the direct vicinity or have high likelihood of habitat potential and are analyzed for effects in this document.*

Species	Global Rankings	Forest Service Listing Status	CRPR List with Threat Code Ext.
Artemisia tripartita ssp. *tripartita*	G5T4T5	Watchlist	2B.3
Astragalus pulsiferae var. *pulsiferae* (Pulsifer's milk vetch)	G4T2	Sensitive	1B.2
Astragalus webberi (Webber's milk vetch)	G1	Sensitive	1B.1
Balsamorhiza macrolepis (Big-scale balsamroot)	G2	Sensitive	1B.2
Botrychium ascendens (Upswept moonwort)	G4	Sensitive	2B.3
Botrychium montanum (Western goblin)	G3G4	Sensitive	2B.1
Botrychium neolunaria (Common moonwort)	G5	Sensitive	2B.3
Botrychium pinnatum (Northwestern moonwort)	G5	Sensitive	2B.3
Buxbaumia viridis (Green shield-moss)	G5?	Sensitive	2B.2

Species	**Global Rankings**	**Forest Service Listing Status**	**CRPR List with Threat Code Ext.**
Artemisia tripartita ssp. *tripartita*	G5T4T5	Watchlist	2B.3
Claytonia palustris (Marsh claytonia)	G4	Watchlist	4.3
Cypripedium fasciculatum (Clustered lady's slipper)	G4	Sensitive	4.2
Cypripedium montanum (Mountain lady's slipper)	G4G5	Sensitive	4.2
Didymodon norrisii (Norris' beard moss)	G4	Watchlist	-
Diplacus pygmaeus (Egg Lake monkeyflower)	G4	Watchlist	4.2
Erigeron eatonii var. *nevadincola* (Nevada daisy)	G5T4	-	2B.3
Eriogonum microtheca var. *schoolcraftii* (Schoolcraft's wild buckwheat)	G5T3	Sensitive	1B.2
Erigeron petrophilus var. *sierrensis* (Northern Sierra daisy)	G4T4	Watchlist	4.3
Eriogonum microtheca var. *schoolcraftii* (Schoolcraft's wild buckwheat)	G5T3	-	1B.2
Fissidens aphelotaxifolius (Brook pocket moss)	G3G4	Sensitive	2B.2
Ivesia aperta var. *aperta* (Sierra Valley ivesia)	G5T3	Sensitive	1B.2
Lewisia cantelovii (Cantelow's lewisia)	G3	Sensitive	1B.2
Lewisia kelloggii ssp. *kelloggii*	G3G4T2T3Q	Sensitive	3.2
Lomatium foeniculaceum ssp. *macdougalii* (Macdougal's lomatium)	G5T4T5	Watchlist	2B.2
Oreostemma elatum (Plumas alpine aster)	G2	Sensitive	1B.2
Orthocarpus bracteosus (Rosy orthocarpus)	G3	-	2B.2
Peltigera gowardii (Veined water lichen)			
Penstemon personatus (Closed-throated beardtongue)	G4T2	Sensitive	1B.2
Phlox muscoides (Squarestem phlox)	G4G5	-	2B.3
Potamogeton epihydrus (Nuttall's ribbon-leaved pondweed)	G5	-	2B.2
Rhynchospora alba (White beaked rush)	G5	Watchlist	2B.2

Global rankings reflect the overall status of a species throughout its global range, with G1 representing critically imperiled species, and G5 representing secure and widespread species. Most species in this analysis fall under the G5 (secure) to G3 (vulnerable) range. State rankings are assigned similarly to global rankings, but reflect the imperilment status only within California. CRPR listings similarly reflect extirpation rankings and threat levels within California.

Direct and Indirect Effects

Direct effects occur when plants are physically impacted. Examples of proposed treatment activities that have the potential to directly affect rare plants include being stepped on; crushing by vehicles or equipment; timber falling; application of herbicides; temporary road and landing construction; placement of fill in incised channels in meadow restoration projects; and prescribed fire treatments. These actions can result in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, or uprooting plants.

Indirect effects are separated from an action in either time or space. These effects, which can be beneficial or detrimental to rare species, may include changes in vegetation composition, soils, hydrology, successional patterns, fire regimes, or the distribution and abundance of invasive plants. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance and tend to occupy interior forest habitats with high canopy cover.

In contrast, for those species that tolerate or are dependent upon some level of disturbance and inhabit gaps and forest openings, treatments may have beneficial indirect effects. For species that occupy wet meadow habitat, meadow restoration that restores hydrology will also be beneficial. For all rare species, negative effects may occur if prescribed burns are too hot; this has the potential to kill the seedbank and sterilize the soil. Burning hand or machine piles can also alter soil biotic and chemical properties for a number of years, which in turn greatly influences the degree and type of plant colonization into the fire-scarred site. Other indirect effects that are associated with herbicide treatments may include impacts to pollinators or mycorrhizae (fungi) that are associated with rare species.

For this Project, the important activities to consider in analysis of indirect effects are vegetation and fuels management, herbicide application for invasive weed management, and site preparation related to treatment activities. The direct and indirect effects of herbicides on rare species are considered negligible due to a combination of factors. Known rare plant occurrences will be flagged and separated spatially from invasive plant infestations for treatment purposes. Impacts to rare species from herbicide treatments would be limited with the Design Features and Management Prescriptions in place. These measures mitigate impacts by spatial separation and use of herbicides that are selective to target invasive species.

Direct and indirect effects of silviculture treatment activities on rare species would be minor due to the design features and management prescriptions in place. Some species would accept a small amount of minimized direct effects by machinery, ground disturbing fire line construction, tree felling, yarding, and skidding, affecting these plants by directly crushing and killing individuals.

It is difficult to assess and quantify the effects to suitable habitat without both specific locations of proposed actions and ground-truthing botanical surveys. Recent 2023 surveys collected important information, but were directed to focus areas within the Project Area. More in-depth surveys will be conducted prior to treatment implementation, and additional Design Features to protect rare species will be identified, as appropriate.

Cumulative Effects

The effects of past activities on rare plant species in the botany analysis area are largely unknown. On the PNF, rare plant surveys did not begin until the early 1980s. In many cases, even when project-level surveys were conducted, there is very little documentation that describes whether past projects avoided or protected rare plant species during project implementation. In addition to these unknowns, changes have been made to the PNF Sensitive Species list. Therefore, in order to incorporate the contribution of past activities into the cumulative effects of the Proposed Action, this analysis uses the current abundance and distribution of rare plant species as a proxy for the impacts of past actions.

Over the past 30 years, the landscape in the botany analysis area has experienced moderate levels of past activity and, consequently, moderate levels of past disturbance. For those species that occupy open habitats and are tolerant of some level of disturbance, it is possible that past activities in the botany analysis area have had a beneficial effect by creating openings and areas of potential habitat across the landscape.

Fifty-seven percent of the Project Area burned at high-severity in the Walker and Dixie Fires. Updated vegetation mapping shows high rates of delayed mortality among the low and moderate severity burn classes. Most rare plant species do not benefit from high-severity wildfire, and some species face detrimental effects. This can result in widespread habitat loss and alteration. Some species, like rocky outcrop species, are not detrimentally affected by high-severity wildfire because their habitats are simply not reached by the fire effects.

Degraded conditions in sensitive riparian habitats are common through the fire footprint and surrounding area. This disturbance, paired with past disturbances from prior activities, have created a landscape that is susceptible to invasive plant introduction and spread. This has increased the overall risk to native plant communities and rare species.

A cumulative effect can result from the incremental impact of an action when added to the effects of past, present, and reasonably foreseeable future actions, affecting areas in and around the Tributaries Project Area. The 0.25-mile buffer used in the botany analysis was also considered the cumulative effects analysis area. The temporal cumulative effects of past actions over the last 30 years, from 1994 through 2023, are based on an assessment of current baseline environmental conditions.

Potential cumulative impacts include damage to habitats and individuals from soil displacement activities, potential impacts from fuels reduction actions, and potential degradation of habitat from mechanical equipment use.

If existing management guidelines (such as field surveys, protection of known rare plant locations, and implementation of invasive plant mitigations) remain in place, the effects of future projects are likely to be minimal or similar to those described in this analysis. Ongoing activities, such as woodcutting, hunting, and dispersed recreation activities, are not likely to make a significant impact on rare plant species; however, these activities may act as vectors for invasive plant spread.

Effects Determination

The treatments proposed have the potential to affect rare species in many ways. Treatments will inevitably occur within suitable habitat and adjacent to it for some of these species. Any impacts to these habitats and species would be short term and are not expected to impact the viability of these species. Due to the long-term nature of this Project, 163,248 acres being treated over the next 10 years, impacts to species will be spread out over the duration of the Project. The long-term benefits to these species over the lifetime of this Project are expected to outweigh any detrimental effects to species done in the implementation process. Management Prescriptions and all other implementation guidelines protecting rare plant occurrences will be in place.

In combination with past, present, and future actions, implementation of the Proposed Action may affect individuals, but is not likely to lead to a loss of viability or a trend toward federal listing for FS or State TES and rare species. Planned actions will foreseeably occur within suitable habitat for rare species, but there is anticipated to be no sizable loss of habitat. Anticipated effects will be reduced by the Project Design Features (Appendix E) and the Management Prescriptions and Design Features described in the Botanical Biological Evaluation and Noxious Weed Risk Assessment (Attachment 3).

<u>No Action</u>

Under the No Action Alternative, no direct effects are anticipated because no project-related activities would be implemented. Following the Walker and Dixie Fires, thick brush stands would continue to grow and become denser, resulting in increased shading, duff, fuels accumulation, and eventually canopy closure. These conditions could negatively impact the rare plant species that have been documented within the botany analysis area by reducing the quality of existing habitat as well as the amount of potential, but unoccupied habitat. These stand conditions and the continued exclusion of fire would also increase the risk of catastrophic wildfire, which could have detrimental effects on all the rare species. Some species would likely be unaffected, such as those in rocky cliff habitats or low-severity patches that received beneficial effects following the Walker and Dixie Fires.

Under this alternative, the existing invasive plant infestations would continue to grow and likely spread to other areas of potential habitat. Invasive plant species pose a serious threat to ecosystem function because of their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure. Invasive plant establishment and spread in the Botany analysis area can negatively affect potential habitat, not only for rare species, but also for all native plant species. The spread of invasive plant infestations is less likely to affect species that grow in rocky or other protected habitats that aren't overgrown.

Effects on Non-Native and Invasive Species

<u>Proposed Action</u>

Approximately 17 invasive plant species are known to be documented in the Project Area, or within the direct vicinity (Table 12). There are 576 acres of mapped infestations within the Project Area.

Approximately 72,517 acres were surveyed between 2011-2024. The need for additional surveys will be evaluated depending on the need to monitor known sites and a change in conditions. Future surveys will be conducted in all Project implementation areas where ground disturbance is proposed.

Table 12. *Priority non-native invasive plant species within the Project Area and vicinity.*

Scientific Name	Common Name	Form	Rank (CAL-IPC)
Alopercurus pratensis	Meadow foxtail	Perennial grass	Watch
Bromus tectorum	Cheatgrass	Annual grass	High
Centaurea solstitialis	Yellow starthistle	Perennial herb	High
Centaurea stoebe ssp. micranthos	Spotted knapweed	Perennial herb	Moderate
Cirsium arvense	Canada thistle	Perennial herb	High
Cirsium vulgare	Bull thistle	Perennial forb	Moderate
Cytisus scoparius	Scotch broom	Shrub	Moderate
Elymus caput-medusae	Medusahead	Annual grass	Moderate
Festuca arundinacea	Tall fescue	Perennial grass	Moderate
Isatis tinctoria	Dyer’s woad	Annual herb	Moderate
Lepidium latifolium	Perennial pepperweed	Perennial herb	High
Linaria dalmatica	Dalmatian toadflax	Perennial herb	Low
Linaria vulgaris	Butter-and-eggs	Perennial forb	Moderate
Onopordum acanthium	Scotch thistle	Annual herb	High
Potamogeton crispus	Curlyleaf pondweed	Aquatic perennial	Moderate
Rumex acetosella	Red sorrel/Sheep sorrel	Perennial herb	Moderate
Ventenata dubia	Wiregrass/North Africa grass	Annual grass	High

Direct and Indirect Effects

Activities from the Proposed Action to reduce and remove existing invasive species infestations will reduce the presence of these species throughout the Project Area. It will be difficult to achieve complete eradication and control of many of these species due to the size and nature of their infestations. While proposed treatments will reduce the existing populations, the proposed activities will also increase risks of invasive species spread by introducing additional vectors and altering forest habitats. Short-term ground disturbing activities will occur.

Other ground disturbing activities such as grazing allotments, recreational activities, and wood cutting would continue to be potential vectors for introduction but would be candidates for control measures. With Management Prescriptions and Design Features, there would be a minimal expected establishment of new non-native and invasive species infestations.

Cumulative Effects

Throughout the Project Area and over time, past and current activities have contributed to the spread of invasive species. The spread of these species to new sites and habitats will inevitably occur, but the Project itself would decrease the rate of spread and aim to control populations with the proposed invasive species treatments.

Past activities in the Project Area have resulted in various levels of disturbed, or altered, habitat. These activities include but are not limited to: mining, timber harvest, historical grazing, wildfire, road construction, and recreational activities. Disturbed habitats can be more highly susceptible to invasive infestations due to either direct effects from alterations (such as destruction of vegetation), or indirect effects such as changes in canopy cover, moisture, and other site conditions. Areas directly burned in the Walker and Dixie Fires at high severity are at particularly high vulnerability to invasive plant colonization, and disturbance from implementation activities could increase the spread.

No Action Alternative

Under the No Action Alternative, invasives would continue to spread. Control measures would be limited to the actions proposed in prior signed NEPA decisions for smaller Project Areas and to future planned projects. Without action, infestations could expand beyond feasible control measures.

4.2.4 Cultural Resources

A cursory record search for the project area conducted by Plumas National Forest (PNF) Archaeologists identified more than 700 previously recorded cultural resources (e.g., precontact and historic sites) within the Tributaries Forest Recovery Project 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, and water conveyance systems, transportation systems/networks (roads, trails, railroads, etc.), transmission corridors, and aborglyphs.

Consistency with Relevant Laws, Regulations, and Policy

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 Amendment 1 (12/2024) of 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 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 meet post-NEPA decision but pre-Implementation.

The Plumas National Forest (PNF) developed the PNF Protect and Recover Project HIP (2023) 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, Tásmam Koyóm Foundation, Maidu Cultural Group and the California State Historic Preservation Officer (SHPO).

Proposed Action

The Proposed Action would have no effect on cultural resources. Standard Protection Measures (SPMs) from the PNF HIP would be employed as integrated design features and applied to all cultural resources within the project area for all the action alternatives. Application of SPMs would eliminate any potential adverse effects to cultural resources.

Section 106 consistency review and approval:

If the PNF Protect and Recover Project HIP procedures, as developed under the National Programmatic Agreement for phasing Section 106, are followed there will be no effect to cultural resources. If the project area of potential effect (APE) is modified, additional review and approval by the District Archaeologist would be required.

4.2.5 Economics

Economic effects of the Proposed Action Alternative were evaluated using the best available information on the relevant revenues and costs to implement the proposed actions. This was quantified by analyzing income generated through timber sales and costs associated with labor and transportation related to timber sales and associated service contracts. Economic assumptions, such as those related to treatment costs, inflationary forces, and labor market fluctuations are not known with a high degree of certainty, so future economic conditions could vary from the assumptions presented here. Subsequently, the economic estimates presented in this analysis only provide a comparison of the relative costs and revenues of the Proposed Action Alternative, and do not attempt to predict precise future costs.

Proposed Action

Direct, Indirect, and Cumulative Effects

Many of the proposed restored acres have little timber value to offset implementation expenses with the exception of some commercial thinning and biomass sales. Timber harvest is a byproduct of implementing the proposed vegetative treatments aimed to manage forest resources for resiliency and restoration. Average costs of proposed treatment methods were estimated based on available data and typical costs of past projects in Table 13. Mechanical treatments are estimated to average between $1,000 to $4,500 per acre depending on site conditions and the current value of any commercially harvested timber, biomass markets, and fuel prices. Table 14 shows total volume of possible merchantable material proposed for removal based on maximum potential value. Not all estimated merchantable volumes may result in revenue depending on market conditions over the course of project implementation. Non-timber generating activities, such as mechanized removal of non-saw log material, mastication, hand thin and pile burning, prescribed burning, and reforestation average $150 to $2,000 per acre. All activities would require securing funding for contracted services, providing direct employment benefits in the logging, reforestation, trucking, biomass, and non-profit sectors. Jobs in support services (i.e. grocery stores, gas stations, housing/lodging, etc.) would indirectly benefit, contributing to overall increased employment opportunities in local communities surrounding the Project Area. Increased local employment would in turn support local hospitals, schools, and other essential community services. Implementation of the Proposed Action Alternative would continue over several years as initial treatments are completed, with subsequent treatments required to maintain desired conditions, sustaining local job markets for a minimum of ten years.

Table 13. *Average payment for contracted services for all proposed vegetative treatment activities.*

Proposed Treatments	Estimated Treatment Cost/Acre or Mile*
Commercial Thin	$1,000-$4,500
Fuelbreak	
Fuels Reduction – Mechanical	
Fuels Reduction – Hand Thin (PACs)	$1,500
Reforestation – High Intensity Site Prep	$150-$200
Reforestation – Low Intensity Site Prep	$100-$200
Herbicide Application	$200-$300
Pile Burning	$995-$2,000
Prescribed Burning	$500
Road Maintenance	$2,500-$17,000

*Based on review of costs on similar projects on private and public lands.

Table 14. *Estimated timber and biomass material generated by the Tributaries Project.*

Vegetation Type / Treatment Area	Proposed Treatment Acres	Merchantable MBF/Acre	Merchantable Biomass CF/Acre	Total Merchantable Volume (MMBF)	Total Merchantable Biomass (CF)
Eastside Pine	10,895	8.1	1,541	88.66	16,785,394
Sierra Mixed Conifer	1,104	8.2	1,469	9.1	1,621,366
True Fir	4,090	10.3	1,846	42.14	7,550,395
Fuelbreak- Low Severity Fire	152	0.474	120	0.072	18,314
TOTAL OR AVERAGE	**19,899**	**7.0***	**1,305****	**139.97**	**25,975,469**

*weighted average; based on total merchantable volume divided by total treatment acres.
** weighted average; based on total merchantable biomass divided by total treatment acres.

Other economic benefits to implementing the Proposed Action would be reduced costs from wildfires, including suppression costs, property damages, impacts to recreation and tourism, and costs associated with wildfire impacts to human health. To demonstrate the cost of not reducing wildfire risk, the total cost of suppressing the Dixie Fire in 2021 was $637 million (NIFC 2024), averaging $662 per acre. Impacts to local economies far exceed suppression costs (Taylor et al. 2022), as they do not account for property damages and impacts to recreation, tourism and other local businesses. Property damage costs from the Dixie Fire were estimated at $524 million (Cal Fire 2021). Some owners and businesses impacted chose not to rebuild, reducing tax revenues and jobs. The total monetary value of all final recreation and tourism services (i.e., Gross Domestic Product - GDP) produced in Plumas County in 2022 was approximately $49 million (U.S. Bureau of Economic Analysis 2024). For comparison, agriculture, forestry, fishing and hunting accounted for $12 million of the county's GDP in 2022 (Ibid). Extreme wildfires and persistent smoke in the region threaten these revenues, whereas, implementing landscape-level fuel treatment projects to improve wildfire resilience could maintain and potentially increase them. Lastly, wildfire smoke results in health impacts not only on firefighting personnel, but on nearby communities and distant population centers. Although data on impacts of wildfire smoke on population health is limited, studies have indicated that: 1) disadvantaged and minority communities are disproportionately at higher risk from wildfire smoke (CCST 2020), 2) increases in hospital visits related to respiratory issues and asthma complications were attributed to peak fire periods (Hutchinson et al. 2018), and 3) based on a 2017 study the annual national costs of wildfire smoke short-term was estimated at $12-$20 billion, and long-term in one year between $76-$130 billion (Fann et al. 2017). Reducing the number and severity of fires with proactive forest management would decrease human health costs associated with wildfire smoke, and ultimately protect public health and public health investments with significant returns (CCST 2020).

In conjunction with treatments proposed in other forest recovery and community protect projects on the Plumas National Forest and private lands, the economic benefits of all forest health treatments combined would be compounded. With the various phases of planning and implementation, including ongoing maintenance/management of desired conditions, economic benefits are expected to be metered over the long-term (10-20 years).

No Action

Direct, Indirect, and Cumulative Effects

The No Action Alternative would not include any treatments to increase forest health and resiliency, so local communities would not see any of the associated employment opportunities and resulting economic benefits. Leaving the Project Area untreated would likely increase the risk of high intensity wildfires and the accompanying costs. Wildfire costs, including suppression, postfire recovery, loss of tourism and recreation, and impacts on community health, would likely be higher under the No Action Alternative than under the Proposed Action. In addition, 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.

4.2.6 Environmental Justice

Affected Environment

Environmental Justice is defined by Executive Order 12898 (59 Federal Register 7629). EO 12898 focuses federal attention on the environmental and human health effects of federal actions on minority and low-income populations, with the overarching goal of achieving environmental protection for all communities. (US EPA 2024a) Under the EO federal agencies are directed to identify and address any disproportionately high and adverse effects from their actions on these identified populations to the greatest extent practicable and permitted by law. The most currently available census data was used to determine whether minority or low-income populations are present in the areas expected to be affected by the range of project alternatives.

This analysis focuses on the local census block groups and census tracts within the boundaries of the Tributaries Forest Recovery Project. The area of analysis includes where project related impacts may occur, including smoke from prescribed burning, and noise and dust from vegetation management activities. These activities within the Proposed Action could potentially result in an adverse and disproportionately high effect on neighboring communities, including underserved and low-income populations.

Additionally, certain groups are more vulnerable than others to the health impacts of climate change due to social and economic factors like income, education, health care access, and housing. Such factors can affect people's ability to prepare and cope with climate hazards. Socially vulnerable groups in the United States include communities of color, low-income groups, certain immigrant groups, and those with limited English proficiency. These groups may be more at risk because (US EPA 2024b):

- They may live in locations that are prone to climate-related health hazards, such as flooding, extreme heat, and air pollution;
- They can have greater rates of existing medical conditions, such as physical disabilities, poor mental health, kidney disease, diabetes, asthma, or heart disease, which can be worsened by climate change impacts;
- They may live in urban and rural areas with poorly maintained or aging infrastructure that may not be able to handle climate-related events. Such infrastructure can include buildings, utilities, and transportation and health care systems. Individuals in these communities may also struggle to access resources and care during and after extreme weather events;
- They may have limited financial resources or cultural, language, or citizenship barriers that restrict their access to health care, social services, and safe, nutritious food.

According to the 2021 U.S. Census Bureau's American Community Survey, Plumas County meets the "low income" criteria, with a median household income of $57,885. In California to qualify as low-income, locations must have a median household income of less than $67,278, which is 80% of the State's median household income. (USCB 2021) The Project Area also lies within the Upper Feather River Integrated Regional Water Management (IRWM) area containing regions classified as "severely disadvantaged" by the California Department of Water Resources (CDWR). "Severely disadvantaged" is defined by CDWR as an area whose average median household income is less than 60% of the statewide average. (CDWR 2024) The Tributaries Project overlaps two census tracts and no census block groups in Plumas County, California, as there are no established communities within the Project boundary. Table 15 depicts the demographics for the two census tracts and the State comparison.

Proposed Action

<u>Direct and Indirect Effects</u>

All proposed fuel reduction treatments throughout the Project Area include some form of prescribed or cultural burning, including underburn (understory, broadcast, or jackpot burn methods), and/or pile burning. The closest communities to proposed fuel treatment units are Portola at 8 miles and Greenville at 11.5 miles. All burning activities would be regulated by the Northern Sierra Air Quality Management District, which would ensure smoke production does not reach health concern levels. Burn periods are typically limited to short "burn window" timeframes during the spring or fall when atmospheric conditions allow for good smoke dispersal. All burn activities would be supervised by qualified personnel. Impacts to air quality would be short term and minimized with the implementation of design features, reducing direct, indirect, and cumulative impacts of smoke released by prescribed fire. The Proposed Action would result in short term, localized impacts to noise levels. Exposure of community residents or Forest visitors to noise levels in the Project Area would be minimal. Noise impacts would not occur at night, and Project actions would be limited to activity duration as they occur in a treatment area.

Table 15. *Census tract demographics within the Tributaries Forest Recovery Project Area.*

Census tract	White	Black	American Indian	Asian	Native Hawaiian, Pacific Islander, or Other Race	Two or more races	Hispanic	Census Tract Identified as Disadvantaged
Tract 3, GEOID: 06063000300 (Greenville)	80%	0%	2%	0.2%	0.5%	4%	13%	Y
Tract 4, GEOID: 06063000400 (Portola)	77%	0.2%	3%	2%	0%	10%	9%	N
State	62%	21%	1%	6%	8%	10%	19%	

While Plumas County is considered low income and underserved, only one of the Census Tracts within the boundary of the Tributaries Project is identified as disadvantaged according to the U.S. Climate and Economic Justice Screening Tool. (USCEQ 2024) Census Tract 06063000300 is considered disadvantaged because it meets more than one burden threshold and the associated socioeconomic threshold. The lands of Federally Recognized Tribes that cover less than 1% of the Tract is also considered disadvantaged.

As part of the implementation planning process, community members surrounding the Tributaries Forest Recovery Project would receive notification via mail, email, internet postings, and print in local newspaper about the project, its location, and proposed activities.

To protect underserved and low-income communities that could be impacted by proposed project activities, the following actions would be implemented:

- Notify and effectively communicate burn schedule and locations, including providing an accessible representative to address community member questions and concerns.
- Burn in favorable conditions to limit smoke impacts to the greatest extent possible.
- Use smoke prediction models to target mitigations specifically to those who would be in impact areas.

- Share educational material on smoke differences between wildfire and prescribed fire.
- Share educational fliers demonstrating how smoke can affect health and how to practice preventative care.
- Provide High Efficiency Particulate Air purifiers at no-cost on loan basis from the Plumas Underburn Cooperative to those who request them with higher health risks.
- Provide N95 masks to community members who request them.

Cumulative Effects

The Proposed Action fuel reduction treatments including prescribed burning and other known foreseeable future actions would be implemented over multiple years. Noise and smoke exposures would be metered over an extended period. Cumulative impacts from other prescribed burn treatments in the area would be mitigated through coordination with Plumas National Forest, Plumas Underburn Cooperative, and the Northern Sierra Air Quality Management District, to ensure ambient air quality levels do not reach unhealthy levels. In addition, approved forest management activities would increase employment opportunities in forest-related industry jobs, as the need for contractors to implement fuel reduction treatments is expanded with the implementation of the various landscape-level community protection and forest recovery projects across the region, potentially benefitting disadvantage communities. Mitigation measures listed above would ensure effective communication on measures to protect the health and safety of community members. Disproportionate impacts to minority and low-income populations are not expected.

No Action

Under the No Action Alternative none of the proposed actions would be implemented. If no treatments are performed in the Project Area, it is likely that current ecological conditions and socioeconomic risks of climate change, overstocked fuel loads, and inaccessible motorized routes would worsen over time. Increased catastrophic wildfire risk and the resultant smoke production and disrupted economic activity creates a greater environmental justice impact to disadvantaged communities than would the proposed actions with mitigation measures.

4.2.7 Greenhouse Gas Emissions/Climate Change

This section discloses greenhouse gas emissions and climate change risk environmental impacts of the Proposed Action and No Action alternatives. Greenhouse gas emission estimates were quantified and reported as CO_2 equivalents (CO2e) in metric tons (mt) or million metric tons (MMT). Key policies, guidance, executive orders, regulations, and legislation regarding greenhouse gases (GHGs) and climate change are summarized the Greenhouse Gas Emissions and Climate Change Report (Attachment 4).

Affected Environment

Climate change refers to changes in temperature, precipitation, wind patterns, and other elements of the earth’s climate system over a long period of time. In the Sierra Nevada, observations of climate change include long-term warming trends, declining snowpacks, increased proportion of precipitation falling as rain rather than snow, and earlier spring runoff (Dettinger et al. 2018). On the PNF, documented climatic changes include increased minimum and average mean temperatures, greater variability in total annual precipitation, and decrease in total annual snowfall (Merriam et al. 2022). These trends are projected to continue and accelerate in the coming decades, with additional trends in temperature increases, precipitation changes and extremes, soil and vegetation dryness, streamflow amounts, and reduction in air quality expected to become more apparent and impactful (Dettinger et al. 2018). Changes in climatic and environmental conditions can also strongly affect terrestrial, marine, and freshwater biological systems. Climate risk in the Sacramento River Hydrologic Region, within which the Project Area is located, includes stress on ecosystems and species resulting from increased temperatures, reduced reliability of water supplies caused by decreased snowpack storage, greater flood risks, and decreased water quality (CDWR 2015). Climate projections suggest the Project Area will experience increased temperatures, greater interannual variability in precipitation, greater precipitation extremes (both drought and deluge), more of the precipitation falling as rain rather than as snow, and earlier spring snowmelt (Merriam et al. 2022, Halofsky et al*.,* 2021, Merriam et al. 2013), which could result in further losses from fire, drought, and insects.

Terrestrial ecosystems play an important role in the global carbon cycle. Through photosynthesis, plants sequester (absorb) carbon dioxide from the atmosphere and store some of the carbon as biomass, both above- and below-ground. Carbon is naturally released back into the atmosphere when plants die and decompose or burn.

The balance of carbon sequestration versus carbon emissions to the atmosphere determines the size of the total forest carbon stock, which fluctuates over longer periods of time, but tends toward a long-term equilibrium if forest stands are replaced (via natural regeneration or replanting). The long-term capacity of forest ecosystems to sequester and store carbon depends in large part on their health, productivity, resilience, and adaptability to changing conditions. Major factors influencing the long-term capacity of forest ecosystems to gain and store carbon include water availability, forest age, forest structure and diversity, disturbance regimes, and land cover type changes.

National forests play an important role in climate change mitigation. Balancing the numerous environmental benefits provided by healthy ecosystems, including carbon sequestration, is paramount to the Forest Service's mission. As part of promoting balanced ecosystems on the Plumas National Forest, management objectives of the Tributaries Forest Recovery Project include restoring and maintaining the ability of forested stands to sequester carbon by improving the establishment and survival of conifers; improving watershed conditions; retaining forested landscapes that are resilient to changing climatic conditions and disturbance regimes; maintaining functional riparian and meadow ecosystems; restoring degraded or damaged ecosystems; and maintaining habitat for threatened, endangered, and other species of conservation concern.

These management objectives have been developed in response to the past management, history of the Plumas National Forest, and recent catastrophic wildfires. Decades of fire suppression have resulted in overstocked stands and dangerous levels of fuel loading, which, in conjunction with climate change, drive increases in wildfire intensity and severity, resulting in catastrophic wildfires. Such fires greatly impact forest resources including carbon stocks and sequestration capacity. A total of 37.4 MMT CO_2 was released by combustion in the Dixie Fire alone (CARB 2022) – a value which does not include the post fire carbon emissions that continue to be released from burned areas. This continued slower release of carbon emissions can liberate up to three times as much CO_2 from the decomposition of the vegetation killed by the fire (AuClair and Carter, 1993).

Proposed Action

Many management activities may have short-term carbon emissions but yield long-term carbon benefits through enhancing forest resiliency. The use of silvicultural tools such as removing hazardous fuels and reducing live tree density in stands outside the natural range of variation can reduce the risk of wildfire and increase resiliency to disturbance including insects, disease, drought, and fire.

The impact of management practices can vary based on climatic characteristics, vegetation, and soil types, meaning sustainable approaches must be site-specific. The management actions proposed in the Tributaries Forest Recovery Project will consider site-specific conditions to ensure the that site-appropriate activities are implemented. The proposed silvicultural treatments consider projected vegetation climate exposure (the degree to which future hydroclimatic conditions will fall outside of those which a given vegetation community currently occurs) and climatic water deficit (the amount of water plants would use if it were available; an estimate of drought stress on soils and plants) (see Appendix C) to help guide reforestation preferred and microsite planting areas as well as planting densities. This projected climate information can also be used to inform stand density targets for thinning prescriptions.

<u>Direct and Indirect Effects</u>

Fossil fuel emission contributions by activity are discussed below:

Silvicultural Treatments

Silvicultural treatments have a carbon cost and have potential carbon co-benefits of sequestration (via enhanced growth of released trees and planted trees) and emissions avoided (reducing the risk of stand-replacing wildfires avoids those associated carbon emissions and loss of additional sequestration capacity). Collectively, the proposed silvicultural treatments, including trucking and equipment emissions, would release 0.10 MMT (104,947 metric tons, mt) CO_2 equivalent (CO_2e) over 40,170 acres of proposed treatment within the Project Area. This equates to 2.61 mt CO_2e per acre release during project implementation, which would occur over a 10-year period, compared to 40 mt CO_2 per acre released from direct combustion during the Dixie Fire over a four-month period.

The following are sources of fossil fuel emissions associated with implementation of silvicultural treatments: transportation emissions associated with hand thinning, mechanical thinning, prescribed fire, and emissions from equipment operations and burning. Workers would commute to the Project Area in passenger vehicles, and construction materials and equipment would be transported to and from the Project Area by haul trucks. Construction equipment would include water truck, skidder, feller buncher, delimber, masticator, tracked chipper, loader, and chainsaw. As implementation of silvicultural treatments would take place over a 10-year period, equipment emissions would not be released in entirety at one time.

Reforestation: Managed reforestation following disturbance events can enhance carbon ecosystem functions by increasing woody biomass and sequestration rates, with immediate and long-term carbon benefits. Reforestation treatments would release 31,803 metric tons (mt) CO_2e over 19,546 acres. Based on aboveground net primary productivity (Law et al. 2003) and carbon stock growth estimates (Hoover et al. 2021), estimated carbon stocks from replanting 19,546 acres of conifer forest would take approximately 5 to 7 years to recapture an equivalent amount of CO_2 release by reforestation activities and approximately 11 years to recapture an equivalent amount of CO_2 release from all Project activities. The establishment of woody vegetation delivers immediate to multi-decadal carbon sequestration benefits in aboveground woody biomass and coarse woody debris pools, with an estimated recapture of five to twelve times the total carbon cost of the Project within 20 to 30 years post-treatment.

Commercial Thin and Fuels Reduction: Thinning out dense forest stands under the Proposed Action Alternative will reduce the chance of losing the remaining green forest to catastrophic wildfires, as well as reduce losses due to drought, insects, and disease. Long-term, thinning can increase carbon stocks of the treated stands (Zhang et al. 2024, Dore et al. 2016, Wiechmann et al. 2015) as the treatment reduces competition and releases remaining tree growth; however, there will be a short-term decrease in aboveground carbon stocks due to such thinning. The Plumas National Forest is reported to have had 131.49 teragrams of carbon (Tg C) (482 MMT CO2e) in above and belowground stocks in 2018 (USDA Forest Service 2024a, USDA Forest Service 2024b). Since then, 65% of the Forest has burned in the 2019-2021 cohort of megafires, likely representing a significant loss of carbon due to direct combustion and continued decomposition of fire-killed trees. The Proposed Action Alternative would remove an estimated 0.16 Tg C (0.6 MMT CO2e), equivalent to about a tenth of a percent of the Forest's 2018 total carbon stocks and less than half a percent of estimated current carbon stocks based on a 65% loss (likely an overestimate of loss used to consider worst-case). Under the Proposed Action Alternative, the project will emit from equipment release an estimated 65,378 mt CO2e from 14,983 acres through commercial thinning; 1,211 mt CO2e from 1,272 acres of mechanical fuels reduction; 3,488 mt CO2e from 3,664 acres of non-mechanical fuels reduction inside Protected Activity Centers; and 3,058 mt CO_2e from 701 acres of mechanical thinning in shaded fuelbreaks.

Prescribed Fire: Emissions from prescribed fire would mimic those of the historical fire regime and represent the contemporary carbon cycle and are therefore separated from calculations presented here of fossil carbon emissions from mechanical equipment. Carbon emissions associated with prescribed fires come mainly from the combustion of duff, litter, and small-sized dead wood, which would otherwise decay and release carbon even in the absence of fire. The Project's prescribed fire treatments will primarily affect understory and forest floor carbon pools. Under the Proposed Action Alternative, prescribed fire will occur in a variety of methods, including prescribed burning, pile burning, and cultural burning. Burning to reduce fuels on the project would release 199,865 mt CO_2e throughout the 5,637 acres of fuels reduction and shaded fuelbreak treatments in the Project Area. Wiechmann et al. (2015) found that the carbon recovery period for prescribed fire burning was within the historical fire return interval for a mixed-conifer forest in the Sierra Nevada.

Watershed Treatments

The Project Area includes the opportunity for numerous watershed treatments including meadow, spring and fen, stream channel and riparian, and stream-road crossing treatments. The construction of these watershed treatments would generate temporary and one-time GHG emissions by on-site construction equipment and travel to the work site. During implementation of the identified meadow restoration treatments, workers would commute to the Project Area in passenger vehicles, and construction materials and equipment would be transported to and from the Project Area by haul trucks. Construction equipment would include excavators, loaders, a grader, roller, bulldozer, water truck, and water pump.

Meadow Restoration: There are three identified meadow treatments within the Project Area. The carbon emissions produced during meadow treatments would be offset by the restoration of meadow hydrology and re-establishment of meadow vegetation, the combination driving carbon storage in meadow soils. It is estimated that the total construction activity emissions would be approximately 1,214 – 5,044 mtCO_2e depending on whether on-site or off-site material is used. Restoration of the three meadows back to a proper functioning state would have the potential for restored meadow soils to recapture approximately 4,577 mt CO_2e per year. This carbon benefit is further augmented by the prevention of ongoing soil carbon loss from the meadows in a degraded state for a net carbon benefit of 9,994 mt CO_2e per year. Thus, the carbon benefits of meadow restoration offset the construction emissions within one year of being restored.

Stream-Road Crossings: There are 187 stream-road crossing issues identified within the project. Road improvements to address these issues include adding drainage structures such as critical and rolling dips, culverts, and road out-sloping, as well as resetting culverts, clearing debris, and rocking crossings. Such treatments would require similar equipment to that described above for meadow restoration and would emit an estimated 245 mtCO_2e.

Implementation of BMPs would reduce GHG emissions from construction projects by minimizing fuel usage by construction equipment, reducing fuel consumption for transportation of construction materials, and reducing the amount of landfill material. Minimizing idling time by requiring that equipment be shut down after five minutes when not in use (as required by California Code of Regulations, Title 13, Section 2485, the State's airborne toxics control measure), as well as maintaining all construction equipment in proper working condition and performing all preventative maintenance. Required maintenance includes compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition. Maintenance schedules shall be detailed in an air quality control plan prior to commencement of construction.

<u>Cumulative Impacts</u>

Cumulative impacts with regards to climate change are associated with past, ongoing, planned, and proposed activities which emit GHGs and sequester carbon.

The most substantial past and ongoing carbon impact in the Project Area are the 2021 Dixie and 2019 Walker fires, both of which burned large, broad swaths of land with high intensity resulting in high severity burn impacts (measured in both vegetation basal area loss and soil burn severity) and carbon losses (37.4 MMT CO_2e, CARB 2022; and an estimated 2.2 MMT CO_2e, respectively). Beyond the Project Area boundary, the 2021 Sugar and 2020 North Complex fires additionally burned large patches at high severity with high carbon losses (3.6 MMT CO_2e, CARB 2022; and 10.9 MMT CO_2e, CARB 2021, respectively). Direct carbon emissions from combustion from these four recent megafires combined total 54.1 MMT CO_2e. Post-fire, carbon emissions continue to be released from burned areas. Slower, indirect carbon emissions from decomposition of the vegetation killed in these and other recent fires can be up to three times as much as the direct combustion emissions (AuClair and Carter, 1993).

Other ongoing and planned projects (see Appendix I) that include thinning and reforestation efforts are assumed to have similar emissions per acre as the Tributaries Forest Recovery Project due to similar implementation activities. The carbon emissions from the forest recovery and resiliency projects add to existing emissions from local residential and commercial/industrial activities. Plumas County's combined emissions in 2005 from residential, commercial/industrial, transportation, solid waste and wastewater, and agriculture were 403,280 $mtCO_2e$ (0.41MMT) (County of Plumas 2012).

While the Proposed Action will have associated release of carbon emissions due to project activities, forest health and long-term stability are enhanced by the thinning and removal of fuels, including standing dead trees from burned areas, as well as by reforestation efforts, especially within large patches that experienced high severity fire where natural regeneration likelihood is low. Integrating the meadow restoration into forest management is additionally important for carbon management. Restoration of degraded meadows represents great potential for carbon sequestration with long-term carbon storage in functioning meadow soils (Reed et al., 2022).

The hydrologic and vegetation treatments for the Project Area as well as for ongoing and reasonably foreseeable future projects both have carbon emitting and carbon sequestering components and processes making a cumulative CO2e quantification excessively complicated. However, review of the literature and of the Project as a whole, it is reasonable to conclude that the project will ultimately reduce the risk and amount of further below- and above-ground carbon loss while simultaneously facilitating more carbon sequestration benefit.

No Action

Under the No Action Alternative, there would not be an increase in GHG emissions associated with burning, equipment usage, or worker commutes. However, under the No Action Alternative, the Project Area would continue to be threatened and degraded by the impacts of a warming climate. Rising temperatures and reduced snowpack will increase water stress and vegetation dryness, resulting in additional potential carbon losses to fire, drought, disease, insects, and meadow degradation. Natural forest regeneration will be scarce within the large patches (>250 acres) of severe loss of forest (including multiple patches over 10,000 acres large) from the Dixie and Walker fires as lack of seed sources, competition, drought, heat, fire, and other climatic stressors will prevent the re-establishment of healthy forests. Large-scale conversion of forest to shrubland will result in a reduction of the potential to recapture the carbon lost in the fires and a reduction of forest carbon stability. The Project Area as a whole may convert from a carbon sink to a long-term carbon source (Liang et al. 2017, Liang et al. 2016) as dead, decomposing vegetation continues to emit carbon into the atmosphere and repeat high severity fire becomes more likely.

4.2.8 Hazards and Hazardous Materials

Affected Environment

Hazardous materials, including hazardous substances and wastes, are regulated by many state and federal laws. Statutes govern the generation, treatment, storage and disposal of hazardous materials, substances, and waste, and also the investigation and mitigation of waste releases, air and water quality, human health and land use.

The primary federal laws regulating hazardous wastes/materials are the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Resource Conservation and Recovery Act of 1976 (RCRA). The purpose of CERCLA, often referred to as “Superfund,” is to identify and clean up abandoned contaminated sites so that public health and welfare are not compromised. The RCRA provides for “cradle to grave” regulation of hazardous waste generated by operating entities. Other federal laws include:

- Community Environmental Response Facilitation Act (CERFA) of 1992
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act
- Occupational Safety and Health Act (OSHA)
- Atomic Energy Act
- Toxic Substances Control Act (TSCA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

In addition to the acts listed above, Executive Order (EO) 12088, *Federal Compliance with Pollution Control Standards*, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved.

California regulates hazardous materials, waste, and substances under the authority of the CA Health and Safety Code and is also authorized by the federal government to implement RCRA in the state. California law also addresses specific handling, storage, transportation, disposal, treatment, reduction, cleanup and emergency planning of hazardous waste. The Porter-Cologne Water Quality Control Act also restricts disposal of wastes and requires cleanup of wastes that are below hazardous waste concentrations but could impact ground and surface water quality. California regulations that address waste management and prevention and clean up contamination include Title 22 Division 4.5 Environmental Health Standards for the Management of Hazardous Waste, Title 23 Waters, and Title 27 Environmental Protection. Worker and public health and safety are key issues when addressing hazardous materials that may affect human health and the environment. Proper management and disposal of hazardous material is vital if it is found, disturbed, or generated during project construction.

Direct, Indirect, and Cumulative Effects

Heavy equipment use will occur throughout the Project Area. Locations for equipment refueling and serving will develop a Spill Prevention and Response Plan to minimize pollution. Fueling in RCAs and CARs will be limited to sites covered by Special Use Authorization (Sierra Nevada Forest Plan Amendment S&G 99). Sites designated for water drafting will be constructed so that oil, diesel, fuel or other spilled pollutants do not enter the stream channel.

Herbicide treatment areas will have an on-site spill kit, a safety plan and will follow California's labeling requirements. Herbicide transport into the project will not exceed daily-use quantities or more than what is needed for the planned duration of fieldwork. All herbicides will be stored a minimum of 100 feet away from any body of water or stream channel.

Compliance with the Forest Plan and Other Direction All potentially occurring hazardous materials encountered as a result of the proposed would be handled and disposed of according to PNF, state and federal laws and guidelines.

<u>Contaminated Sites</u>

There are two related, but distinct, contaminated sites within the Tributaries Project. Walker Mine, on private lands, and Walker Mine Tailings on USFS lands. Both sites have ongoing remediation efforts to address contaminants. There are no Proposed Actions in the Project related to these remediation efforts. It is possible that some wood residues might be of value to those efforts. Outreach would be conducted at the appropriate times.

CEQA Considerations

The Proposed Project does not involve the routine transport, use, or disposal of hazardous materials, and is not located on a known hazardous materials site per Government Code Section 65962.5 (Caltrans, 2016c). The Project is not in the vicinity of an existing or proposed school, public or private airport, and/or airstrip. The Project would not interfere with an emergency response plan and/or emergency evacuation plan, or expose people or structures to wildland fire-related hazards. The Project would result in less than significant impacts related to the above hazards and hazardous materials items.

No Action

Under the no action alternative there will be no change in risks associated with hazardous materials.

4.2.9 Hydrology and Soils

This section discloses environmental impacts of the Proposed Action and No Action alternatives on hydrology and soils, including direct, indirect, and cumulative effects on special-status species and non-native and invasive species. The complete Hydrology and Soils Report can be found in Attachment 5.

Affected Environment

The eastern two-thirds of the Feather River watershed, including the entire Tributaries Forest Recovery Project, occupies a geologic feature called the Diamond Mountains. While abutting the Sierra batholith, the Diamond Mountains are a separate amalgam of meta-volcanic, volcanic and meta-sedimentary formations with granitic intrusions intermixed by tectonic faulting (Durrell, 1994). The Diamond Mountains are much older than the Sierra Nevada. As a consequence, erosional processes coupled with faulting have resulted in long, extensive alluvial meadow features. Many of these meadows were once lakes as recently as the Pleistocene era. Given this significantly older age, weathering processes have created a relatively stable geologic landscape, with an absence of landslide and liquefaction issues.

The Diamond Mountains are also the transition between the moist, temperate west slopes of the Sierra and the arid Great Basin. The orographic crest of the Sierra Nevada range is approximately 35 air miles west of Red Clover Creek, resulting in a rain-shadow effect, which contributes to an average annual precipitation of 25”-30”. The bulk of annual precipitation falls as snow from Pacific frontal systems during the winter (October- May) with a dry summer. Intense thunderstorms occur somewhere in the watershed during the summer every year, which can generate significant local erosional events. These thunderstorms also serve as a major source of potential wildfire ignitions sources. Major watershed scale floods are the result of long duration, intense, rain-on-snow, storm events (1955, 1986, 1997 and 2017).

As noted above, the Tributaries project area is geologically stable outside of occasional small earthquakes, generally in the Grizzly Ridge area. The high percentage of severely burned landscape resulted in slopes and drainages denuded of organic cover. Debris torrents derived from surficial erosion have become much more common post-fire, during high intensity rainfall events. Given the significant variety in parent geologic material, soils are equally diverse in texture and hydraulic properties. This translates into significant variability in stream sediment volumes and sizes.

Pre-Walker/Dixie Fire conditions in the analyzed watersheds had been impacted by many actions over the last century - specifically timber harvest, fuels treatments, wildfire, livestock grazing, mining, recreation, and the transportation system. Watersheds were analyzed by HUC12 watershed boundaries. All, or a portion of, 14 HUC12 watersheds lie within the Tributaries project area within the larger Walker/Dixie Fire footprints. The table below details the percentage of each watershed within the project area, as well as slopes in each watershed. Slopes provide general information on the types of treatments that would be feasible, and the potential for erosion. All HUC12 watersheds in the project area are tributary to either the Indian Creek/North Fork Feather River, or the Middle Fork Feather River (18020123) watershed. More information about project impacts can be found in the Hydrology and Soils Report (Attachment 5).

Table 16. *Acres of HUC12 watersheds in project area and percent slopes in each watershed.*

Watershed Name & HUC#	Entire HUC12 watershed area	Watershed area within project area	Percent of Project Watershed in each slope class		
	acres	acres	<35%	35-50%	>50%
Antelope Creek 180201220302	12,994	3,425	74	19	7
Big Grizzly Creek 180201230401	33,438	9,811	90	9	1
Cold Stream-Indian Creek	14,345	13,025	45	32	23

Watershed Name & HUC#	Entire HUC12 watershed area	Watershed area within project area	Percent of Project Watershed in each slope class		
	acres	acres	<35%	35-50%	>50%
180201220305					
Dixie Creek 180201220101	19,817	1,726	95	4	1
Hungry Creek 180201220304	12,097	12,099	69	22	9
Little Grizzly Creek 180201220602	22,451	22,242	55	22	23
Lone Rock Creek-Indian Creek 1802012203030	21,804	4,626	67	22	11
Lower Red Clover Creek 180201220103	37,406	34,818	38	31	30
Middle Lights Creek 180201220402	14,012	1,426	93	5	1
Mo Bisipi Creek 180201220205	26,850	19,300	74	15	11
Poison Creek-Last Chance Creek 18020120206	23,802	21,196	76	15	9
Upper Lights Creek 18020120401	22,571	7,376	70	19	11
Ward Creek-Indian Creek 180201220603	19,330	4,068	86	11	3
Willow Creek-Last Chance Creek 108201220204	34,361	6,591	95	4	1

Tributaries to Indian Creek that comprise the project area flow through substantial reaches of low-gradient, broad alluvial meadows as well as steeper-gradient, canyon dominated channels. Prior to the Walker and Dixie Fires, most of the meadow reaches were incised from legacy land uses, such as roads and ditching. Generally, the meadow reaches that were not incised (due to previous restoration or natural conditions) experienced a cooler burn with, channel-floodplain functionality remaining intact post-fire. In steeper first and second order channels, wood is a significant element of structural stability. Much woody debris structure was lost to the fire. In such channels, the lack of large woody debris increased downstream sediment transport that impacted roads as well as stream channels. Post-fire road and fire suppression line surveys identified fire-related damage and need for repair.

Stream channels and special aquatic features were assessed within the Tributaries project. Springs utilized by livestock were also surveyed and assessed for repair needs. Prior to project implementation, detailed surveys will be conducted to ensure that Forest Standards and Guidelines and Best Management Practices would be properly located and incorporated into project activities for the protection of aquatic resources.

In the watershed and soils analysis for the Tributaries Project, the potential for soil erosion from proposed activities was considered to be due to three primary factors: the identified Erosion Hazard Rating (EHR) (from the Plumas National Forest Soil Resource Inventory (USDA 1989) geodatabase); the slope; and the percentage loss of basal area from the Walker and Dixie Fires. Most (74%) soils in the project are rated as High EHR or Very High EHR, and over half of the project experienced a basal area loss >75% (Figures 4 and 5). While the majority of the project is gently sloped (73% of project area is less than 35% slope), even low slope channels have fairly high erosion rates due a number of factors including the lack of woody debris, roads, legacy land uses, and fire-related decreased soil stability.

Table 17. *Erosion Hazard Rating for HUC-12 watershed boundaries.*

Erosion Hazard Rating for HUC-12 watershed boundaries within the Tributaries Project Area								
HUC-12 Watershed	**Very High Acres**	**% Very High**	**High Acres**	**% High**	**Moderate Acres**	**% Mod**	**Low Acres**	**% Low**
Antelope Creek	0	0%	2,954	86%	471	14%	0	0%
Big Grizzly Creek	0	0%	2,953	30%	3,260	33%	0	0%
Cold Stream-Indian Creek	757	6%	11,767	90%	500	4%	0	0%
Dixie Creek	29	2%	139	8%	157	9%	0	0%
Hungry Creek	254	2%	8,669	72%	3,175	26%	0	0%
Little Grizzly Creek	4,673	21%	13,494	61%	3,881	17%	92	<1%
Lone Rock Creek-Indian Creek	0	0%	4,367	94%	257	6%	0	0%
Lower Red Clover Creek	679	2%	20,505	59%	9,927	29%	0	0%
Middle Lights Creek	761	53%	663	46%	0	0%	0	0%
Mo Bisipi Creek	719	4%	7,707	40%	7,321	38%	0	0%
Poison Creek-Last Chance Creek	1,351	6%	17,859	84%	1,985	9%	0	0%
Upper Lights Creek	151	2%	6,964	94%	259	4%	0	0%
Ward Creek-Indian Creek	72	2%	3,872	95%	122	3%	0	0%
Willow Creek-Last Chance Creek	79	1%	3,378	51%	3,132	48%	0	0%

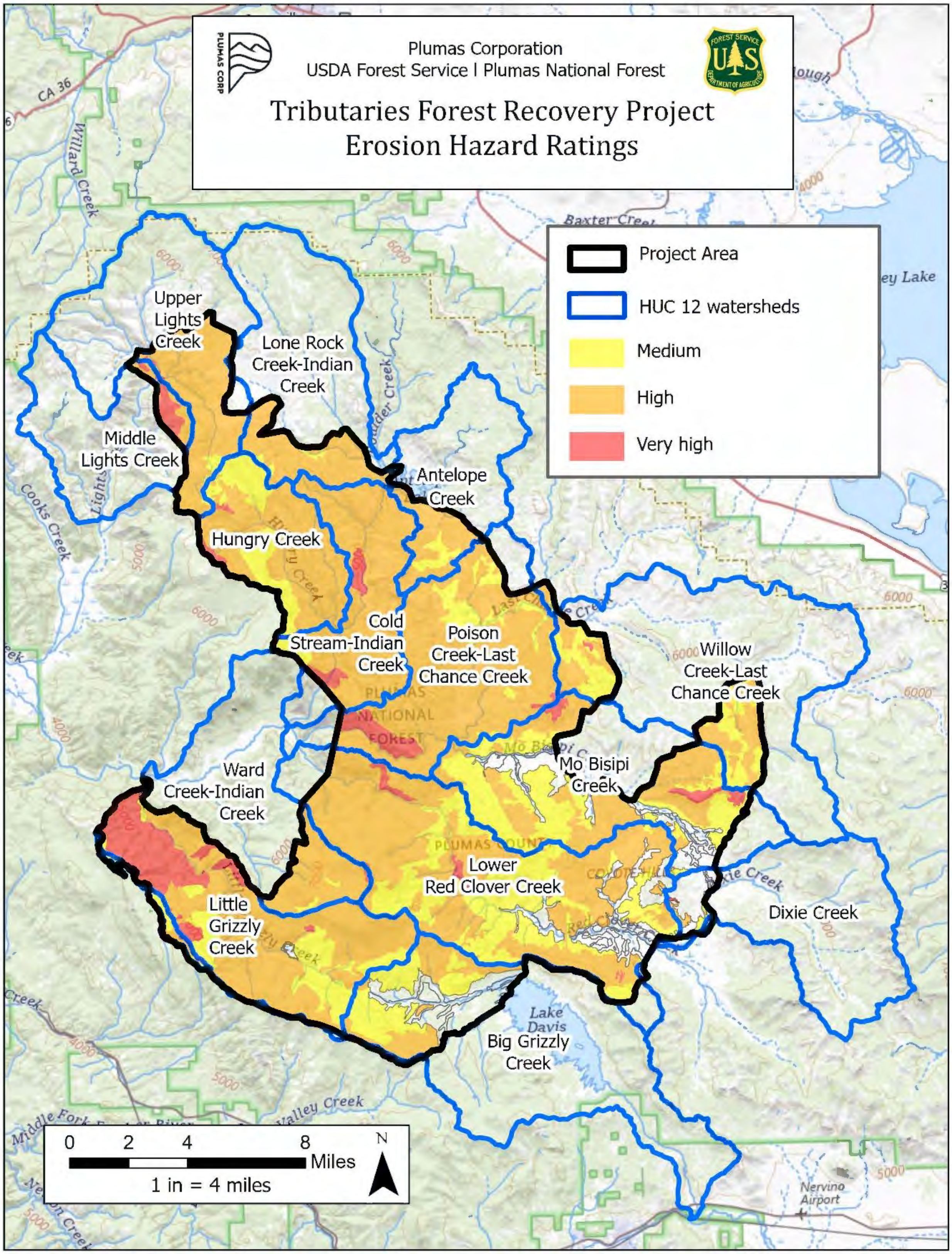

Figure 4. Erosion Hazard Ratings in the Tributaries Project Area.

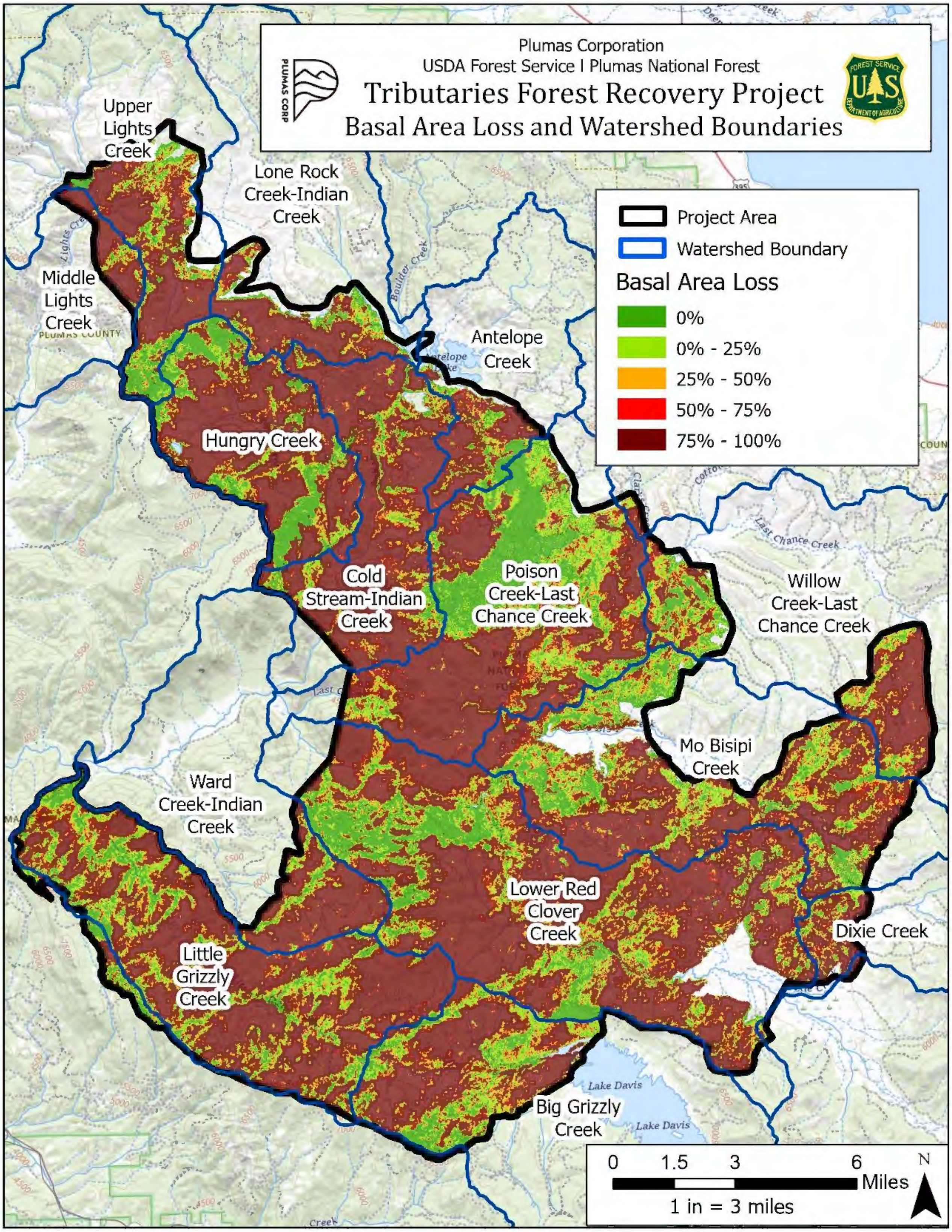

__Figure 5.__ Basal Area Loss in the Tributaries Project Area.

Proposed Action

Direct and Indirect Effects of Mechanical Treatments on Steep Slopes

Silvicultural treatments are proposed on 39,843 acres, 62% of which would occur on highly erosive soils or slopes greater than 35%. This acreage comprises 15% of the total project area. Table 18 outlines the acreages of mechanical treatments by Erosion Hazard Ratings and slope within each HUC-12 watershed. During harvest activities, harvesting equipment has potential to displace soil even on relatively flat ground, but chances of disturbance increases on higher slopes. Slope with moderate EHR have a soil cover standard of 50%, and high EHR has a standard of 60%. Monitoring will occur during operations to ensure soil cover standards are achieved. Higher slopes limit equipment maneuverability and result in more concentrated skid trails, higher soil compaction and reduced infiltration, leading to increased erosion potential. Waterbars on skid trails and subsoiling on landings and temporary roads will help alleviate soil compaction and erosion concerns. Full bench skid trails are one way to facilitate skidding material on the contour of a steep slope. Recontouring these benches and adding fine organic matter may be necessary once harvest activities are complete. Indirect impacts, in the long term would be beneficial with the development of healthier fire-resilient forest stands on steep slopes that would protect soils from erosion, promote infiltration of precipitation, and provide biomass for soil development.

Table 18. *Proposed silvicultural treatments in areas with erosive soils or greater than 35% slope*.

Watershed *(note: there are no silvicultural treatments in the Dixie Creek watershed)*	**Area Within Tributaries Project**	**Total Proposed Mechanical Silvicultural Treatments**	**Total of Treatments on High & Very High erosive soils**	**Total of Treatments in Moderately erosive soils AND slopes >35%**	**Total treatment areas w/potential issues (i.e., sum of previous 2 columns)**	**Percent of watershed (Treatments with potential issues)**
	Acres	**Acres**	**Acres**	**Acres**	**Acres**	**Percent**
Antelope Creek	3,424	999	801	17	818	24
Big Grizzly Creek	9,808	4,159	1,056	75	1,131	12
Cold Stream-Indian Creek	13,023	7,31	440	39	478	4
Hungry Creek	12,097	4,144	1,691	44	1,735	14
Little Grizzly Creek	22,238	4,193	2,857	113	2,970	13
Lone Rock Creek-Indian Creek	4,625	512	441	1	442	10
Lower Red Clover Creek	34,808	7,286	3,892	120	4,013	12
Middle Lights Creek	1,426	15	15	0	15	1
Mo Bisipi Creek	19,293	3,803	2,257	53	2,309	12
Poison Creek-Last Chance Creek	21,190	8,447	6,549	34	6,583	31
Upper Lights Creek	7,375	1,395	1,188	36	1,224	17
Ward Creek-Indian Creek	4,067	2,154	2,061	6	2,067	51
Willow Creek-Last Chance Creek	6,588	2,004	1,028	35	1,063	16
Total*	**159,962**	**39,843**	**24,274**	**573**	**24,847**	**Average 15%**

Direct and Indirect Effects of Herbicide Use for Reforestation

Herbicide use BMPs are designed to avoid conditions that may trigger high runoff events by requiring implementation during the dry season. National Weather Service forecasts with a >50% chance of precipitation within 24 hours will halt herbicide application. Strips of untreated vegetation near water sources will act as filters or sinks if herbicides accidentally get carried via runoff.

Potential for offsite transport of herbicides is variable as reflected by characteristics summarized in Table 19. Additional best management practices and project design features would effectively diminish the possibility of off-site transport via runoff and limit herbicides from entering surface waters through overland flow. Proposed herbicide treatments are not expected to accumulate or negatively affect water quality in the project area or downstream. In the long term, herbicide-treatment leads to forest development rather than brush fields. Forest cover promotes greater biomass and cooler soil temperatures, thus improving watershed conditions that retain moisture on the landscape.

Table 19. *Characteristics and leaching potential for herbicides proposed in the Tributaries Forest Recovery Project.*

Herbicide (Active Ingredient)	**Soil Persistence** (Half-life in days)	**Water Persistence** (Half-life in days)	**Potential for leaching**
Aminopyralid	35	127 – 447	Limited, but may leach into groundwater if there are permeable soils and shallow water table.
Chlorosulfuron	40	60	Weakly adsorbs to soils, considered to have high leaching potential.
Clopyralid	40	8-40	High leaching potential, especially in sandy soils and areas with high water tables
Flauzifop-P- Butyl	15	60	Very low
Glyphosate	47 (no soil activity)	4 – 11	Very low as herbicide has high adsorptive capacity
Imazapyr	25 – 142 (soil type)	2 – 730 (avg 40)	Low potential for leaching, but is susceptible to surface runoff, and leaching from dead roots
Triclopyr	10 – 46 (avg 30)	0.5 – 426 (conditions)	Not considered to have high potential for surface or groundwater contamination
Indaziflam	36-178 (laboratory conditions)	5-200 (Dependent on sunlight exposure)	Parent compounds and degradants have moderate to high potential to leach through the soil column.

Direct/Indirect Effects of Treatments Near Riparian Areas

Of the proposed treatment acres, 11,324 are within Riparian Conservation Areas (RCAs) (Table 20). RCAs are buffers around water flow paths or other aquatic features. In RCAs, timber operations are modified to protect soil and water (described in Appendix A of the Hydrology and Soils Report). Objectives within the RCAs, and how the project would meet the objectives are described in Appendix B of the Hydrology and Soils Report. The implementation of design features and BMPs would reduce the impact of the project to less than significant.

Table 20. *Proposed silvicultural treatments in Riparian Conservation Areas.*

Name	Commercial Thin	Fuelbreak	Fuels Reduction - Mechanical	Reforestation - High Intensity Site Prep	Reforestation - Low Intensity Site Prep	Total
Antelope Creek	116				384	501
Big Grizzly Creek	413	4	71	823		1,311
Cold Stream-Indian Creek	118		47	3	52	220
Hungry Creek	173		44	431	343	991
Little Grizzly Creek	101	50	20	371	6	549
Lone Rock Creek-Indian Creek	53		40	61	64	218
Lower Red Clover Creek	535		7	1,610		2,154
Middle Lights Creek				4		4
Mo Bisipi Creek	840			478		1,318
Poison Creek-Last Chance Creek	1,897		180	327	287	2,692
Upper Lights Creek	177		128	80	184	569
Ward Creek-Indian Creek	14			103		117
Willow Creek-Last Chance Creek	431			252		682
Total	**4,868**	**54**	**537**	**4,545**	**1320**	**11,324**

Direct and Indirect Effects of Watershed Treatments

Watershed treatments include both road-related treatments and meadow treatments. There are 934 acres of meadow treatments in three watersheds and 187 road treatments are proposed throughout the project (Figure 6). Meadow and aspen stand restoration may include conifer thinning and will use heavy equipment where appropriate. Watershed treatments would utilize both hand crews and heavy equipment. The primary negative impact of watershed treatment near stream channels is the potential introduction of sediment; a secondary potential impact would be the accidental introduction of oil-based pollutants from power equipment. Watershed treatments within Waters of the State or Waters of the US will require permits from the State Water Resources Control Board and the Army Corps of Engineers, with requirements designed to protect water resources. These requirements would be adhered to, in addition to Forest Service BMPs which are also designed to protect water resources. Preservation of existing vegetation is a primary BMP, and no temporary roads will be allowed in meadows; skid trails will be assessed by a qualified specialist prior to use. After restoration, subsoiling (where appropriate), seeding, and mulching will be used to remediate affected areas, with special care taken in meadows, where intact sod is to be protected.

Fire suppression line repair treatments and obliteration of temporary roads are designed to restore drainage patterns to as close to natural condition as possible. Recontouring the roads will likely not include excavating the existing road fill, in order to maintain the soil-stabilizing effect of existing vegetation. Instead, portions of road fill would be sloped to restore drainage patterns to the natural hillslope direction. Disturbed surfaces will be subsoiled, where appropriate, to improve infiltration, and channel banks will be mulched to prevent erosion. Road, trail and fire line suppression repairs will utilize design features and BMPs to protect water quality during and after treatments.

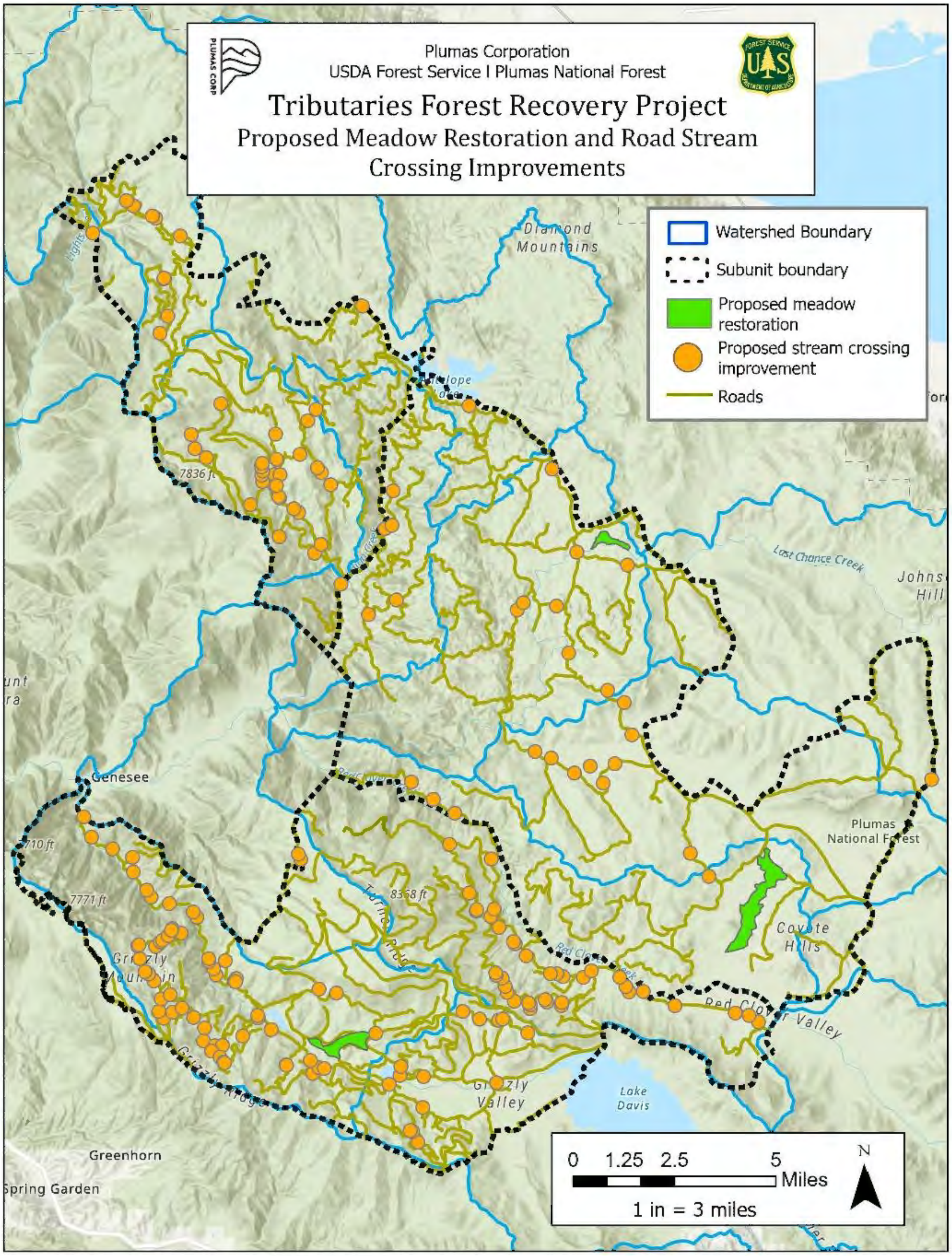

Figure 6. Proposed Meadow Restoration and Road Stream Crossing Improvements.

Cumulative Impacts

A cumulative watershed effects analysis would determine which HUC12 watersheds are at elevated risk of damage to soil and water resources due to proposed actions, overlaid on top of existing conditions, and foreseeable future actions (there are none in the project area). Implementation would occur over a ten-year period that will spread out possible negative effects on soils. The Proposed Action seeks to ameliorate and improve recovery of the landscape from the Walker and Dixie Fires, and improve landscape resiliency to future fires. Cumulatively, and in the long term, effects of the Proposed Action are expected to be beneficial to soil and water resources by creating fire-resilient ground cover. Without action, it is likely that much of the pre-Walker/Dixie Fires forested landscape would be converted to brush fields. Additional mitigations utilized on high slopes and in riparian areas will help avoid creating off-site negative effects of implementation. Legacy soil impacts from past land management activities (e.g., displacement, erosion, and compaction) are minimal, and potential negative impacts of the Proposed Action are expected to be less than significant due to the design features that are part of the Proposed Action.

No Action Alternative

Soil cover in the form of organic matter and large woody debris would increase in the coming years, but this will only be beneficial in the absence of another high severity fire. Untreated portions of the 2000 Storrie Fire burned again during the 2012 Chips Fire, thus losing the beneficial effects of what little vegetative recovery had occurred. Erosion hazard ratings would decrease over time as more vegetation becomes established. Without fuel treatments or strategic replanting, the forest will remain prone to fire which may recreate the current conditions. Deferred maintenance issues of the road system, and the absence of treatment for SEPES road sites would continue to pose risks to water quality. Non-system roads and trails, as well as unneeded NFS roads, would not be obliterated or treated, likely leaving untreated erosion sites that impact water quality in nearby streams.

4.2.10 Noise

Affected Environment

Noise is defined as unwanted sound. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. An individual’s noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. The time-varying characteristic of environmental noise is described using statistical noise descriptors.

Some land uses are considered more sensitive to ambient noise levels than others, due to the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. Residences, motels and hotels, schools, libraries, churches, hospitals, nursing homes, auditoriums, and parks and other outdoor recreation areas generally are more sensitive to noise than are commercial (other than lodging facilities) and industrial land uses. There are no Federal or State noise regulations that are applicable to the Proposed Action. The Project Area is not located within two miles of a public airport, public use airport, or private airstrip facilities, where additional noise may be a consideration. At the local level, the Plumas County General Plan (Plumas County 2013) includes a noise element with a goal to establish and maintain a quiet and healthy environment, with land uses arranged and managed to reduce annoyance and complaints and minimize the exposure of community residents to excessive noise.

Proposed Action

Direct, Indirect, and Cumulative Effects

The Proposed Action would require mechanized forest management activities (operations) within PNF on the Beckwourth and Mt. Hough Ranger Districts. There are a handful of private inholdings with cabins or other infrastructure within the Project Area, and the area supports recreational and agricultural activities, such as hunting, mountain biking, off-highway vehicles, and livestock grazing. The nearest sensitive receptors are communities approximately 12-13 air miles south and southeast of the proposed McReynolds and Mt. Ingalls Focus Areas, and approximately 10 and 15 air miles south and southwest of the Taylor Lake and Babcock Focus Areas respectively.

Operations would be expected to occur during daylight hours, typically between 6:00 a.m. and 6:00 p.m., five days a week. During operations, noise would occasionally dominate the environment in the immediate area of operations. Noise generated by operations would be a function of the noise levels generated by individual pieces of equipment, the type and amount of equipment operating at any given time, the timing and duration of construction activities, and the proximity of nearby sensitive receptors.

For planning purposes, the Plumas County General Plan (Plumas County 2013) includes the Governor's Office of Planning and Research noise compatibility guidelines by land use category. For existing residential uses, noise exposure of up to 60 dB is considered normally acceptable and noise exposure from 60 to 70 dB is considered conditionally acceptable. For agricultural uses, noise exposure of as much as 75 dB is considered normally acceptable, and 75 to 80 dB is considered conditionally acceptable.

The Proposed Action would include earthwork, tree work, excavation, filling, and grading. Mechanized equipment is expected to generate noise levels ranging from 70 to 90 dB at a distance of 50 ft., and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance (CalTrans 2013) and attenuated further by surrounding vegetation. Construction impacts would be temporary in nature and sensitive receptors would not be exposed to construction noise, as there are no sensitive receptors near the Project Area. The Proposed Action complies with the Forest Plan and adheres to Plumas County's General Plan noise element goal for construction noise within public facilities (used as a proxy for public lands). Therefore, implementation of the Proposed Action would not have an adverse impact with regard to noise, and noise related impacts would be less than significant.

No Action Alternative

Under the No Action Alternative, project activities would not commence, resulting in no increase in ambient noise levels associated with construction activities. There would be no noise-related impacts or adverse effects under the No Action Alternative.

4.2.11 Recreation

Affected Environment

The Project Area is located on public National Forest system lands and is used for dispersed recreation such as camping, hiking, backpacking, fishing, hunting, snowmobiling, and off-highway vehicle (OHV) touring. The Project Area has an estimated 516 miles of roads and trails for OHV use. There are over an estimated 5,400 miles of OHV roads and trails in the PNF, with approximately 9.6% occurring in the Tributaries Project. The proposed Project Area includes one developed recreational facility at Antelope Lake, the Lost Cove Picnic Area near the Antelope Dam informational kiosk.

Approximately 55 miles of hiking trails occur across the Project Area. The Antelope / Taylor Lake trail system encompasses approximately 16.5 miles of non-motorized multi-use singletrack trail routes. Multi-use trail designation encompasses equestrian, hiking, and mountain biking use. Over snow vehicle (snowmobiling) use is enjoyed by visitors in the winter within the Project Area, particularly at Antelope Lake and Lake Davis.

The entire Project Area is within California Department of Fish and Wildlife designated X Zones for deer hunting (Zone X6-A and X6-B). Deer tags issued for these zones are classified as premium hunting tags, and are issued exclusively through a lottery system for a limited number per year. Due to the restricted number of tags and area accessibility, the Project Area is a desirable big game hunting range.

<u>Taylor Lake Focus Area</u>

The Taylor Lake Focus Area is occasionally used for dispersed recreation such as fishing, hunting, and OHV touring. Although outside the focus area, there are proposed actions to improve the Antelope-Taylor Lake trail system, directly south of the focus area boundary. (see Appendix B) The Antelope / Taylor Lake trail system encompasses approximately 16.5 miles of non-motorized multi-use singletrack trails. This trail system includes three different trails that all connect: Antelope / Taylor Lake Trail (9.7 miles), Cold Stream Trail (1.7 miles) and the Middle Creek Trail (5.0 miles). This focus area does not include any developed recreational facilities.

<u>Babcock Peak Focus Area</u>

The Babcock Peak Focus Area is particularly popular during the Fall season for hunting, dispersed camping, and OHV touring. This focus area includes the one developed recreational facility at Antelope Lake, the Lost Cove Picnic Area.

<u>Mt. Ingalls Focus Area</u>

The Mt. Ingalls Focus Area is occasionally used for dispersed recreation such as fishing, hunting, and OHV touring. Dispersed camping is common in this focus area along Beckwourth Genesee Road from Notson Bridge on Red Clover Creek upstream to Red Clover Valley. The Mt Ingalls Focus Area is also popular for snowmobiling near the southern end of the focus area by Lake Davis. This focus area does not include any developed recreational facilities.

McReynolds Focus Area

The McReynolds Focus Areas is occasionally used for dispersed recreation such as mountain biking, camping, fishing, hunting, and OHV touring. This focus area does not include any developed recreational facilities.

Proposed Action

The Proposed Action includes several treatments that may temporarily impact recreation resources, including commercial thinning, fuels reduction and prescribed fire, reforestation, road and road crossing improvements, trail improvements, and invasive species management. Direct, indirect, and cumulative effects of these treatments on recreation are discussed below.

Direct and Indirect Effects

Designated trails and roads open to the public may be closed for periods of time during implementation of the Proposed Action treatments for public safety purposes. Noise, dust, and smoke from vegetation management activities may disrupt Forest visitor's recreation experience, particularly for users participating in hiking, mountain biking, equestrian, or hunting activities. However, in contrast with long-term closures and smoke during wildfires, disruptions from Proposed Action treatments would be less. Treatments would be focused in identified units and undertaken incrementally over several years, leaving the majority of the Project Area available for recreational use at any given time.

The Antelope/Taylor Lake trail system is the only identified trail network in the Project Area that is proposed for treatment. A recent assessment of the trail network noted that many locations have been completely reclaimed by nature (see Attachment 6). Proposed trail improvements to reopen the trail system and bring it up to Forest Service specifications include removal of hazard trees and vegetation, root ball removal, sign replacement, reconstructing the trail with drain dips or break in grade every 200 feet, and re-benching the tread to a minimum of 24 inches. A 2.24-mile trail realignment on the Antelope/Taylor Lake Trail is proposed to reduce the grade on a section that is currently at 30% (1.8 mi), and to move another trail segment out of a meadow (.44 mi). On the Middle Creek Trail a 1.73-mile trail realignment is proposed to reroute two segments, one to reduce the trail grade (1.07 mi) and the second to move the trail away from a wetland area (0.66 mi). Activities would entail a combination of hand and mechanical work. Trail improvements would have beneficial direct and indirect effects on the Antelope/Taylor Lake trail system providing for a less strenuous and safer user experience, as well as protecting other resources (i.e. meadow/wetland habitat and water quality) from recreational use impacts. Short-term adverse direct and indirect effects would include trail closures, and noise and dust from tree/vegetation removal, trail benching, re-construction, and new trail (reroutes) construction.

Project design features (Appendix E) for recreation and public use would mitigate impacts or potential adverse effects to recreation facilities, areas, trails, and forest visitor experiences. Implementation near and/or along trails and OHV routes would be implemented during shoulder seasons to lessen disruption during high visitation times. Slash piles generated from proposed fuel reduction actions would be limited as to the proximity of their placement in relation to trails. Smoke from burning activities would be regulated by the air quality board, so as to not reach unhealthy levels. The project is not expected to increase recreational use of the area because the primary character of the area would not change.

There are no Proposed Action treatments to develop additional recreational facilities, nor would the Proposed Action result in a need for an expansion of recreational facilities.

Cumulative Effects

Other proposed forest recovery and community protect projects on the Plumas National Forest, in conjunction with treatments on local public and private lands, will increase the overall amount of forest health treatment (i.e. fuel reduction, prescribed fire, reforestation, etc.) activities in and surrounding the Tributaries Project Area. All of these projects are in various phases of planning or implementation, with sequencing treatments in spatially separate project specific units over multiple years. Planning and coordination with implementing partners, regulatory agencies, and other forest/fire practitioners will help mitigate cumulative effects of smoke, dust, noise and closures of recreation resources and potential herbicide exposure. Long-term, recreational resources valued by the public, would be restored, enhanced and maintained by the Proposed Action activities.

No Action

Under the No Action alternative, proposed actions would not be implemented. Trail and OHV route rehabilitation and maintenance would not take place.

Direct, Indirect, and Cumulative Effects

The objective of active forest health management, including reduction of hazardous fuel loads and revegetating burned areas that lack natural regeneration, is to reduce the frequency and severity of wildfires for the protection of all public and private land natural resources, including the communities that surround them. Without these activities, it is likely there would be an increase in subsequent large wildfires, resulting in greater effects to recreation than the Proposed Action, such as long-term closures of public land access, non-regulated amounts of smoke from wildfires, and noise and dust from fire suppression activities. These effects would likely be at a much larger scale, negatively impacting more recreational resources in a short timeframe than the Proposed Action would over a ten-year implementation period. Not addressing the existing post-fire conditions of fuel loading, the No Action alternative maintains post-Walker/Dixie Fire conditions of reduced safety and recreational opportunities for the public.

4.2.12 Roads/Transportation

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. The Project Area contains numerous Forest Service Roads ranging from smooth, gravel-surfaced roads to rough, primitive, and unsurfaced roads. Roads outside the Project boundary will provide access to treatment units and will require routine maintenance. Support for these nearby roads may be needed for implementation, but those activities are outside the scope of this analysis and fall within the purview of PNF program management including cooperator agreements, or state or county road programs.

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) Design new stream crossings and replacement stream crossings for locations with ineffective water conveyance or are sources of erosion
6) Design stream crossings to minimize the diversion of streamflow out of the channel and down the road in the event of a crossing failure.
7) Design stream crossings to minimize disruption of natural hydrologic flow paths, including minimizing diversion of streamflow and interception of surface and subsurface water.
8) Avoid wetlands or minimize effects to natural flow patterns in wetlands.
9) Avoid road construction in meadows.
10) Require vehicles and equipment used for project implementation to be weed free.
11) Apply limited operating periods with buffers for road maintenance and use for fisher and marten den sites.
12) Implement corrective actions to restore hydrologic connectivity on roads that intercept, divert, or disrupt natural surface and subsurface water flow paths.
13) 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 (USDA 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, and improvements. 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.

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. Approximately 536 miles of roads are within the Project boundary; of those 750 miles, approximately 504 miles are NFS roads. Details of road conditions within the Project boundary are included in Attachment 5. 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.

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.

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 objectives, 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. Four maintenance levels are represented within the Project boundaries (Table 21).

Table 21. *National Forest System Roads within Project Boundary.*

Road Classification	Description	Miles in Project Area
OpML - 1	Basic custodial care (closed)	26
OpML - 2	High clearance vehicles	404
OpML - 3	Suitable for passenger cars	41
OpML - 5	High degree of user comfort	31

Note: State, county, and private roads are not included as they are not subject to Forest Service Maintenance Level codes.

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, replacing under-functioning features, replacing 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 used 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-, or non-NFS, system 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 vehicles, 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 trucks or chip vans, 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 steep 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 lanes depending on average daily traffic.

Temporary Road Construction

New permanent road construction with addition to the NFTS is <u>not</u> 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 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. Temporary road construction is not permitted within meadows. Temporary roads will be closed at system road intersections and will have water bars to prevent erosion and structures like rock boulders, root wads and logs to prevent future access. Water bars will be spaced out depending on road slope as outlined in the project design features.

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 adding 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. Skid trails and temporary roads will be camouflaged, revegetated or barricaded with natural materials once no longer in use to prevent unauthorized OHV access.

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, road 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.

Action Alternative

Direct and Indirect Effects

Implementation of the Project and associated road improvement activities would increase traffic to implement treatments. Traffic would consist of 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.

Taylor Lake Focus Area

The Taylor Lake focus area is 5,922 acres and has 29 linear miles of roads. All except for two small sections of PC213 and 28N34 are Forest Service roads, accounting for 28.6 miles of the roads in the this focus area. Portions of these roads may be closed or have limited access during project implementation to ensure public safety. There are four stream crossings that need hydrological improvements, and adjacent sections of these roads may be closed while repairing crossing infrastructure. Stream Crossing problems in this area pertain to mass wasting and surface flow associated with roads on steeper slopes. Treatments here may include falling woody debris into the channel to improve in-stream sediment retention and redefining ditches to keep flow off the road surface.

Mt. Ingalls Focus Area

There are 51 miles of roads in the 10,517-acre Mt. Ingalls focus area. 38 miles of these were surveyed to assess stream crossing infrastructure, and 17 locations were identified as needing improvement. County Roads 111 and 113 (Beckwourth Genesee Road and Beckwourth Taylorsville Road, respectively) run 7 miles through this section of the project and both are well traveled. CR111 had substantial repairs needed in its crossing infrastructure, and there are multiple places where erosion from the road surface has entered Red Clover Creek in high volumes. The Plumas County Department of Public Works has expressed support for improving these crossings to reduce maintenance and improve aquatic organism passage. Given CR111's relatively high use compared to other roads in the Project Area, efforts will be made to notify the public of any planned road closures. Forest Service Road 25N93 has 9 crossings that need culvert repairs and in-channel sediment capture structures. This road does not transect any silvicultural treatment areas or meadows with proposed improvements, and 25N93 is not a heavily traveled road. There will be few changes to this road's usage during silvicultural implementation.

McReynolds Focus Area

The McReynolds focus area has 27 miles of roads with 10 miles surveyed. No crossing repairs are proposed. Usage of Forest Service Roads 25N06, 25N40, and 25N78 will increase when the McReynold's Meadow restoration project is implemented. Silvicultural treatments in this subunit mostly consist of east side pine (ESP) commercial thin and High Intensity Site Prep Reforestation. Forest Roads 25N05 and 28N01 will have more use when silviculture treatments are implemented. Both of these roads were surveyed in 2023, and neither were found to have hydrological issues.

Babcock Peak Focus Area

The Babcock focus area has 12 miles of roads, of which 5 miles were surveyed. There is a variety of proposed work in this unit including commercial thinning, fuels reduction and reforestation. Forest Service roads 28N01, 26N15X, 26N06, and 28N03 transect large portions of the subunit and will likely have increased use during implementation. 5 stream crossings were determined to need improvements to reduce surface erosion and maintain road integrity during implementation. These repairs include replacing or clearing existing culverts or establishing a sediment reduction system to prevent road erosion from entering the waterways.

No Action Alternative

Under this alternative, no treatments would be performed and the existing road system within the Project Area would remain in its current state. There would be no incentive for road maintenance or improvements to support project 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. The use of unauthorized routes within the Project Area could continue to impact forest resources. Impacts on 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.

4.2.13 Silvicultural Resources/Fuels

This section summarizes the effects of the Proposed Action and No Action alternatives on silvicultural resources. The Vegetation Management Report (Attachment 7) and Fire & Fuels Report (Attachment 8) provide more detail on analysis methodology and results.

Affected Environment

Fire suppression since the early 1900s has altered the historic fire regime and allowed for the accumulation of trees, brush and surface fuel with densities far above the pre-fire suppression era (Peterson et al., 2005). Historic fires would control stocking in the smaller diameter classes by killing a proportion of smaller trees during each burn. Fire suppression has also altered the species composition in Sierra forests to favor shade-tolerant species. Excessive duff accumulation and a reduction in frequency of canopy gaps have prevented germination and growth of shade-intolerant species (Parsons and DeBenedetti 1979).

Four major fires have occurred in the project area in the past two decades: the Wheeler Fire in 2007, the Moonlight Fire in 2007, the Walker Fire in 2019, and the Dixie Fire in 2021. Of the 163,248 acres under analysis, approximately 155,000 acres have burned in a major fire in the past two decades. Of the total analysis area, just 30,000 acres remain forested. Since the Wheeler and Moonlight fires, approximately 18,000 acres of reforestation have occurred on the project area. However, much of this replanted area burned again in the Walker and Dixie fires and levels of seedling survival are unclear.

Historic harvest activities resulted in present-day stands having a scattered overstory of trees over 40" inches in diameter and a second cohort of smaller trees which make up the bulk of the stand. Historic clearcuts were replanted with shade intolerant species following harvest. Of the over 50,000 acres of historic harvest in the Project area, approximately 70% burned at high or moderate intensity during the Dixie or Walker fires. Thus, the legacy of these harvest activities is no longer detectable across much of the landscape.

Fire-killed, "black", forest stands in the Project can generally be divided into open ground areas and areas with a high snag density. The open ground areas are 19% of the black stands on the Project. These are mostly areas which burned at high intensity in the Wheeler Fire or Moonlight Fire, were salvage logged, then reburned in the Dixie Fire or Walker Fire. Many of these areas were reforested between fires, but rates of seedling survival from the later round of fires are unknown. During field surveys, seedling survival has been anecdotally observed to be low. These units have a large brush component but lack large dead trees.

These stands with high snag density comprise approximately 81% of the black stands. These areas were completely forested prior to the Dixie and Walker fire, and experienced mortality of over 75% of their live basal area according to RAVG data. They have not been salvage logged. Miller et al. (2016) sampled postfire landscapes across California between 1 - 7 years after burning and found that forest areas designated as high severity burn had an average post-fire conifer canopy cover of 10%, which is substantially below the SNFPA ROD canopy cover targets to support wildlife habitats. Standing live basal area averaged less than 20 ft2/acre. Shrub cover averaged 30% and shrub height averaged above 2 feet. Standing dead basal area averaged over 100 ft2/acre.

Three types of coniferous forest predominantly make up the surviving "green" stands in the Project: 15% are Sierran mixed conifer (SMC), 75% are eastside pine (EPN), and 10% are true fir.

The Sierran mixed conifer forest type generally occurs on North-facing slopes below 6000 ft elevation in the western portions of the Project area. This forest type contains a mixture of ponderosa pine, Jeffrey pine, Douglas-fir, white fir, incense-cedar and sugar pine. A minor component of lodgepole pine is also present. Relative densities of each of these species vary, but fire suppression in the past century has led to increased white fir and incense-cedar dominance in these forests (Dolanc et al., 2014). These forests are highly heterogeneous in spatial structure, consisting of mixed aged trees arranged as individuals, clumps of trees, and openings (North et al., 2009). Current forest composition includes vastly disproportionate amounts of small diameter trees compared with historical conditions (North et al., 2007). At the time of field sampling, the average relative Stand Density Index—a measure of relative inter-tree competition, or how crowded a stand is, tree growth, and vigor—of Sierran mixed conifer stands was 37%, which is in the range of full competition. An overabundance of 10-20 inch diameter class trees and a dominance of shade-tolerant over shade-intolerant trees were observed. According to project orthophotography, average canopy cover SMC stands was 60%. Fire return intervals in this forest type are highly variable and with low severity surface fires occurring as frequently as every 10-20 years and periodic mixed severity fire common on longer timescales (NatureServe 2018).

The eastside pine forest type occurs between 4000-6500 ft elevation and makes up much of the eastern portions of the Project area. The primary components of this stand type are ponderosa pine and Jeffrey pine, with smaller components of white fir, incense-cedar, and lodgepole pine. On trailing edge forests of this type, western juniper (*Juniperus occidentalis*) can also be found. Like Sierran mixed conifer forests, eastside pine forests are highly heterogeneous in spatial distribution of trees, consisting of clumps, gaps, and openings (Larson and Churchill, 2012). However, they did not historically possess the heterogeneity in vertical structure found in SMC stands. Instead, EPN stands followed an "old forest, single stratum" arrangement (O'Hara et al., 1996) which consisted of an overstory of large, old trees, and hardly any understory. The overstory trees were widely spaced and often consisted of multiple age cohorts (Youngblood et al., 2004). At the time of field sampling, the average rSDI of eastside pine stands was 47%, which is in the range of full competition. An extreme overabundance of trees in the 6-20 inch diameter class and a moderate overabundance in the 20-30 inch diameter class were observed. According to project orthophotography, average canopy cover in EPN stands was 50%. In the modern era, many of these stands have developed an understory and/or have an overstory tree density far exceeding historical levels.

The true tir forest type occurs mostly above 6000 ft elevation in the Project area. These forests consist of pure, even-aged red fir stands or mixed aged stands that include red fir, white fir, and a minor component of Jeffrey pine, lodgepole pine, and western white pine. Due to true firs' comparatively low resistance to fire, especially at young ages (Zouhar, 2001), their ecology differs significantly than the other forest types in the project. These forests are often made up of even-aged patches, ranging from 0.5 to several acres in size. These patches were historically formed when fires burned hot over a small area, killing all but the absolute largest/oldest trees. The bare mineral soil created by these fires resulted in mass germination of true fir seedlings, forming a new even-aged cohort patch (Pitcher, 1987). At the time of field sampling, the average rSDI of true fir stands was 20%, which is in target range, but with an extreme overabundance of trees in the 10-18 inch diameter class. According to project orthophotography, average canopy cover in true fir stands was 60%. Mean fire return intervals for this forest type are estimated at 35-50 years with the likelihood of stand-replacement events varying significantly due to local site conditions and slope position (NatureServe, 2018).

Native insects and pathogens are part of the natural ecosystem and are among the many agents responsible for introducing heterogeneity into forest stands. In general, these agents will be present in all forest stands within the Sierra Nevada. In stands which are too dense or are suffering from drought, insects and pathogens will be over-represented and may cause a stand to have mortality that exceeds growth. Within the Project Area, major insects and pathogens were noted during walkthrough surveys. These include white pine blister rust (*Cronartium ribicola*), fir dwarf mistletoe (*Arceuthobium abietinum*), fir engraver (*Scolytus ventrails*), and annosum root disease (*Heterobasidion annosum*).

Proposed Action

Proposed silvicultural actions across black and green stands are intended to reduce potential future fire intensity, facilitate reforestation, and enhance forest health.

An Ecosystem Approach focused on restoring the forest to its pre-fire-suppression state was used to evaluate current green stand conditions by comparing them to historical conditions. Two key indicators were used to evaluate green stands and determine objectives of treatments: relative stand density index (rSDI) and stem diameter (DBH) distribution compared to reference conditions described in scientific literature. Secondary indicators include Basal Area Per Acre (BA/acre; ft^2/acre), Trees Per Acre (TPA; count/acre), Quadratic Mean Diameter (QMD; in), and Canopy Cover (%). Additionally, two potential fires were simulated for both the Proposed Action and no action alternatives using the FlamMap software package (Finney, 2006). The simulated fires were modeled as having the 90th and 97th percentile fire weather derived from US Forest Service FireFamilyPlus 5 software (Bradshaw & McCormick, 2000).

North et al. (2022) examined inventory data taken in unlogged forests in the Sierra Nevada in 1911 to compare to contemporary (2011) forest conditions. The researchers used rSDI and the self-thinning rule—an extensively used ecological description of plant mortality and size based on density-dependent competition—to compare forest structure. Results of calculating rSDI for different forest types in 1911 were consistent with early 20th century observations of low stocking. Across all stand types 73-85% of stands had low density and were experiencing “free” growth (<25% SDI_{max}; with maximum tree diameter growth) or had moderate density and were experiencing “partial competition” (25-34% SDI_{max}; with intermediate tree diameter growth). In stark contrast, when the authors examined forest inventories from 2011, 82-95% of stands had high densities and were experiencing “full competition” (35-59% SDI_{max}) in which tree diameter growth declines or had extremely high densities in the zone of “imminent mortality” (≥60% SDI_{max}) in which trees experiences severe competition and minimum diameter growth. Overall, they found that between 1911 and 2011, on average, tree densities increased 500-600% and tree size decreased by 50%.

In the era prior to fire suppression, frequent fire killed off regeneration and acted as an inhibitor to competition. In the modern era, mechanical treatments and prescribed burns must step in to serve this purpose. On the Tributaries Forest Recovery Project, rSDI is used to evaluate whether these treatments are necessary on the landscape level. At the landscape level, the forest stands in the Project area are evaluated based on the percentage of stands within desired “free” growth or “partial competition” rSDI ranges (low to moderate densities) as opposed to undesirable “full competition” or “imminent mortality” rSDI ranges (high to extremely high densities). If less than 75% of forest area is within desirable ranges, treatment will be deemed necessary as part of the restoration. Treatments will be considered successful from an rSDI standpoint if they bring at least 75% of the green stands in the forest into these rSDI ranges. This will achieve restoration to the pre-fire suppression ecosystem and increase resiliency of the stands to future wildfires.

The area determined to be suitable for treatment was divided into seven treatment categories (Table 22), described in Section 2.4.1. Two treatment categories are designed for black stands: Reforestation with High Intensity Site Prep and Reforestation with Low Intensity Site Prep. Four categories occur in green stands: Commercial Thin (outside of California spotted owl HRCAs and Territories), Commercial Thin within HRCAs/Territories, Fuels Reduction – Mechanical (outside of PACs), and Fuels Reduction – PAC (within PACs). Finally, Shaded Fuelbreaks, can occur in both black and green stands. All mechanical treatments would be limited to slopes below 35%, with an allowance for short pitches beyond this slope.

Table 22. *Proposed silvicultural treatment acres by category.*

Treatment	Acres
Reforestation - Low Intensity Sity Prep	3,674
Reforestation - High Intensity Sity Prep	15,876
Commercial Thin	14,150
Commercial Thin - within HRCA/Territories	833
Fuels Reduction - Mechanical	1,272
Fuels Reduction - PAC	3,664
Shaded Fuelbreak	701
Total	**40,170**

Direct and Indirect Effects

Black Stands

Treatments in black stands intend to reduce future wildfire intensity/size, restore and improve forested conditions, improve safety for the public and for workers, and provide economic opportunities to community partners. Coppoletta et al. (2016) found snag basal area and shrub density are strong predictors of reburn severity in fire scars. Altering surface fuel characteristics will reduce shrubs density and prevent coarse woody debris accumulation that results from snag fall.

Shrub regeneration which occurs following overstory loss may create a positive feedback loop which leads to repeated high intensity fires over the same area (Coppoletta et al. 2016, Grabinski-Parker 2015). Treatments that include non-timber vegetation management (ie. management of shrub cover and regeneration) and replanting will set severely burned forest areas on a path to restoration (see Appendix A, Figure A-2). Treatment of brush can include mastication, manual or mechanical uprooting, piling and burning, prescribed livestock grazing, and ground-based herbicide treatments. Research suggests that herbicide and manual release are the most effective methods for reforestation in the Sierra Nevada; McDonald & Fiddler (2010) found that herbicide consistently provided significant increases in height, diameter, or foliar coverage versus an untreated control. Manual release using grubbing and/or chainsaw shearing also yielded advantages over the control but were three times more expensive than herbicide treatments. Zhang et al. (2017) found a 68% increase in tree biomass after 20-years resulting from these treatments. A meta-analysis of 29 study ponderosa pine plantation sites yielded a similar result, showing that these methods provided an average 105% increase in basal area after 10 years versus untreated controls (Zhang et al., 2013).

Stands in the Sierra Nevada which experience catastrophic wildfire and are not manually reforested often lack natural regeneration, even up to three decades after burning (Nizolek et al., 2024). Large patches (>250 acres) of high severity burn lack the seed source to naturally regenerate. The Project Area includes many such large patches, including multiple swaths over 10,000 acres large, of high severity burn. Among stands that do naturally regenerate, seedling composition is usually disproportionally dominated by shade-tolerant species (White and Long, 2018), rather than the shade-intolerant, yet fire-tolerant species. Snag abatement will improve safety conditions for the public and forest workers. Snag presence inhibits wildland firefighter response to future incidents, as falling trees and tree fragments are among the leading causes of death wildland firefighters (Riley and O'Connor, 2023).

It should be noted that these initial treatments may not always have an immediate, positive effect on fuel loading or potential fire behavior. The reduction in competition can be critical for ensuring seedling survival and promoting desirable forest structures over time, but the biomass that comprises that competition generally remains on site until it can decompose. As such, care should be taken for how treated material that remains on site is arranged in order to minimize the risk to both seedlings and any overstory remnants in the event of a fire. Coarse woody debris may be piled and burned to reduce fuel loading where feasible.

Modeled fire simulation results indicate that the greatest moderation in fire behavior comes not from the treatment of the green stands, but from the treatment of the black. The Proposed Action alternative effectively eliminates that extreme fire category through a combination of brush control and reforestation designed to ensure that previously forested stands are accelerated back to forested conditions. The shift away from the moderate and extreme fire behavior, as illustrated in model results (shown further in the analysis in Table 24), represents a significant contribution to the safety of the public and wildland firefighters by minimizing the risk inherent in engaging a fire and increasing the likelihood that the fire can be contained and controlled.

Green Stands

Treatments in green stands focus on reducing future wildfire intensity and size, maintaining remaining forest stands and improving forest conditions, and providing economic opportunities to community partners by the creation of work opportunities. Lowering stand densities and reducing ladder and canopy fuels will improve stand resilience to wildfire. In comparing treated and untreated conifer stands burned in the Dixie Fire, Shive et al. (2024) found that the probability of stand-replacement (100% basal area mortality) was lowest in mechanically treated stands with follow-up fire treatment (eg. prescribed or pile burn). Where stand-replacing fire did not occur, they found that percent basal mortality was reduced in mechanical only and mechanical plus fire treatment areas, characterized by larger trees and lower tree densities, than untreated areas.

Forest health will be improved by restoring stands to their pre-fire suppression rSDI levels and shifting the diameter distribution to more closely align with baseline mortality on the landscape level. The concept of baseline mortality follows the idea that to persist over long time scales, forests must balance growth and mortality. Forests that maintain a stable size-structure relationship on the landscape-level are “healthy” due to their ability to replace old trees that die with young cohorts (Manion and Griffin, 2001). This size-structure relationship for a healthy forest has a typical graphical stem diameter curve, providing an objective measure of health from the landscape-level. Shifting the current, observed stem-diameter and mortality patterns towards expected baseline mortality will help in turn to create a forest more conducive to ongoing management through periodic low intensity wildfire or prescribed fire, with lower levels of competition, stress, and fuel loading and connectivity. Where an over-abundance of small to intermediate trees is found, treatment to reduce the number of trees in these size classes is warranted for restoration. These trees serve as ladder fuels during wildfire and their overrepresentation in the current stands is not reflective of pre-fire suppression conditions of Sierran mixed conifer forests (North et al., 2007) or eastside pine forests (Youngblood et al., 2004). Stephens et al. (2023) showed that mechanical treatments, such as those in the Proposed Action, prescribed fire, or a combination of both can be used to reduce stand density and flatten diameter distributions, while also reducing total fuel loading.

Treatment prescriptions will shift forest conditions toward historical structure of well-spaced, larger trees more resilient to wildfire and suitable for the use of prescribed or cultural fire to maintain health and resilience.

In Commercial Thin units, the removal of trees in the medium and large diameter size classes allows for the reshaping of the forest structure to meet historic conditions. Treatments in SMC and EPN stands will reduce stand density such that rSDI will be within the “free growth” or “partial competition” levels. The overabundance of small diameter trees will be managed bringing stands in line with or on a trajectory toward baseline mortality.

Treatments will promote vertical and horizontal structural heterogeneity in SMC stands, horizontal structural heterogeneity in EPN stands, and shift species composition in both forest types to reduce the prominence of shade-intolerant trees and promote fire-tolerant species. A mosaic of cut areas and leave areas in treated true fir stands will be created, replicating the natural gap-dynamics of historic true fir stands. Treatments will improve stem diameter distributions in all forest types, aligning stands with or sending stands on a trajectory towards baseline mortality.

Fuels Reduction – Mechanical treatments outside of AGOS and CSOW PACs will reduce stand density such that rSDI will remain within the “free growth” or “partial competition” levels for 20 years post-treatment. Treatment will restore heterogeneity in stem structure and create a mosaic of individual trees, clumps and openings. Treatments will reduce ladder and surface fuels, managing the overrepresentation of trees smaller than 10” DBH.

Fuels Reduction within PACs will reduce ladder and surface fuels, managing the overrepresentation of trees smaller than 10” DBH.

The Shaded Fuelbreak will help safely and effectively fight against future wildfires. By mitigating the movement of uncontrolled wildfire, the fuelbreak can help reduce wildfire intensity and size.

Table 23 shows the current, observed and modeled, primary and secondary indicators for stand condition evaluations Sierran mixed conifer, eastside pine, and true fir green stands compared to those metrics in treated stands 20 years post-treatment. In 2045, approximately 92% of SMC stands and 99% of EPN stands will be within the “free growth” or “partial competition” ranges of rSDI, meeting the rSDI-related restoration goals of the Project. For true fir stands, SDI is a less important metric, as most of the Project’s true fir stands are not overstocked in their current condition. Instead, baseline mortality is the key indicator of a successful restoration; treatment will shift the diameter distribution to be in line with baseline mortality (see modeled results in Attachment 7).

Table 23. *Current acre-weighted average green stand characteristics (rSDI, BA/acre, TPA, QMD, canopy cover, canopy bulk density, canopy base height, and canopy height) by forest type compared to those metrics modeled for treated stands 20 years post-treatment under the Proposed Action.*

Forest type	**Sierran Mixed Conifer**		**Eastside Pine**		**True Fir**	
Year	**2023**	**2045**	**2023**	**2045**	**2023**	**2045**
rSDI (%)	37%	22%	47%	19%	20%	12%
TPA (count/acre)	138	59	116	20	204	109
BA/acre (ft^2/acre)	157	97	126	56	143	90
QMD (in)	14	17.3	14	22.8	11.3	12.3
Canopy Cover (%)	60%	33%	50%	25%	60%	37%
Canopy Bulk Density (kg/m^3)	0.05	0.03	0.05	0.01	0.07	0.05
Canopy Base Height (ft)	16	20.6	16	27.4	12	14.3
Canopy Height (ft)	75	70.3	67	68.4	74	58.5

The Proposed Action, as modeled, yielded a significant change in stand characteristics with decreases in canopy cover and bulk density and increases in canopy base height (indicative of a decrease in ladder fuel potential). Given the change in composition and fuel loading described above, the Proposed Action yields a decrease in expected flame length and fireline intensities (Table 24) to desired condition levels under both the 90th percentile and the 97th percentile fire weather models.

Table 24. *Percent of area with specified flame lengths and fireline intensities resulting from FlamMap simulations for a future, 2045, fire under 90th and 97th percentile fire weather conditions, given post-treatment conditions under the Proposed Action Alternative.*

Flame Length (ft)	**90th Percentile**	**97th Percentile**
< 4	95%	94%
4 – 8	5%	6%
8 – 11	0%	0%
> 11	0%	0%

Fireline Intensity (BTUs)		
<100	95%	93%
100-500	5%	7%
500-1,000	0%	0%
1,000-2,000	0%	0%
>2,000	0%	0%

The modeled post-treatment results of the vast majority of flame lengths and fireline intensities less than four feet and 100 BTUs, respectively, have significant implications for both potential fire severity and the ability of managers and responders to control a fire where necessary. The Fireline Handbook Book (National Wildland Coordination Group, 2006) describes that flame lengths of less than four feet and fireline intensities of less than 100 BTUs/ft/second "can generally be attacked at the head of flanks by persons using hand tools" and "handline should hold the fire". Flame lengths of four to eight feet and fireline intensities of 100-500 BTUs/ft/second "are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective." Thus, the Proposed Action Alternative would likely keep conditions at the head of a wildfire in a manageable state.

Cumulative Effects

Cumulative impacts which specifically impact silvicultural resources would change rSDI, TPA, BA/acre, canopy cover, diameter distribution and other associated vegetation attributes. Those which specifically impact fuels and potential fire behavior include activities that would change fuel loading, arrangement, and connectivity. On some projects they may also include broader changes in species composition or fire regime as part of an ecological restoration strategy to prevent conifer encroachment in meadows or spur the development of forest in areas captured by shrub post-fire.

Past activities in the project area have not been analyzed specifically but were considered qualitatively by focusing on current aggregate effects to the affected environment. Examples of past activities include fire suppression, post-fire repair and restoration, utility and right-of-way management, prescribed burns, timber harvest, range management, recreation, special use permit authorizations, outfitting and guiding, non-native invasive plant management, and road and facility maintenance.

The most substantial past or ongoing effects to the project area are the Walker and Dixie Fires themselves. Actions implemented immediately after the fires include fire line construction repair, emergency road repair, and removal of hazardous snags. Climate change is also contributing to changes to project area resources and conditions (Thorne et al., 2017).

Ongoing activities which impact vegetation within the project area include road and trail maintenance, developed facility maintenance, special use permit administration, firewood cutting/gathering, and utility right-of-way management.

Past decisions that are ongoing or will be implemented in the next few years are likely to contribute to the vegetation resource in and around the project area are described in Appendix I. These projects would have a net positive effect in terms of resilience to wildland fire, insects, and disease. Inter-tree competition would decrease, and tree growth would increase. There would be increased vertical and horizontal heterogeneity within the treated areas, specifically those thinned to meet restoration objectives. Treated stands would generally be less dense and have overall less fuel loading in both live and dead fuels, which will likely decrease the intensity and size of future wildfires. Reforestation from multiple projects will positively affect deforested areas by changing the trajectory from that of shrub-dominated to conifer-dominated vegetation cover. Additionally, the public and forest workers' safety will be improved by the removal of hazardous snags. Finally, the increase in forestry activities will increase economic opportunities in the region and provide a supply of fiber to the local forest products industry.

No Action Alternative

Under the No Action Alternative, the forest will remain vulnerable to catastrophic wildfire, as stand density and ladder fuels will be present in concentrations far above their historic levels. Additionally, the ecological state of the forest will continue to be negatively impacted, as stand structure will remain out of step with baseline mortality and rSDI will consistently exceed desirable levels. Finally, work and other economic opportunities will not be created by the forestry work associated with Alternative 1.

Black Stands

Untreated black stands will be highly unlikely to return to forest cover and may be converted to brush-dominated chaparral with a positive feedback loop of repeated high intensity fires over the same area.

Natural regeneration is challenged in the large high severity burn areas by the lack of seed source and competition from shrubs. Where natural regeneration can take hold, seedling establishment and density is likely to be poor and seedling growth reduced (Crotteau et al. 2013, Welch et al. 2016). Without fuel reduction activities, this natural regeneration will most likely be killed in the next wildfire.

Post-fire, unstocked ecosystems can persist for extended periods of time. In sampling fire scars up to 30 years old in Lassen Volcanic National Park, Niziolek et al. (2024) found less than half of the plots met Forest Service stocking standards and stocking standards were rarely met whenever shrub cover exceeded 20%. Distance to forest was also inversely correlated with probability of stocking, with unstocked stands being the norm at distances exceeding 650 feet. This is especially relevant for the Dixie Fire, in general, where 303 high severity burn patches exceed 100 acres in size (Coppoletta, 2022), and for the Tributaries Project, in particular, where multiple swaths of high severity burn exceed 10,000 acres in size. Such large areas lacking natural seed source are unlikely to return to forested conditions.

The conversion of these historically forested ecosystems into brush-dominated chaparral also presents increased fire danger. Scott & Burgan (2005) fuel models generally predict higher wildfire flame lengths and rates of spread in shrub ecosystems versus timber ecosystems. Unlike forested ecosystems that historically burned with low-intensity surface fires, chaparrals in California are adapted to burn at high intensity. Such burns often kill off nearly all aboveground biomass (Keeley, 2007). Moreover, Scott & Burgan (2005) fuel models suggest that high amounts of coarse woody debris can lead to even more intense fires than brush-dominated fuels. It is likely that high amounts of such debris would accumulate over time as snags from the Walker and Dixie Fires decay and fall (Kennedy et al., 2024).

Without the removal of burnt snags, hazardous conditions will remain present if there are no treatments, thereby reducing public and worker safety and inhibiting wildland firefighting activity.

Green Stands

Table 25 shows the shows the current, observed and modeled, primary and secondary indicators for stand condition evaluations for Sierran mixed conifer, eastside pine, and true fir green stands compared to those metrics modeled for untreated stands 20 years later under the No Action Alternative.

Under the No Action Alternative, in 2045, just 32% of SMC stands and 5% of EPN stands will be within the “free growth” or “partial competition” ranges of rSDI. This will not meet project goals of restoring historic forest conditions where at least 75% of stands were within these rSDI ranges.

Table 25. *Current acre-weighted average green stand characteristics (rSDI, BA/acre, TPA, QMD, canopy cover, canopy bulk density, canopy base height, and canopy height) by forest type compared to those metrics modeled for untreated stands 20 years later under the No Action Alternative.*

Forest type	**Sierran Mixed Conifer**		**Eastside Pine**		**True Fir**	
Year	**2023**	**2045**	**2023**	**2045**	**2023**	**2045**
rSDI	37%	40%	47%	56%	20%	25%
TPA	138	114	116	104	204	186
BA/acre	157	167	126	153	143	183
QMD	14	16.4	14	16.4	11.3	13.4
Canopy Cover	60%	52%	50%	61%	60%	65%
Canopy Bulk Density (kg/m3)	0.05	0.06	0.05	0.05	0.07	0.08
Canopy Base Height (ft)	16	17.7	16	19.2	12	11.5
Canopy Height (ft)	75	86.3	67	80.9	74	85.9

Under the No Action Alternative, true firs are expected to increase in prominence in as a percentage of SMC stands, which is undesirable. The overstocked condition of small diameter trees in all forest types will remain unmanaged and all forest types will remain out of line with baseline mortality.

Modeled fire simulation results show that over half of the area modeled exhibits moderate to extreme fire behavior (flame lengths and fireline intensities exceed four feet and 100 BTUs, respectively; Table 26).

Table 26. *Percent of area with specified flame lengths and fireline intensities resulting from FlamMap simulations for a future, 2045, fire under 90th and 97th percentile fire weather conditions, given conditions under the No Action Alternative.*

Flame Length (ft)	**90th Percentile**	**97th Percentile**
< 4	45%	45%
4 – 8	24%	24%
8 – 11	0%	0%
> 11	31%	31%

Fireline Intensity (BTUs)		
<100	45%	45%
100-500	24%	24%
500-1,000	0%	0%
1,000-2,000	0%	0%
>2,000	31%	31%

The Fireline Handbook Book (National Wildland Coordination Group, 2006) provides the following interpretations of flame length and fireline intensity in the context of fire suppression:

- Flame lengths of less than four feet and fireline intensities of less than 100 BTUs/ft/second "can generally be attacked at the head of flanks by persons using hand tools" and "handline should hold the fire".
- Flame lengths of four to eight feet and fireline intensities of 100-500 BTUs/ft/second "are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective."
- Flame lengths of eight to eleven feet and fireline intensities of 500-1000 BTUs/ft/second "may present serious control problems – torching out, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective." And
- Flame lengths of greater than eleven and fireline intensities of greater than 1000 BTUs/ft/second results in fires where "crowning, spotting, and major runs are common. Control efforts at the head of the fire are ineffective."

Under the No Action Alternative, the risk (31%) of overwhelming fire conditions (11-foot flames and more than 2,000 BTUs) would be significantly greater than under the Proposed Action Alternative (0%). The risk of more catastrophic fire on the landscape would put the remaining green forested lands at risk of severe loss and conversion to non-forested conditions.

4.2.14 Special Area Designations

The proposed project will need to comply with laws, regulations and policies that pertain to the following special areas (Figure 7):

Research Natural Areas

The Mud Lake Research Natural Area (RNA) lies within the Taylor Lake Focus Area. Research Natural Areas are federally administered public lands for the primary purposes of maintaining biological diversity, providing baseline ecological information, and encouraging research and university natural-history education. Areas selected exemplify minimally disturbed ecosystems representative of the range of widespread and unique natural vegetation types on federal lands. Non-manipulative research, monitoring, and education are promoted on these RNA lands. There are no treatments planned in the Mud Lake RNA, and no adverse effects are anticipated.

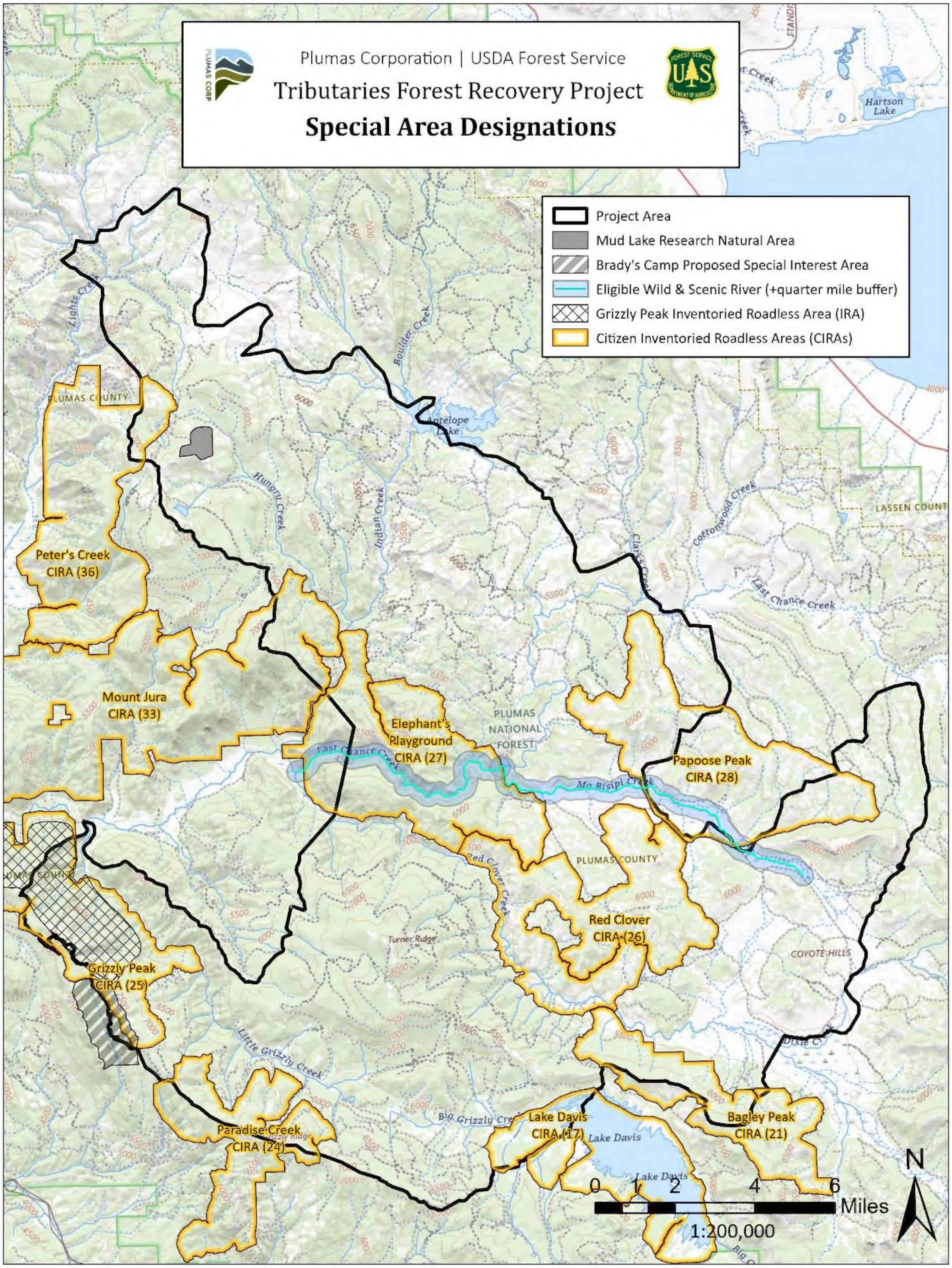

Figure 7. Special Area Designations within the Tributaries Forest Recovery Project.

Wilderness Areas

There are no designated Wilderness Areas within the proposed Project Area. The nearest Wilderness Area is the Bucks Lake Wilderness, located within the Plumas National Forest south of SR 70 and near the community of Belden. The 23,710-acre Bucks Lake Wilderness is approximately 23 air miles west of the Project Area. The Bucks Lake Wilderness is managed to maintain and protect wilderness characteristics and values in accordance with the Wilderness Act of 1964. Five wilderness characteristics must be considered when management activities have the potential to affect wilderness character in a proposed project. Four of these wilderness characteristics are from Section 2(c) of the Wilderness Act of 1964: untrammeled, natural, undeveloped, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. There is a fifth quality; the unique qualities of a particular wilderness area, which is used to monitor wilderness character although it is not derived from the Wilderness Act of 1964. The proposed Project Area is located outside of the Bucks Lake Wilderness and it is not anticipated that any of the five wilderness characteristics (opportunities for solitude, untrammeled, natural, undeveloped, or unique qualities of the Bucks Lake Wilderness) would be negatively impacted under the Proposed Action.

Inventoried Roadless Areas

USFS direction for management of Inventoried Roadless Areas (IRAs) is to provide lasting protection and to maintain the roadless characteristics which consist of 1) high quality or undisturbed soil, water, and air; 2) sources of public drinking water; 3) diversity of plant and animal communities; 4) habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; 5) primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation; 6) reference landscapes; 7) natural appearing landscapes with high scenic quality; 8) traditional cultural properties and sacred sites; and 9) other locally identified unique characteristics.

There is one designated Inventoried Roadless Area, Grizzly Ridge IRA, located within the southwestern finger of the Project Area, along Little Grizzly Creek near the confluence with Indian Creek. Within a portion of the IRA adjacent to Little Grizzly Creek there are 27 acres of proposed Fuels Reduction in a California spotted owl PAC (hand-thinning up to 10” DBH, pile burn, and underburn; see treatment description in Section 2.4.1) to improve habitat structure and function and reduce wildfire risk. There are approximately two miles of Shaded Fuelbreak proposed along the ridge on the southwest edge of the Grizzly IRA. Fire suppression lines were created during the Dixie Fire along this edge and the proposed Shaded Fuelbreak for this Project would maintain these suppression lines, as described in Section 2.4.1, retaining the strategic ridgetop position of containment lines to help reduce future wildfire intensity and protect the adjacent forested areas and downslope communities.

There are portions of nine Citizen Inventoried Roadless Areas (CIRAs) totaling 42,843 acres within the Project Area. Although CIRAs are not recognized by the Forest Service as areas with special designation status, they were identified by the public through a field inventory conducted in 2017 by The Wilderness Society (TWS). These areas were identified for their mostly roadless character and the opportunities they provide for unconfined recreation and solitude, as well as important refuges for wildlife. The majority of these areas were substantially altered by the Walker and Dixie Fires since their assessment by TWS in 2017; however, the assessments provide a pre-fire baseline for informing post-fire management activities. The 6,712 acres of proposed silvicultural treatments within the Project Area that overlap with CIRAs are aimed at restoring forested conditions and protecting the resilience of remaining green stands to future wildfires, which in turn will help protect the remaining refuges of wildlife habitat in these areas. The following summarizes the proposed silviculture treatments that overlap CIRAs by acreages of each activity type:

- Reforestation - High Intensity Site Prep: 3,039 acres
- Reforestation - Low Intensity Site Prep: 199 acres
- Commercial Thin: 2,703 acres
- Commercial Thin within HRCAs/Territories: 9 acres
- Fuels Reduction - Mechanical: 120 acres
- Fuels Reduction - PAC: 210 acres
- Shaded Fuelbreak: 432 acres

No new roads will be built or re-established with the implementation of the Proposed Action. Temporary access roads will be used to access treatment areas, but would be closed and rehabilitated after completion of the proposed activity. Project design features will minimize impacts to the character of the CIRAs.

Wild and Scenic Rivers

There are no designated Wild and Scenic Rivers within the Project Area. A 78-mile long reach of the Middle Fork Feather River (MFFR), one of the originally designated Wild and Scenic rivers, is approximately six miles south of the Project Area. A reach of Last Chance Creek, with tributary Mo Bisipi Creek are considered eligible and deemed to have potential for inclusion in the Wild and Scenic River (WSR) System. In accordance with management direction outlined in a memorandum to District Rangers dated May 8, 2001, all planned Forest Service Management activities within a quarter (1/4) mile of both sides of the river's bank need to be consistent with management direction for Wild and Scenic Rivers until a suitability determination is made through the land management planning process.

There are 168 acres of Commercial Thin, 239 acres of Reforestation – High Intensity Site Prep, 3.4 miles of fire suppression line repairs/rehabilitation, and three stream-road crossing repairs (culvert replacement or rocked low water crossing) located within the quarter mile buffer of the eligible WSR stretches. The proposed treatments are aimed at restoring forested conditions, protecting the resilience of remaining live forest stands to future wildfires, rehabilitate damaged areas to retain soil and vegetation productivity, reduce erosion, and protected water quality. The proposed treatments would not have an adverse effect on the MFFR or proposed eligible reaches of Last Chance Creek or Mo Bisipi Creek. Under the Proposed Action there would not be any adverse effects on the outstandingly remarkable values or the free-flowing condition of these eligible reaches currently managed as a Wild and Scenic River. There are no known past, present or reasonably foreseeable future projects within these areas that when considered with the Proposed Action would contribute to adverse cumulative impacts on the Wild and Scenic River System.

Municipal Watersheds (FSM 2540)

There are no Municipal Watersheds in the vicinity of the proposed Project Area and no adverse effects are anticipated.

4.3 Mandatory Findings of Significance

CEQA Guidelines Section 15065 states that the lead agency shall find that a project may have a significant effect on the environment, and thus require that an environmental impact report (EIR) be prepared for the project, where there is substantial evidence, in light of the whole record, that any of the following conditions may occur:

- Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?
- Does the project have impacts that are individually limited but cumulatively considerable? (“Cumulatively considerable” meant that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of the other current projects and the effects of probable future projects)?
- Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Prior to commencement of the environmental analysis, when a project proponent agrees to mitigation measures or project modifications that would avoid any significant effect on the environment or would mitigate the significant environmental effect, a lead agency need not prepare an EIR solely because, without mitigation, the environmental effects would have been significant.

4.3.1 Environmental Consequences

Implementation of the proposed Tributaries Forest Recovery Project is expected to have a long-term beneficial impact to the environment, replacing lost forest conditions, while incorporating the predicted effects of climate change: conduct site preparation and conifer planting in strategic locations; improve the resilience of remaining green forest stands to future wildfire by fuel reduction and thinning from below; restore and enhance wildlife and botany with an emphasis on elk, spotted owl and aquatic resources; identify, assess and develop treatments for road crossings that are impairing water quality and/or are barriers to aquatic organism passage; develop restoration alternatives to restore meadow function for multiple benefits; and, develop a suite of maintenance activities to ensure the investment in the recovery of forest values is sustained.

The proposed project would not result in cumulatively considerable impacts (refer to Chapter 4.4, “Cumulative Impacts”). The proposed project would not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below a self-sustaining level, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory, or have environmental effects that would cause substantial adverse effects on human beings.

Best management practices, standard operating procedures, project design features, and project-specific mitigation measures described in this EA/IS would ensure that resources are protected and impacts under the proposed project would not have adverse effects.

4.4 Cumulative Impacts

CEQA Guidelines (Section 15355(b)) defines cumulative impacts as the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.

The CEQA Guidelines require that the cumulative impacts of a proposed action be addressed in an environmental document when the cumulative impacts are expected to be significant (14 California Code of Regulations [CCR] 15130[a]). When a lead agency is examining a project with an incremental effect that is not "cumulatively considerable," the lead agency need not consider that effect significant, but should briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.

This analysis relies on existing environmental conditions as a proxy for the impacts of past actions because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to the cumulative effects of the Proposed Action and No Action Alternative.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Existing conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the Proposed Action or alternative. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at existing conditions, the analysis is sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the CEQ 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."

The cumulative effects analysis in this EA/IS is also consistent with Forest Service NEPA Regulations (36 CFR §220.4(f)) (November 18, 2024), which state, in part:

> *"CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonably foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR §1508.7)."*

In determining cumulative effects, the past, present, and future actions displayed in Appendix C were considered while evaluating the direct and indirect effects of the Proposed Action and No Action alternatives.

Proposed Action

A summary of the cumulative analysis is included within the environmental consequences section for the individual resource analyses (see Sections 4.2.1 through 4.2.14). Based on the proposed project minimizing or avoiding potential adverse effects through use of design features (See Appendix E) adherence to required permits, and mitigation measures, no effects were determined to be cumulatively considerable. A majority of potential effects would be temporary and would be avoided or greatly reduced with proper erosion control, construction methods, BMPs, and onsite revegetation. Sensitive biological resources within the surrounding area would likely benefit from restoration of forest conditions.

<u>CEQA Considerations</u>

Refer to the Alternative A discussion. The proposed project would not result in any adverse effects that, when considered in connection with other projects, would be cumulatively considerable.

No Action Alternative

Under the No Action Alternative, no cumulatively considerable effects are anticipated. No construction would occur, and the existing environmental condition would remain unchanged within the proposed project and surrounding area.

4.5 Federal Legal Regulatory Compliance and Coordination

The USFS operates under a diverse array of local, State, and Federal management guidance and policy as well as various executive orders. Currently, the Mt. Hough Ranger District and Beckwourth Ranger District are guided by the Plumas National Forest 1988 Land and Resource Management Plan (USDA

1988) as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD (USDA 2004 a, b).

4.5.1 Principal Federal Environmental Laws

National Environmental Policy Act

NEPA requires that federal agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail. This environmental document meets the requirements of NEPA including public scoping and a thorough analysis of issues, alternatives, and effects.

National Forest Management Act

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The NFMA Act requires the Secretary of Agriculture to assess forest lands and develop a management plan for each unit of the National Forest System. The USFS is complying with the provisions of this law by ensuring that the design of the project meets the Standards and Guidelines of the Plumas National Forest Land and Resource Management Plan (USDA 1988) and its amendments.

Endangered Species Act

The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered species (TES), or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult with the USFWS and NMFS concerning TES under their jurisdiction. It is USFS policy to analyze impacts to TES to ensure management activities are not likely to jeopardize the continued existence of a TES or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This analysis is documented in a BA and two BEs. The BA and BEs include evaluation of potential effects to TES, terrestrial and aquatic wildlife, sensitive habitats, and sensitive plant species, and is summarized and incorporated by reference in Chapter 2.

Clean Water Act

The Clean Water Act was adopted to protect the quality of the nation’s surface waters. Section 208 of the Clean Water Act (CWA) required the States to prepare non-point source pollution plans, which were to be certified by the State and approved by the U.S. Environmental Protection Agency (EPA). In response to this law and in coordination with the State of California Water Resources Control Board (SWRCB) and EPA, USFS Region 5 (Pacific Southwest Region) began developing BMPs for water quality management planning on National Forest System lands within the State of California in 1975. State of California Water Resources Control Board Resolution #68-16 (SWRCB, 1968) directs that high-quality water or water of higher quality than required by regulation be maintained at that higher quality. Similarly, antidegradation EPA policy 40 C.F. R. Section 131.12 states that existing water quality, even when it exceeds required levels for stated beneficial uses will be maintained.

Under Section 404 of the CWA, USACE regulates the discharge of dredged or fill material into waters of the U.S. Waters of the U.S. are those waters that have a connection to interstate commerce, either directly via a tributary system or indirectly through a nexus identified in the USACE regulations. In non-tidal waters, the lateral limit of jurisdiction under Section 404 extends to the ordinary high water mark (OHWM) of a water body or, where adjacent wetlands are present, beyond the OHWM to the limit of the wetlands. The OHWM is defined as “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area” (33 CFR 328.3).

Under Section 401 of the CWA, the SWRCB must certify all activities requiring a 404 permit. The RWQCB regulates these activities and issues water quality certifications for those activities requiring a 404 permit. In addition, the RWQCB has authority to regulate the discharge of “waste” into waters of the State pursuant to the Porter-Cologne Water Quality Control Act. RWQCBs are responsible for establishing the water quality standards (objectives and beneficial uses) required by the CWA and regulating discharges to ensure compliance with the water quality standards. Details about water quality standards in a Project Area are included in the applicable RWQCB Basin Plan. In addition, the SWRCB identifies waters failing to meet standards for specific pollutants. These waters are then state-listed in accordance with CWA Section 303(d). If a state determines that waters are impaired for one or more constituents and the standards cannot be met through point source or non-point source controls, the CWA requires the establishment of Total Maximum Daily Loads (TMDLs). TMDLs specify allowable pollutant loads from all sources (point, non-point, and natural) for a given watershed. The proposed project contains multiple tributaries to the East Branch of the North Fork Feather River (EBNFFR), as well as Big Grizzly Creek, tributary to the Middle Fork Feather River (MFFR). The North Fork Feather River (NFFR) has been placed on the Section 303(d) list for mercury, polychlorinated biphenyls, high water temperature, and unknown toxicants. To date no TMDL’s have been listed by the EPA for the NFFR below Lake Almanor (EPA, 2016).

Potential effects of the proposed project, either through surface runoff of sediment and chemicals, or chemicals entering water bodies through groundwater sources do not constitute a significant degradation of quality or impair existing beneficial uses. The proposed project adheres to the CWA by implementing BMPs that are consistent with the Soil and Water Conservation Handbook (USDA 2011b), the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA, 2012a), and the Pacific Southwest Region (Region 5) Supplement No. 2500-2012-1 for Soil Management (USDA, 2012b). In addition, proper Best Management Practices (BMPs) for erosion and pollutant control would be implemented as required by the RWQCB. The USFS would be required to obtain Section 401 (RWQCB) and 404 (USACE) permits for any proposed activities within jurisdictional waters of the U.S.

Clean Air Act

The Clean Air Act (CAA) provides the principal framework for national, state, and local efforts to protect air quality. Under the CAA, the EPA's Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The EPA promulgated the General Conformity Rule on November 30, 1993 in Volume 58 of the Federal Register (58 FR 63214) to implement the conformity provision of Title I, section 176(c)(1) of the CAA. Section 176(c)(1) requires that the federal government not engage in, support, or provide financial assistance for licensing, permitting, or approving any activity not conforming to an approved CAA implementation plan. The approved implementation plan could be a federal, state, or tribal Implementation Plan (i.e., FIP, SIP, or TIP). The General Conformity Rule is codified in Title 40 of the Code of Federal Regulations (CFR) Part 51, Subpart W and Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans." The General Conformity Rule applies to all federal actions except highway and transit programs. The latter must comply with the conformity requirements for transportation plans in 40 CFR Part 93, Subpart A.

The MCAB is the local air district with authority within the proposed Project Area. The district regulates air quality through its permit authority over most types of stationary emissions sources through planning and review activities. The Proposed Project involves site preparation and conifer planting; in strategic locations; thinning of remaining green forest stands; restore and enhance wildlife and botany with an emphasis on elk, spotted owl and aquatic resources; treat road crossings impairing water quality and/or are barriers to aquatic organism passage; restore meadow function for multiple benefits; and, develop a suite of maintenance activities to ensure the investment in the recovery of forest values is sustained in Plumas County. Plumas County is in attainment for all current National Ambient Air Quality Standards, except for PM 2.5 in the City of Portola and surrounding area. This non-attainment area is outside the Project Area. Project-related emissions of criteria pollutants during short-term implementation activities would not expose any sensitive receptors to substantial pollutant concentrations, result in air pollutant standard violations, or conflict with MCAB air quality plans. Best available control measures would be applied to reduce impacted of project implementation.

National Historic Preservation Act

The NHPA of 1966, as amended, sets forth national policy and procedures for historic properties, defined as districts, sites, buildings, structures, and objects included in or eligible for listing in the NRHP. Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on historic properties and to allow the Advisory Council on Historic Preservation the opportunity to comment on those undertakings, following regulations issued by the Advisory Council on Historic Preservation [36 Code of Federal Regulations (CFR) 800]. The project has complied with Section 106 of the NHPA.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits actions that will result in "take" of migratory birds, their eggs, feathers, or nests. "Take" is defined in the MBTA as any means or any manner to hunt, pursue, wound, kill, possess, or transport, any migratory bird, nest, egg, or part thereof. Migratory birds are also protected, as defined in the MBTA, under Section 3513 of the California Fish and Game Code. The proposed project would not result in impacts to migratory birds through implementation of avoidance measures and pre-construction nesting bird surveys.

4.5.2 Federal Executive Orders

Consultation and Coordination with Indian Tribal Governments, Executive Order 13175 of November 6, 2000

Executive Order 13175 establishes the requirement for federal governments to engage in regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes. Executive Order 13175 reaffirms the federal government's commitment to tribal sovereignty, self-determination, and self-government. Its purpose is to ensure that all Executive departments and agencies consult with Indian tribes and respect tribal sovereignty as they develop policy on issues that impact Indian communities. The Forest Service has closely consulted with Indian tribes and Native American organizations regarding this project and will continue tribal coordination throughout implementation.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Executive Order 13007 is designed to protect and preserve Indian religious practices. It directs federal land management agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. No Traditional Cultural Properties, sacred sites, or locations with specific religious associations were identified through research or consultation efforts for this project.

Invasive Species, Executive Order 13112 of February 3, 1999

Executive Order 13112 created the Invasive Species Council (ISC) in order to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological and human health impacts that invasive species cause. Federal agencies are required to:

- Identify actions that may affect the status of invasive species
- Use relevant programs and authorities to prevent the introduction, control and monitoring of invasive species
- Provide for native species restoration as well as their habitats
- Promote public information
- Not condone or carry out actions that may spread invasive species
- Consult with the ISC and other stakeholders as appropriate

The following Standard Management Requirements (SMRs) were developed with the direction provided by the Invasive Species Management section of the Forest Service Manual (USDA 2011a). The implementation of SMRs would reduce the potential to introduce invasive species to new areas and spread existing infestations. Implementing these actions would ensure the proposed project would be in compliance with EO 13112:

- Cleaning off-road equipment – require all off-road equipment and vehicles (Forest Service, DWR and contracted) used for project implementation to be free of weeds.
- Clean all equipment and vehicles of all mud, dirt, and plant parts. This would be done at a vehicle washing station or steam-cleaning facility before the equipment and vehicles enter the Project Area. Cleaning is not required for vehicles that would stay on the roadway. Also, all off-road equipment must be cleaned prior to leaving areas infested with noxious weeds. All off-road equipment must be cleaned prior to leaving designated weed units if weeds are present at the time of implementation and are unable to be avoided.
- Staging Areas – do not stage equipment, materials, or crews in areas infested with invasive plant species where there is a risk of spread to uninfested areas.
- Road construction, reconstruction, and maintenance – all earth-moving equipment, gravel, fill, or other materials would be free of invasive plants and propagules. Use onsite sand, gravel, rock, or organic matter where possible.
- Revegetation – Use weed-free equipment, mulches, and seed sources. Avoid seeding in areas where revegetation will occur naturally, unless invasive species are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with invasive species. All activities that require seeding or planting will need to use only locally collected native seed sources. Plant and seed material should be collected from as close to the Project Area as possible, from within the same watershed, and at a similar elevation whenever possible. Persistent non-native species such as timothy, orchard grass, or ryegrass should be avoided. Site-specific revegetation and seeding guidelines will be developed or customized from existing general guidelines as necessary by Plumas National Forest botanists.

Floodplain Management, Executive Order 11988 of May 24, 1977 and Protection of Wetlands, Executive Order 11990 of May 24, 1977

Executive Orders 11988 and 11990 require federal agencies to avoid, to the extent possible, short- and long-term effects resulting from the occupancy and modification of flood plains and the modification or destruction of wetlands. These executive orders are intended to preserve the natural and beneficial values served by floodplains and wetlands.

The purpose of the proposed meadow treatments is to restore the natural functions of meadow floodplain, by reconnecting the entrenched eroding stream channel to the meadow floodplain, which will allow the stream to spill out onto the meadow more frequently. This in turn will restore and increase the aerial extent of wetlands in the meadow. The proposed meadow treatments meet the above stated executive orders by implementing BMPs that are consistent with the Soil and Water Conservation Handbook (USDA 2011b), the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA 2012), and the Pacific Southwest Region (Region 5) Supplement No. 2500-2017-1 for Soil Management (USDA 2017). By using BMPs, the proposed project meets the executive orders according to the SNFPA ROD (USDA 2004b, Section VII). In addition, proper construction BMPs for erosion and pollutant control will be utilized during construction as required by the RWQCB.

Environmental Justice, Executive Order 12898 of February 11, 1994

Executive Order 12898 requires that federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies and activities on minority and low-income populations. Low-income and minority populations are not within the vicinity of the proposed project, and activities associated with the project are not anticipated to discriminate against these population types. Proposed activities would not adversely affect community, social, economic and health and safety factors. Public scoping was conducted in accordance with NEPA regulations to identify any potential issues or hazards associated with the proposed project.

4.6 Consultation and Coordination

Early and continuing coordination with the general public and appropriate public agencies is an essential part of the environmental process. It helps planners determine the necessary scope of environmental documentation and the level of analysis required, and to identify potential impacts and mitigation measures and related environmental requirements. Agency consultation and public participation for this project have been accomplished through a variety of formal and informal methods, including project team meetings between USFS and DWR and interagency coordination meetings. This chapter summarizes the results of efforts to fully identify, address, and resolve project-related issues through early and continuing coordination.

Federal Endangered Species Act (FESA) Consultation Summary

The USFS has assumed responsibilities under the ESA of 1973 (16 U.S.C. 1531 et seq). An official species list was requested and downloaded from the USFWS on October 9, 2024. Based on the analysis conducted in the BA (Attachment 1), it was determined the proposed project will have **no affect (NA) on the foothill yellow-legged frog**, **and may affect but is unlikely to adversely affect gray wolf, SNYLF, and whitebark pine.** There is designated **critical habitat for SNYLF (Boulder/Lone Rock Creeks Subunit) that may be affected by the Proposed Action** within the Project Area (Attachment 1).

Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect federally listed species and designated critical habitat under their jurisdiction. There is a total barrier to anadromous fish at the Oroville Dam, and as a result the North Fork Feather River does not have anadromous fish species associated with it; therefore, the proposed project would have no effect on species under NMFS jurisdiction.

No formal consultation to date has been conducted for the Project for any listed species. The Sierra Nevada Distinct Population Segment of the California spotted owl is proposed for listing as a threatened species. Consultation is not required for proposed species for actions that do not jeopardize the continued existence of the species; however, Region 5 of the USDA Forest Service is currently conferencing with USFWS through a programmatic Biological Assessment for California spotted owl based on the proposed listing. In addition, project-specific effects to CSOW for the Tributaries Forest Recovery Project are being considered in a separate Biological Evaluation. The USFS expects to request formal consultation with the USFWS on March 1, 2025. The Final EA/IS will contain a summary of the consultation process and outcome.

California Endangered Species Act (CESA) Consultation Summary

Plumas Corp conducted a CNDDB search of the project limits and surrounding area. CESA-listed species occurring within the vicinity of the proposed project were addressed in the Project BA.

California Department of Fish and Wildlife (CDFW)

A proposed project scoping document was mailed to CDFW on February 16, 2024. No correspondence was received with regard to the proposed project. A representative from the Fish and Game Commission attended the community outreach meeting on July 27, 2023 and

Federal Wetlands and Other Waters Coordination Summary

A wetland delineation report will need to be developed to facilitate jurisdictional determination by the US Army Corps of Engineers (USACE) and receive coverage under Nationwide Permit 27 for temporary and permanent impacts to Waters of the United States resulting from proposed meadow restoration and stream channel treatments. Additional coordination will include a Section 401 water quality certification from the Regional Water Quality Control Board.

Cultural Resources Consultation Summary

See Chapter 3, Public Involvement and Tribal Consultation, for a discussion of formal and informal consultation efforts with Federally-recognized Indian tribes, local Indigenous communities and/or interested parties.

List of Preparers

The following USFS PNF staff, Plumas Corporation staff, and Ironwood Consulting, Inc. staff contributed to the preparation of this Environmental Assessment/Initial Study:

Liz Ballou, USFS Mt. Hough District NEPA Planner

Antonio Duenas, USFS Beckwourth District Hydrologist

David Hamilton, USFS Mt. Hough District Biologist

Emily Doe, USFS Feather River District Botanist

Maurice Huynh, USFS Forest Silviculturist

Elaine Vercruysse, USFS Forest Climate Change Coordinator

Mary Kliejunas, USFS Beckwourth District Archaeologist

Teresa Arrate, Plumas Corporation Project Manager

Gia Martynn, Plumas Corporation Operations Director

Jeanie Hinds, Plumas Corporation Project Manager

Leslie Mink, Plumas Corporation Senior Project Manager

Kara Rockett, Plumas Corporation Grant Program/Operations Assistant

Kendal Hiemke, Plumas Corporation Project Manager

Jim Wilcox, Plumas Corporation Executive Director

Robert Galliano, Mason, Bruce & Girard, Inc. Group Manager, Registered Professional Forester (RPF)

Joshua Petitmermet, Mason, Bruce & Girard, Inc. Senior Forest Analyst, RPF

Mike Preminger, Mason, Bruce & Girard, Inc. GIS Analyst, Forester

Emmaline Bryant, Mason, Bruce & Girard, Inc. Forest Analyst

Jacqueline White, Ironwood Consulting, Inc. Wildlife Biologist

References

Auclair, A. N., & Carter, T. B. (1993). Forest wildfires as a recent source of CO2 at northern latitudes. Canadian Journal of Forest Research, 23, 1528–1536. https://doi.org/10.1139/x93-193

Ballard, W. B., Whitman, J. S., & Gardner, C. L. 1987. Ecology of an exploited wolf population in south to central Alaska. Wildlife Monographs 98.

Bradshaw, L., & McCormick, E. (2000). FireFamily Plus user's guide, Version 2.0. https://doi.org/10.2737/rmrs-gtr-67

Burrows, B., Bush, B.C., and Conway, K. (2015). Prescribed Herbivory for Vegetation Treatment Projects: An informational document prepared by the Range Management Advisory Committee. California Board of Forestry and Fire Protection, June 2015.

California Air Resources Board (CARB). Wildfire Emission Estimates for 2021. California Air Resources Board.

California Council on Science and Technology (CCST). 2020. The Costs of Wildfire in California. Sacramento, CA.

California Department of Conservation (CA DOC). 2016. Farmland of Local Importance.

California Department of Conservation (CA DOC). 2022. California Important Farmland Finder. https://maps.conservation.ca.gov/DLRP/CIFF/ (Accessed: May 3, 2024)

California Department of Fish and Wildlife (CDFW). 2024. Accessed November 7, 2024 https://wildlife.ca.gov/Conservation/Invasives/Species/Bullfrog

California Department of Forestry and Fire Protection (CalFire). 2021. Dixie Fire Incident. https://www.fire.ca.gov/incidents/2021/7/13/dixie-fire/. Accessed December 15, 2022.

California Department of Transportation (CalTrans). 2013. Technical Noise Supplement to the Traffic Noise Analysis Protocol. Sacramento, CA.

California Department of Water Resources (CDWR). 2015). California hydroclimate report 2015. California Department of Water Resources.

California Department of Water Resources (CDWR). 2024. Disadvantaged Communities Mapping Tool. https://gis.water.ca.gov/app/dacs/. (Accessed: May 17, 2024)

(CalVTP) California Vegetation Treatment Program. (2019). Program Environmental Impact Report Mitigation Monitoring and Reporting Program. State Clearinghouse # 2019012052. Prepared by Ascent Environmental for the California Board of Forestry and Fire Protection, November 2019.

Churchill, D. J., Larson, A. J., Dahlgreen, M. C., Franklin, J. F., Hessburg, P. F., and Lutz, J. A. 2013. Restoring forest resilience: From reference spatial patterns to silvicultural prescriptions and monitoring. Forest Ecology and Management, Volume 291: 42-457.

Cluer, B., & Thorne, C. 2014. A Stream Evolution Model Integrating Habitat And Ecosystem Benefits: Semi Incorporating Habitat And Ecosystem Benefits. River Research and Applications, 30(2), 135–154. https://doi.org/10.1002/rra.2631

County of Plumas. (2012). 2035 Plumas County General Plan Update: Draft Environmental Impact Report, Appendix E. Greenhouse Gas Inventory: Plumas County 2005 Community-Wide Greenhouse Gas Emissions Inventory. Prepared by Sierra Business Council.

Dettinger, M., Alpert, H., Battles, J., Kusel, J., Safford, H., Fougeres, D., Knight, C., Miller, L., & Sawyer, S. (2018). Sierra Nevada Summary Report. California's Fourth Climate Change Assessment. Publication number: SUM-CCCCA4-2018-004.

Dore, S., Fry, D.L., Collins, B.M., Vargas, R., York, R.A., & Stephens, S.L. (2016). Management impacts on carbon dynamics in a Sierra Nevada mixed conifer forest. PLoS ONE, 11(2): e0150256. doi:10.1371/journal.pone.0150256

Fann, N., Alman, B., Broome, R. A., Morgan, G. G., Johnston, F. H., Pouliot, G., Rappold, A. G. 2017. The health impacts and economic value of wildland fire episodes in the U.S.: 2008-2012. Sci Total Environ. 2018 Jan 1;610-611:802-809. doi: 10.1016/j.scitotenv.2017.08.024. Epub 2017 Aug 18. PMID: 28826118; PMCID: PMC6117838.

Finney, M. A. (2006). An Overview of FlamMap Fire Modeling Capabilities. In: Andrews, Patricia L.; Butler, Bret W., Comps. 2006. Fuels Management-How to Measure Success: Conference Proceedings. 28-30 March 2006; Portland, OR. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 213-220, 041. https://www.fs.usda.gov/research/treesearch/25948

Gallagher, C. V., Keane, J. J., Shaklee, P. A., Kramer, H. A., & Gerrard, R. 2019. Spotted owl foraging patterns following fuels treatments, Sierra Nevada, California. The Journal of Wildlife Management, 83(2), 487–501. https://doi.org/10.1002/jwmg.21586

Gutierrez, R. J., & Manley, P. N. 2017. The California spotted owl: Current state of knowledge. (No. PSW-GTR-254). U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Halofsky, J. E., Peterson, D. L., Buluç, L. Y., & Ko, J. M. (2021). Climate change vulnerability and adaptation for infrastructure and recreation in the Sierra Nevada. USDA Forest Service, Department of Agriculture, September 2021.

Helander, M., Lehtonen, T.K., Saikkonen, K., Despains, L., Nyckees, D., Antinoja, A., Solvi, C., & Loukola, O.J. (2023). Field-realistic acute exposure to glyphosate-based herbicide impairs fine-color discrimination in bumblebees. Science of The Total Environment, Volume 857, Part 1, 2023, 159298, ISSN 0048-9697.

Hoover, C.M., Bagdon, B., & Gagnon, A. (2021). Standard estimates of forest ecosystem carbon for forest types of the United States. General Technical Report NRS-202. Madison, WI: USDA Forest Service, Northern Research Station. https://doi.org/10.2737/NRS-GTR-202

Hutchinson, J. A., Vargo, J., Milet, M., French, N. H. F., Billmire, M., Johnson, J., & Hoshiko, S. 2018. The San Diego 2007 wildfires and Medi-Cal emergency department presentations, inpatient hospitalizations, and outpatient visits: An observational study of smoke exposure periods and a bidirectional case-crossover analysis. PLoS Medicine, 15(7), e1002601.

Keyes, C. R., & O'Hara, K. L. (2002). Quantifying Stand Targets for Silvicultural Prevention of Crown Fires. Western Journal of Applied Forestry, 17(2), 101–109.

Kovacs, K. E., Converse, K. E., Stopher, M. C., Hobbs, M. L., Sommer, P. J., Figura, D. A., Applebee, D. L., Clifford, & Michaels, D. J. 2016. Conservation Plan for Gray Wolves in California (p. 329). CDFW.

Larson, A. J., & Churchill, D. (2012). Tree spatial patterns in fire-frequent forests of western North America, including mechanisms of pattern formation and implications for designing fuel reduction and restoration treatments. Forest Ecology and Management, 267, 74–92. https://doi.org/10.1016/j.foreco.2011.11.038

Law, B.E., Sun, O.J., Campbell, J., Van Tuyl, S., Thornton, P.E. (2003). Changes in carbon storage and fluxes in a chronosequence of ponderosa pine. Glocal Change Biology 9: 510-524. https://doi.org/10.1046/j.1365-2486.2003.00624.x

Liang, S., Hurteau, M. D., & Westerling, A. L. (2017). Potential decline in carbon carrying capacity under projected climate-wildfire interactions in the Sierra Nevada. Scientific Reports, 7, 2420. https://doi.org/10.1038/s41598-017-02686-0

Liang, J., Crowther, T. W., Picard, N., Wiser, S., Zhou, M., Alberti, G., Schulze, E.D., McGuire, A.D., Bozzato, F., Pretzsch, H., De-Miguel, S., Paquette, A., Hérault, B., Scherer-Lorenzen, M., Barrett, C.B., Glick, H.B., Hengeveld, G.M., Nabuurs, G., Pfautsch, S., Viana, H., Vibrans, A.C., Ammer, C., Schall, P., Verbyla, D., Tchebakova, N., Fischer, M., Watson, J.V., Chen, H.Y.H., Lei, X., Schelhaas, M., Lu, H., Gianelle, D., Parfenova, E.I., Salas, C., Lee, E., Lee, B., Kim, H.S., Bruelheide, H., Coomes, D.A., Piotto, D., Sunderland, T., Schmid, B., Gourlet-Fleury, S., Sonké, B., Tavani, R., Zhu, J., Brandl, S., Vayreda, J., Kitahara, F., Searle, E.B., Neldner, V.J., Ngugi, M.R., Baraloto, C., Frizzera, L., Bałazy, R., Oleksyn, J., Zawiła-Niedźwiecki, T., Bouriaud, O., Bussotti, F., Finér, L., Jaroszewicz, B., Jucker, T., Valladares, F., Jagodzinski, A.M., Peri, P.L., Gonmadje, C., Marthy, W., O’Brien, T., Martin, E.H., Marshall, A.R., Rovero, F., Bitariho, R., Niklaus, P.A., Alvarez-Loayza, P., Chamuya, N., Valencia, R., Mortier, F., Wortel, V., Engone-Obiang, N.L., Ferreira, L.V., Odeke, D.E, Vasquez, R.M., Lewis, S.L., & Reich, P.B. (2016). Positive biodiversity-productivity relationship predominant in global forests. Science, 354(6309), aaf8957. https://doi.org/10.1126/science.aaf8957

(MBG) Mason, Bruce and Gerard, & Galliano, R. 2024. Tributaries Forest Recovery Project Vegetation Management Report. Mason, Bruce and Girard.

McDonald, P. M., & Fiddler, G. O. 2010. Twenty-five years of managing vegetation in conifer plantations in northern and central California: results, application, principles, and challenges. Gen. Tech. Rep. PSW-GTR-231. Albany, CA: US Department of Agriculture, Forest Service, Pacific Southwest Research Station. 87 p, 231.

Merriam, K., Gross, S. Estes, B., Safford, H., Sawyer, S., Steel, Z., Wolf, L, Wuenschel, A. (2022). Plumas National Forest Climate Change Trend Summary. USDA Forest Service, Region 5 Ecology Program, Pacific Southwest Region. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd1070203.pdf

Merriam, K., Safford, H., & Sawyer, S. (2013). A summary of current trends and probable future trends in climate and climate-driven processes in the Sierra Cascade Province, including the Lassen, Modoc, and Plumas National Forests. USDA Forest Service, Pacific Southwest Region. Retrieved from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3820062.pdf

Miller, J. D., Safford, H. D., & Welch, K. R. (2016). Using one year post-fire fire severity assessments to estimate longer-term effects of fire in conifer forests of northern and eastern California, USA. Forest Ecology and Management, 382, 168-183.

Mola, J. M., Hemberger, J., Kochanski, J., Richardson, L. L., & Pearse, I. S. 2021. The Importance of Forests in Bumble Bee Biology and Conservation. BioScience, 71(12), 1234–1248.

Motta, Erick V.S. and Nancy A. Moran. 2023. The effects of glyphosate, pure or in herbicide formulation, on bumble bees and their gut microbial communities. Science of The Total Environment, Volume 872, 2023, 162102, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2023.162102.

National Interagency Fire Center. Fire Information Statistics. https://www.nifc.gov/fire-information/statistics (Accessed: May 17, 2024)

NatureServe (2018). International Ecological Classification Standard: Terrestrial Ecological Classifications. Terrestrial Ecological Systems of CONUS and Puerto Rico on the LANDFIRE Legend. NatureServe Central Databases. Version 2.0. Arlington, VA. Data current as of 28 August 2018.

North, M., Innes, J., & Zald, H. (2007). Comparison of thinning and prescribed fire restoration treatments to Sierran mixed-conifer historic conditions. Canadian Journal of Forest Research, 37(2), 331–342. https://doi.org/10.1139/X06-236

North, M., Stine, P., O'Hara, K., Zielinski, W., & Stephens, S. (2009). An ecosystem management strategy for Sierran mixed-conifer forests (PSW-GTR-220; p. PSW-GTR-220). U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

North, M. P., Tompkins, R. E., Bernal, A. A., Collins, B. M., Stephens, S. L., and York R. A. 2022. Operational resilience in western US frequent-fire forests. Forest Ecology and Management, Volume 507: 120004. https://doi.org/10.1016/j.foreco.2021.120004

O'Hara, K. L., Latham, P. A., Hessburg, P., & Smith, B. G. (1996). A structural classification for inland northwest forest vegetation. Western Journal of Applied Forestry. 11: 97-102.

Parsons, D. J., & DeBenedetti, S. H. (1979). Impact of fire suppression on a mixed-conifer forest. Forest Ecology and Management, 2, 21–33. https://doi.org/10.1016/0378-1127(79)90034-3

Peterson, D. L., Johnson, M. C., Agee, J. K., Jain, T. B., McKenzie, D., & Reinhardt, E. D. (2005). Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30 p, 628. https://doi.org/10.2737/PNW-GTR-628

Pitcher, D. C. (1987). Fire history and age structure in red fir forests of Sequoia National Park, California. Canadian Journal of Forest Research, 17(7), 582–587. https://doi.org/10.1139/x87-098

Plumas County. 2013. "Plumas County General Plan 2035." Quincy, CA.

Reed, C. C., Berhe, A. A., Moreland, K. C., Wilcox, J., & Sullivan, B. W. (2022). Restoring function: Positive responses of carbon and nitrogen to 20 years of hydrologic restoration in montane meadows. Ecological Applications, 32(7), e2677. https://doi.org/10.1002/eap.2677

Roberts, S.L. 2017. California spotted owl habitat characteristics and use. Chapter 3 in The California spotted owl: current state of knowledge. General Technical Report PSW-GTR-254. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. pp. 49-74.

Safford HD and Stevens JT. 2017. 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. Gen. Tech. Rep. PSW-GTR-256. US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Shive, K. L., Coppoletta, M., Wayman, R. B., Paulson, A. K., Wilson, K. N., Abatzaglou, J. T., ... & Safford, H. D. (2024). Thinning with follow-up burning treatments have increased effectiveness at reducing severity in California's largest wildfire. Forest Ecology and Management, 572, 122171.

Sierra Meadows WRAMP 2022. 2022. Sierrameadows.Org. https://www.sierrameadows.org/wramp

Taylor, A. H., Harris, L. B., & Skinner, C. N. 2022. Severity patterns of the 2021 Dixie Fire exemplify the need to increase low-severity fire treatments in California's forests. Environmental Research Letters, 17(7), 071002.

Tempel, D.J, Keane, J.J, Gutierrez, R.J., Wolfe, J.D., Jones, G.M., Koltunov, A., Ramirez, C.M., Berigan, W.J., Gallagher, C.V., Munton, T.E., Shaklee, P.A., Whitmore, S.A., and Peery, M.Z. 2016. Meta-analysis of California Spotted Owl (Strix occidentalis occidentalis) territory occupancy in the Sierra Nevada: Habitat associations and their implications for forest management. The Condor 118: 747-765.

Thiel, R. P., Merill, S., & Mech, L. D. 1998. Tolerance by Denning Wolves, Canis lupus, to Human Disturbance. Canadian Field-Naturalist, 122, 340–342.

Thompson, L.J., Smith, S., Stout, J.C., White, B. Zioga, E., Stanley, D.A. 2022. Bumblebees can be Exposed to the Herbicide Glyphosate when Foraging. Environmental Toxicology and Chemistry, Volume 41, Issue 10, 1 October 2022, Pages 2603–2612, https://doi.org/10.1002/etc.5442

Thorne, J. H., Boynton, R. M., Flint, L. E., & Flint, A. L. (2015). The magnitude and spatial patterns of historical and future hydrologic change in california’s watersheds. Ecosphere. 6 (2): 24.

Thorne, J. H., Boynton, R. M., Holguin, A. J., Stewart, J. A., & Bjorkman, J. (2016). A climate change vulnerability assessment of California’s terrestrial vegetation. California Department of Fish and Wildlife, Sacramento, CA.

Thorne, J. H., Choe, H., Boynton, R. M., Bjorkman, J., Albright, W., Nydick, K., ... & Schwartz, M. W. (2017). The impact of climate change uncertainty on California's vegetation and adaptation management. Ecosphere, 8(12), e02021.

Thorne, J. H., Choe, H., Stine, P. A., Chambers, J. C., Holguin, A., Kerr, A. C., & Schwartz, M. W. (2018). Climate change vulnerability assessment of forests in the Southwest USA. Climatic Change, 148, 387-402.

United States Bureau of Economic Analysis. 2024. Gross Domestic Product: All Industries in Plumas County, CA, retrieved from FRED, Federal Reserve Bank of St. Louis. fred.stlouisfed.org/series/GDPALL06063. (Accessed: August 17, 2024)

United States Census Bureau. 2020. Quick Facts Plumas County, CA. https://www.census.gov/quickfacts/fact/table/plumascountycalifornia/PST045222 (Accessed: May 6, 2024).

United States Census Bureau. 2021. American Community Survey. Washington, DC. As reported by the Wildfire Risk to Communities Community Wildfire Defense Grants Data Tool, https://wildfirerisk.org/cwdg-tool/6063. (Accessed: May 17, 2024)

United States Council on Environmental Quality (USCEQ). 2024. Climate and Economic Justice Screening Tool. https://screeningtool.geoplatform.gov/en/#8.85/40.1138/-120.7206. (Accessed: May 17, 2024)

United States Environmental Protection Agency (USEPA). 1992. Prescribed burning background document and technical information document for prescribed burning best available control measures. 1992. Research Triangle Park, NC, U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Air Quality Planning and Standards.

United States Environmental Protection Agency (USEPA). 2024a. Summary of Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice. (Accessed: May 17, 2024)

United States Environmental Protection Agency (US EPA). 2024b. Climate Change and the Health of Socially Vulnerable People. https://www.epa.gov/climateimpacts/climate-change-and-health-socially-vulnerable-people. (Accessed: August 20, 2024)

United States Environmental Protection Agency (USEPA) 2024c. Criteria Air Pollutants. https://www.epa.gov/criteria-air-pollutants. (Accessed: August 17, 2024)

USDA Forest Service. 1988. Plumas National Forest Land and Resource Management Plan. USDA Forest Service Plumas National Forest, Quincy, CA.

USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement. Forest Service, Pacific Southwest Region. January 2001.

USDA Forest Service. 2004a. Sierra Nevada Forest Plan Amendment (SNFPA), Record of Decision (ROD). Pacific Southwest Region, Forest Service, Vallejo, CA.

USDA Forest Service. 2004b. Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS). Pacific Southwest Region, Forest Service, Vallejo, CA.

USDA Forest Service. 2007. Record of Decision, Sierra Nevada Forests Management Indicator Species Amendment. U.S. Forest Service, Pacific Southwest Region. December, 2007. 18pp.

USDA Forest Service. 2010. Plumas National Forest Public Motorized Travel Management: Record of Decision: Plumas National Forest: Plumas, Lassen, Yuba, Butte and Sierra Counties, California. Plumas Motorized Travel Management Project. Quincy, CA.

USDA Forest Service. 2011a. Forest Service Manual (FSM) 2900. Invasive Species Management.

USDA Forest Service. 2011b. Forest Service Handbook (FSH) 2509. Soil and Water Conservation Handbook.

USDA Forest Service. 2012. National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide. FS-990a. USDA Forest Service, Washington D.C.

USDA Forest Service. 2017. Pacific Southwest Region (Region 5) Supplement 2500-2017-1 for Soil Management.

USDA Forest Service. 2019. Conservation Strategy for the California Spotted Owl in the Sierra Nevada. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd624135.pdf

USDA Forest Service. 2022a. Hazard Tree Identification and Mitigation. Pacific Southwest Region, Report-RO-22-01.

USDA Forest Service. 2022b. Confronting the Wildfire Crisis: A Strategy for Protecting Communities and Improving Resilience in American Forests. FS-1187a.

USDA Forest Service. 2022c. Hazard Tree Identification and Mitigation. RO-22-01.

USDA Forest Service. (2024a). Office of Sustainability and Climate. USFS Carbon Dashboard to support land management planning in the National Forest System. Retrieved August 26, 2024, from https://public.tableau.com/app/profile/usda.forest.service/viz/Carbon_Dashboard_Public_17056983339290/Dashboard

USDA Forest Service. (2024b). Forest Carbon Assessment: Plumas National Forest, Pacific Southwest Region. Office of Sustainability and Climate Carbon White Paper Template Version 2.0, June 2024, USDA Forest Service.

USDI, United States Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Foothill Yellow-Legged Frog; Threatened Status With Section 4(d) Rule for Two Distinct Population Segments and Endangered Status for Two Distinct Population Segments. https://www.govinfo.gov/content/pkg/FR-2021-12-28/pdf/2021-27512.pdf

USDI, United States Fish and Wildlife Service. 2023a. Endangered and Threatened Wildlife and Plants; California Spotted Owl; Endangered Status for the Coastal-Southern California Distinct Population Segment and Threatened Status With Section 4(d) Rule for the Sierra Nevada Distinct Population Segment. Federal Register. https://www.federalregister.gov/documents/2023/02/23/2023-03526/endangered-and-threatened-wildlife-and-plants-california-spotted-owl-endangered-status-for-the

USDI, United States Fish and Wildlife Service (USFWS). 2025. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Four Distinct Population Segments of the Foothill Yellow-Legged Frog. Federal Register, Volume 90, No. 8, January 14, 2025. https://www.govinfo.gov/content/pkg/FR-2025-01-14/pdf/2024-31757.pdf#page=1

Van Vuren, Dirk H. and Miguel A. Ordeñana. 2012. Factors influencing burrow length and depth of ground-dwelling squirrels, Journal of Mammalogy, Volume 93, Issue 5, 19 October 2012, Pages 1240–1246, https://doi.org/10.1644/12-MAMM-A-049.1

Verner, J., K.S. McKelvey, B.R. Noon, R.J. Gutierrez, G.I. Gould, Jr., and T.W. Beck, tech. coord. 1992. The California Spotted Owl: a technical assessment of its current status. Gen. Tech. Rep. PSW-GTR-133, US Forest Service, Albany, CA.

Wohl, E., Kramer, N., Ruiz-Villanueva, V., Scott, D. N., Comiti, F., Gurnell, A. M., ... & Fausch, K. D. (2019). The natural wood regime in rivers. BioScience, 69(4), 259-273.

Xerces Society. Western Monarch Count. Retrieved November 11, 2024, from https://westernmonarchcount.org/data/

Xerces Society. Western Bumble Bee. Accessed January 14, 2025, https://xerces.org/endangered-species/species-profiles/at-risk-bumble-bees/western-bumble-bee

Weixelman, D. (2011). Meadow Hydrogeomorphic Types for the Sierra Nevada and Southern Cascades Ranges in California:. United States Department of Agriculture, Forest Service.

Wheaton, J. M., Bennett, S. N., Bouwes, N. W., Maestas, J. D., & Shahverdian, S. M. (Eds.). (2019). Low-tech process-based restoration of Riverscapes: Design manual. Utah State University Restoration Consortium.

Wiechmann, M. L., Hurteau, M. D., North, M. P., Koch, G. W., & Jerabkova, L. (2015). The carbon balance of reducing wildfire risk and restoring process: An analysis of 10-year post-treatment carbon dynamics in a mixed-conifer forest. Climatic Change, 132(4), 709-719.

(WHO) World Health Organization. Wildfires. Retrieved January 23, 2025, from https://www.who.int/health-topics/wildfires#tab=tab_1

Yates, E. L., Iraci, L. T., Tarnay, L. W., Burley, J. D., Parworth, C., Ryoo, J.-M. 2020. The effect of an upwind non-attainment area on ozone in California's Sierra Nevada Mountains. Atmospheric Environment, Vol. 230: 117426.

Youngblood, A., Max, T., & Coe, K. (2004). Stand structure in eastside old-growth ponderosa pine forests of Oregon and northern California. Forest Ecology and Management, 199(2), 191–217. https://doi.org/10.1016/j.foreco.2004.05.056

Zeiner, D. C., Laudenslayer, K. E. M., & White, E. 1990. California's Wildlife Habitat Relationships System (CWHR) 1988-1990. California Department of Fish and Game.

Zhang H., Liu S., Yu J., Li J., Shangguan Z., & Deng L. (2024). Thinning increases forest ecosystem carbon stocks. Forest Ecology and Management, 555:121702.

Zhang, J., Busse, M. D., Young, D. H., Fiddler, G. O., Sherlock, J. W., & TenPas, J. D. (2017). Aboveground biomass responses to organic matter removal, soil compaction, and competing vegetation control on 20-year mixed conifer plantations in California. Forest Ecology and Management, 401: 341-353, 401, 341–353. https://doi.org/10.1016/j.foreco.2017.07.023

Zhang, J., F.Powers, R., Oliver, W., & H.David, Y. (2013). Response of ponderosa pine plantations to competing vegetation control in Northern California, USA: A meta- analysis. Forestry, 86: 3-11, 86, 3–11. https://doi.org/10.1093/forestry/cps054

Zouhar, K. (2001). Abies concolor. Fire Effects Information System (FEIS). https://www.fs.usda.gov/database/feis/plants/tree/abicon/all.html

Appendix A Project Maps

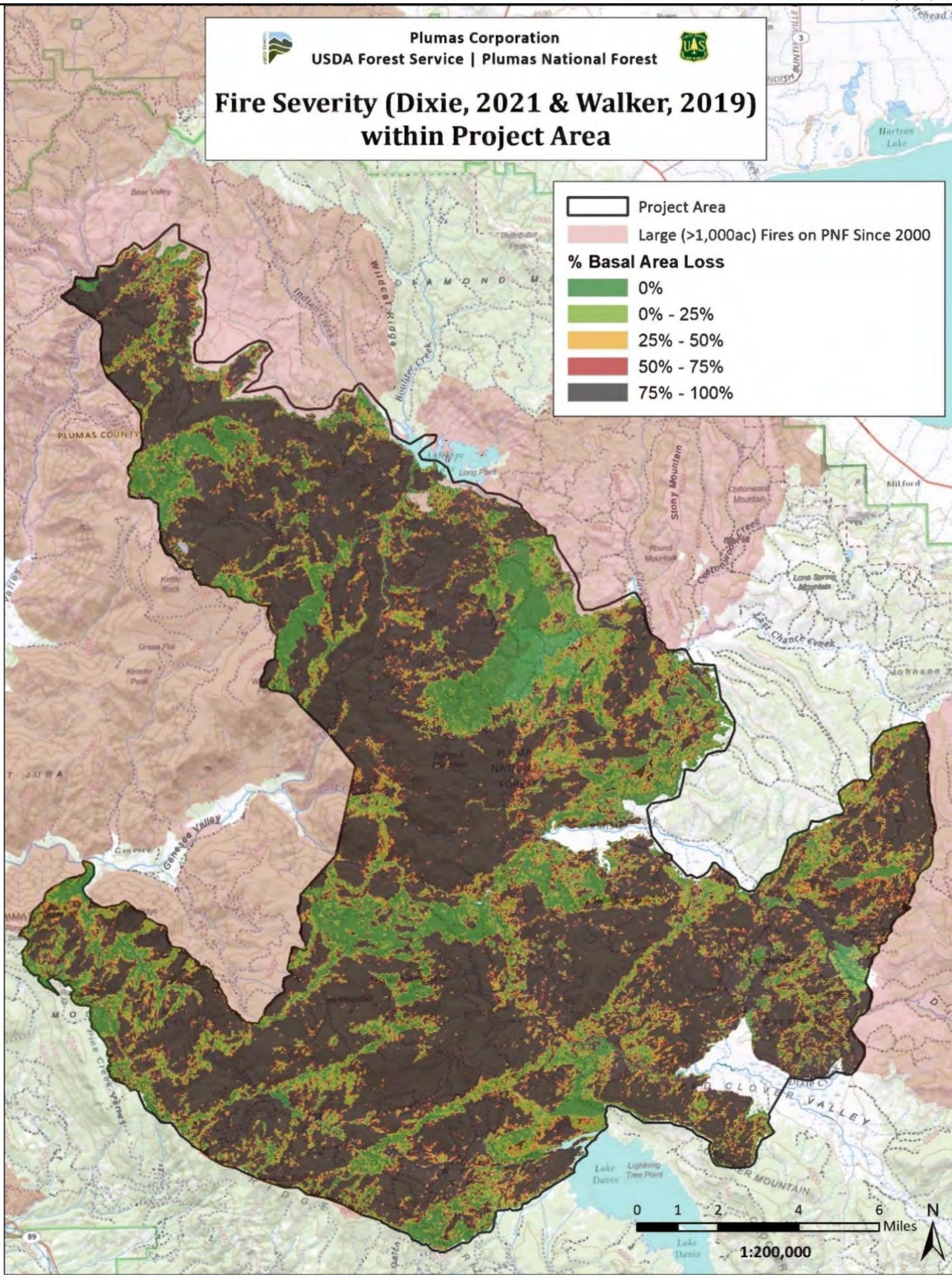

Figure A-1. *Fire severity from the Dixie (2021) and Walker (2019) fires in the Tributaries Forest Recovery Project Area. The Dixie and Walker fires collectively burned 57% of the Project area (93,294 acres) at high severity, with only 27% burned at low severity (21,612 acres) or unburned (21,769 acres).*

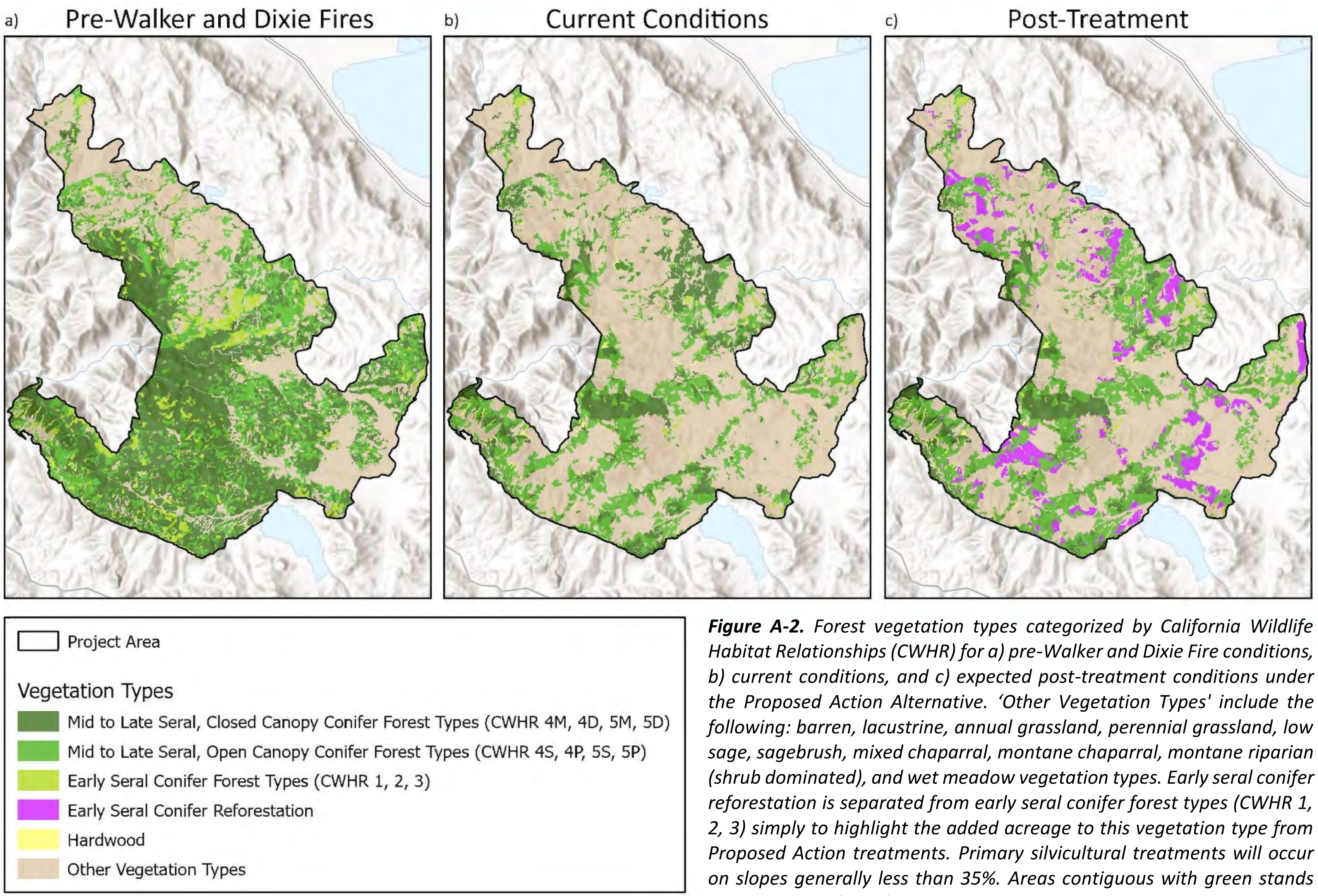

Figure A-2. *Forest vegetation types categorized by California Wildlife Habitat Relationships (CWHR) for a) pre-Walker and Dixie Fire conditions, b) current conditions, and c) expected post-treatment conditions under the Proposed Action Alternative. 'Other Vegetation Types' include the following: barren, lacustrine, annual grassland, perennial grassland, low sage, sagebrush, mixed chaparral, montane chaparral, montane riparian (shrub dominated), and wet meadow vegetation types. Early seral conifer reforestation is separated from early seral conifer forest types (CWHR 1, 2, 3) simply to highlight the added acreage to this vegetation type from Proposed Action treatments. Primary silvicultural treatments will occur on slopes generally less than 35%. Areas contiguous with green stands are important for reforestation to improve treatment connectivity and landscape-level resilience.*

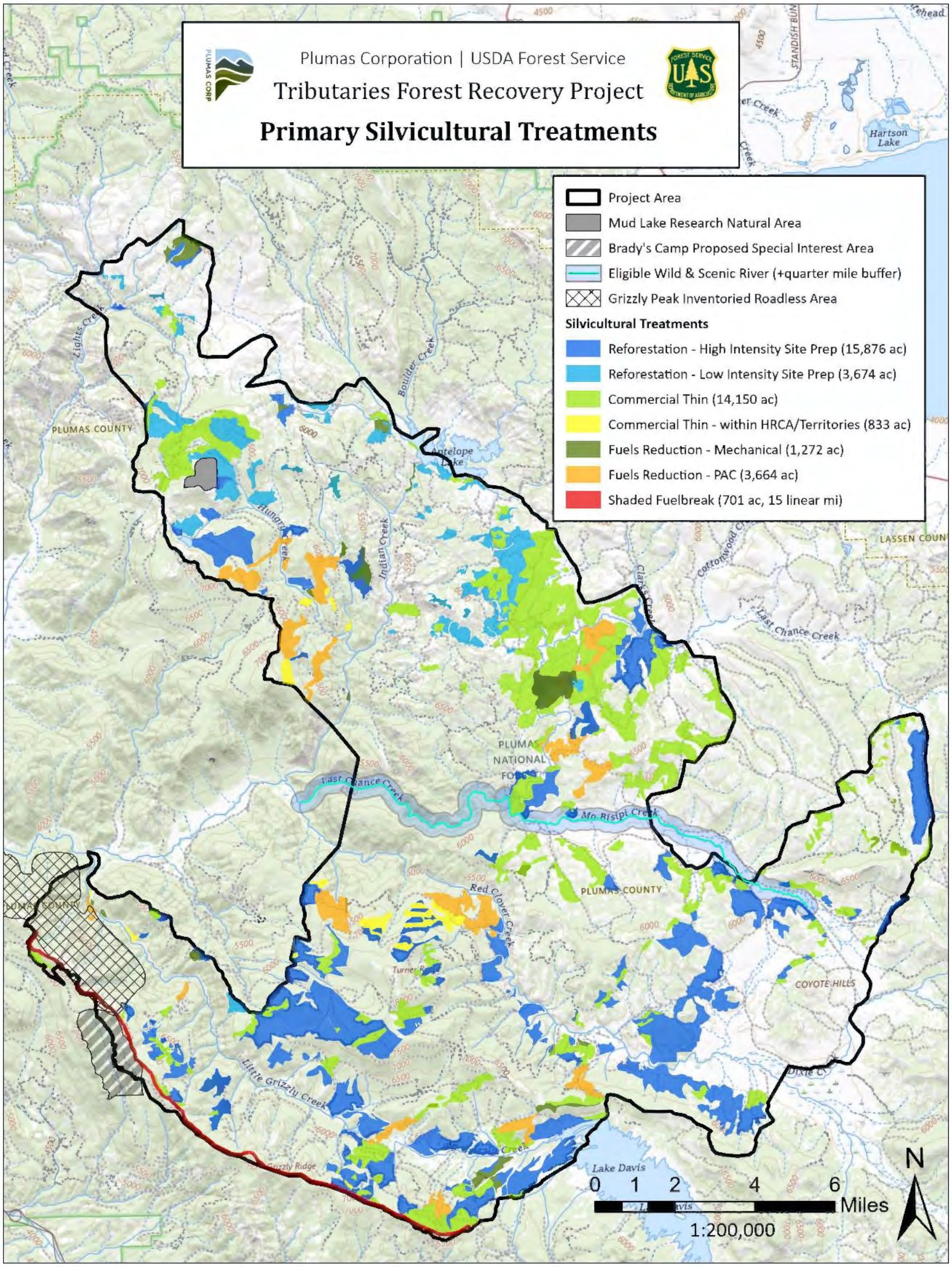

__Figure A-3.__ Primary silvicultural treatments in the Tributaries Forest Recovery Project Area. Silvicultural treatments were developed based on post-fire stand conditions and will be implemented on a site-specific basis considering physical characteristics (majority of treatments occur on slopes < 35%), access, Plumas National Forest projected climate analyses, American (formerly northern) goshawk (AGOS) and California spotted owl (CSOW) Protected Activity Centers (PACs), CSOW Home Range Core Areas (HRCAs), CSOW Territories, and other on-the-ground factors such as meadow-like conditions and tree health.

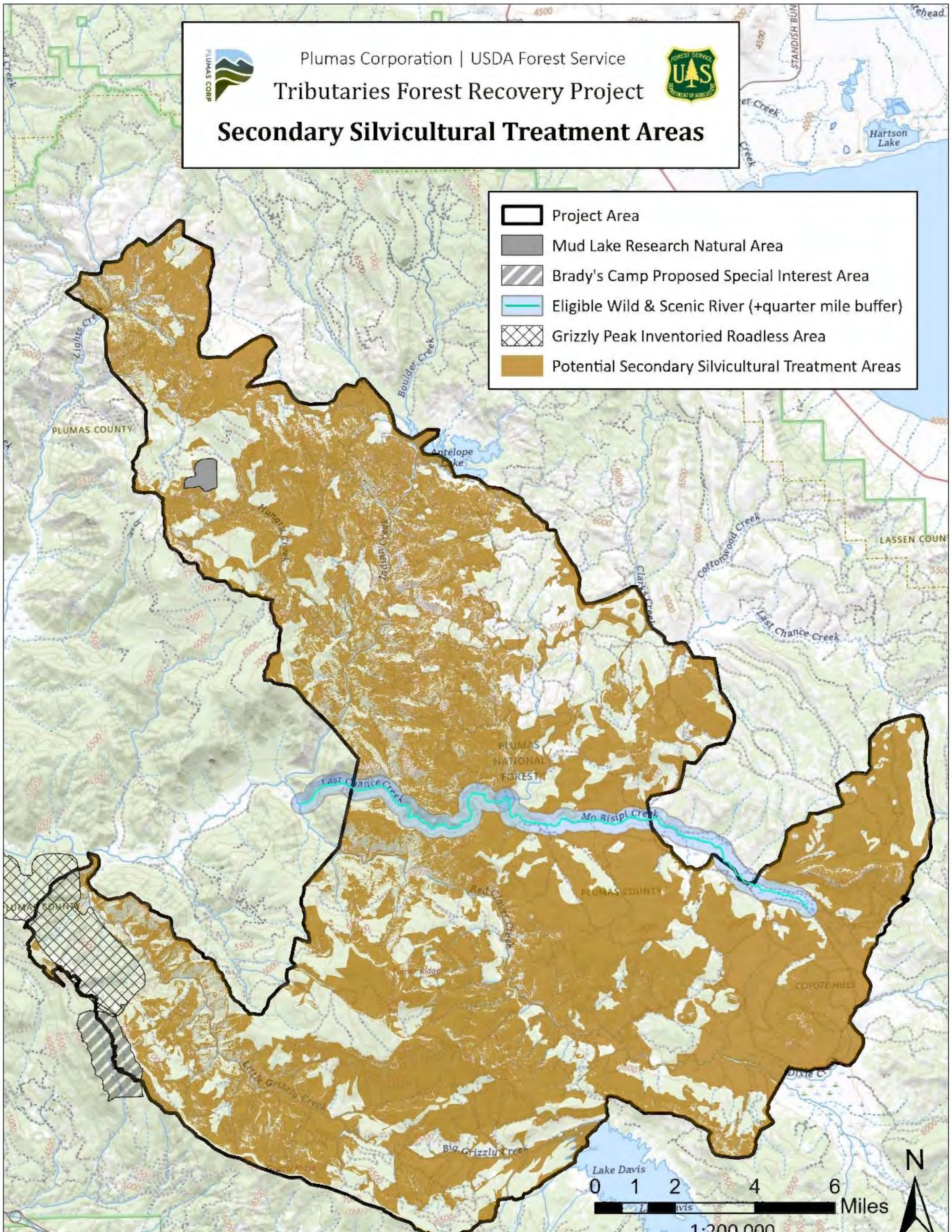

Figure A-4. *Areas of potential secondary silvicultural treatments to provide connectivity between primary treatments in the Tributaries Forest Recovery Project Area. Connectivity between primary treatment units would increase resilience to future wildfire on a landscape scale by minimizing pockets of dense fuel between treatments. To achieve this landscape-scale treatment effect, up to 15,000 acres of secondary mechanical treatments may occur on slopes up to 50%. Such connectivity treatments would be strategically located and delineated as primary treatments are implemented, with consideration of soil type, vegetation cover, and best management practices (BMPs) to protect soil and water quality.*

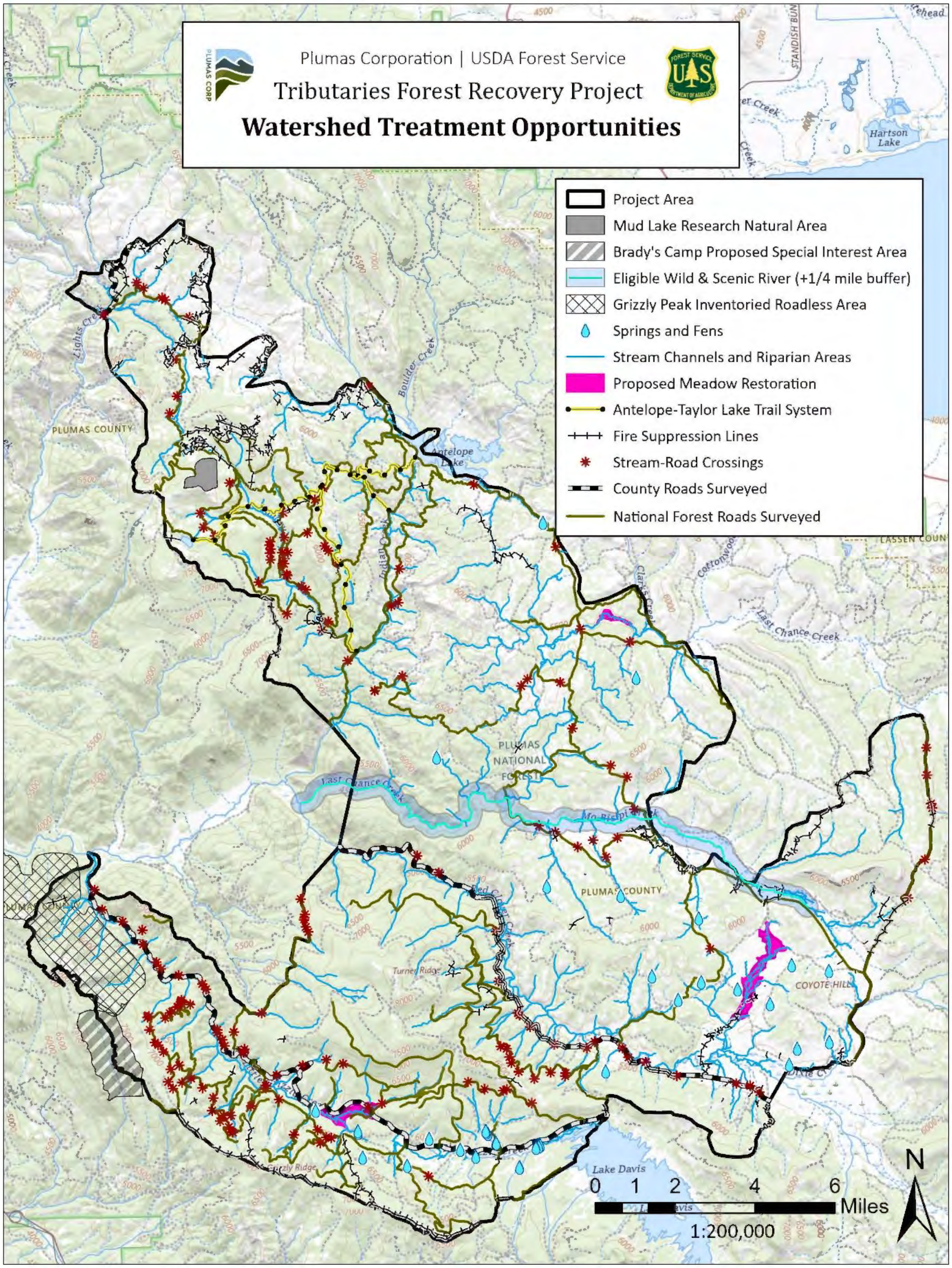

Figure A-5. *Watershed treatment opportunities in the Tributaries Forest Recovery Project Area. Opportunities exist to restore and protect healthy mountain wetlands, reduce soil erosion, and meter sediment delivery for watershed health.*

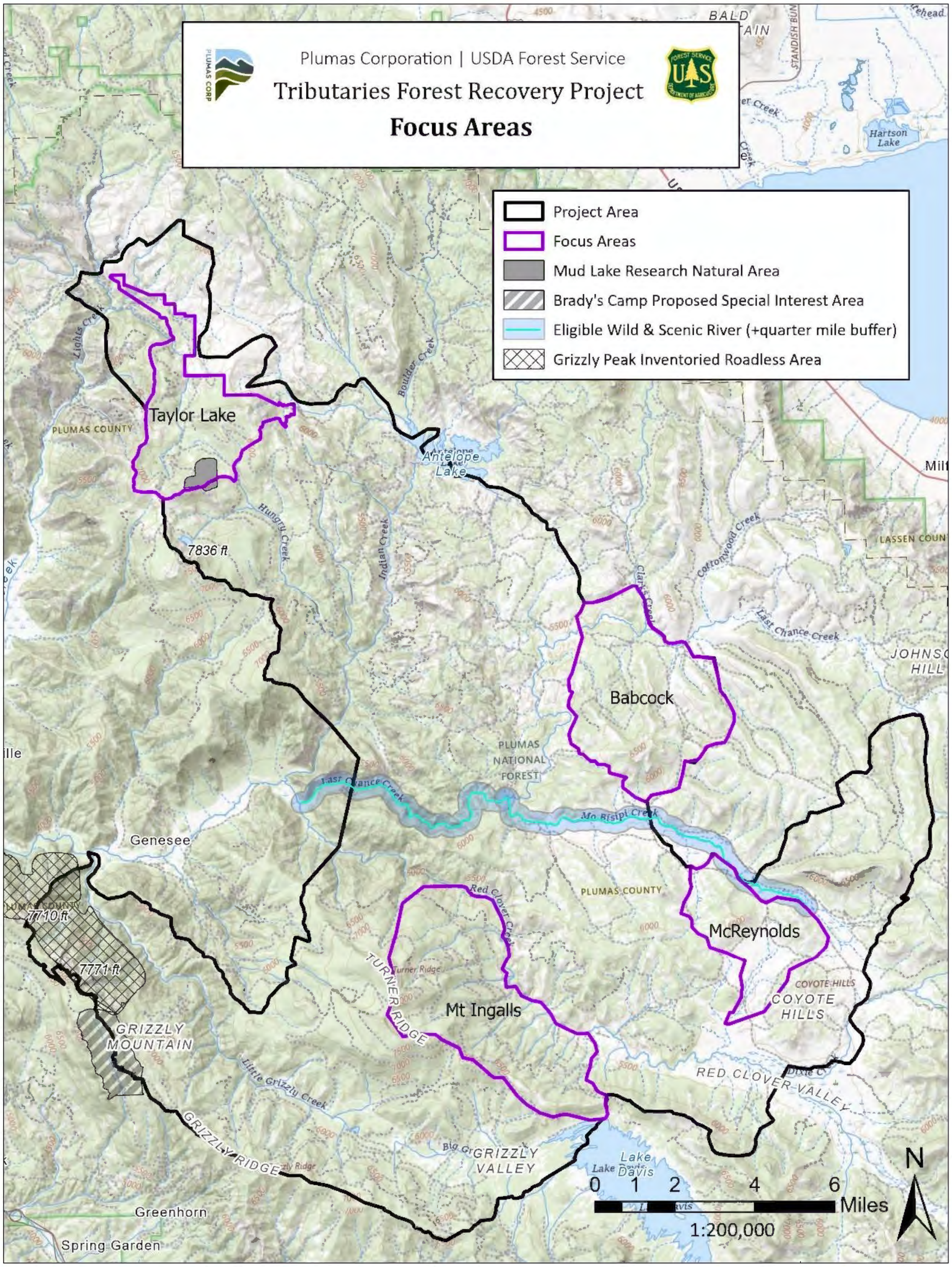

Figure A-6. *Focus areas within the Tributaries Forest Recovery Project. Four focus areas within the larger Project area were identified to be evaluated for potential priority implementation. Field surveys were conducted in and around the Focus Areas to assess current conditions of resources and to inform Project-level impact analyses. As resources and capacity become available for implementation, full NEPA/CEQA-compliant resource surveys will be completed in any area selected for implementation prior to implementation to assess current site conditions and determine the appropriate management action(s).*

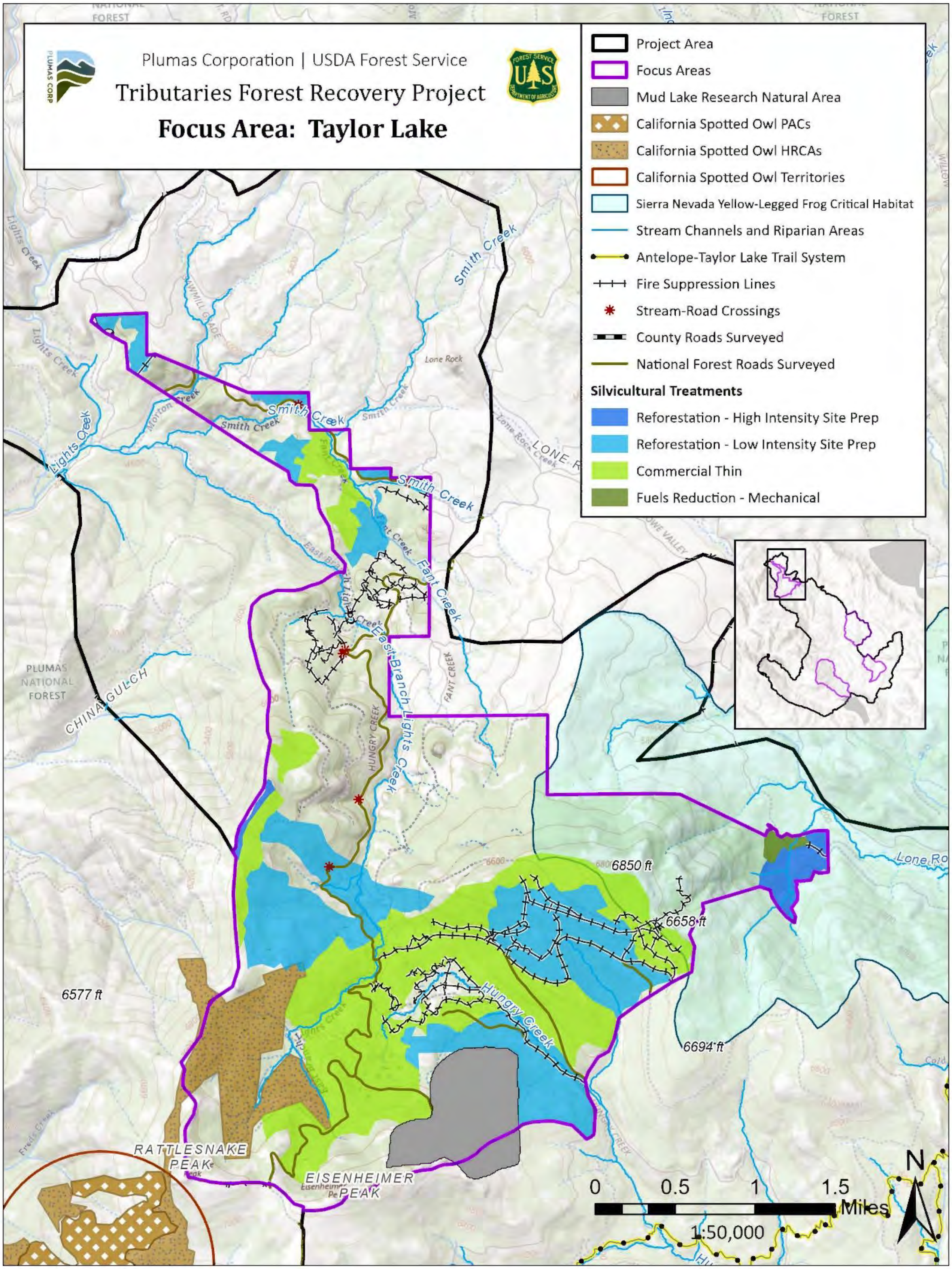

__Figure A-7.__ Proposed actions –silvicultural and watershed treatments—within the Taylor Lake Focus Area.

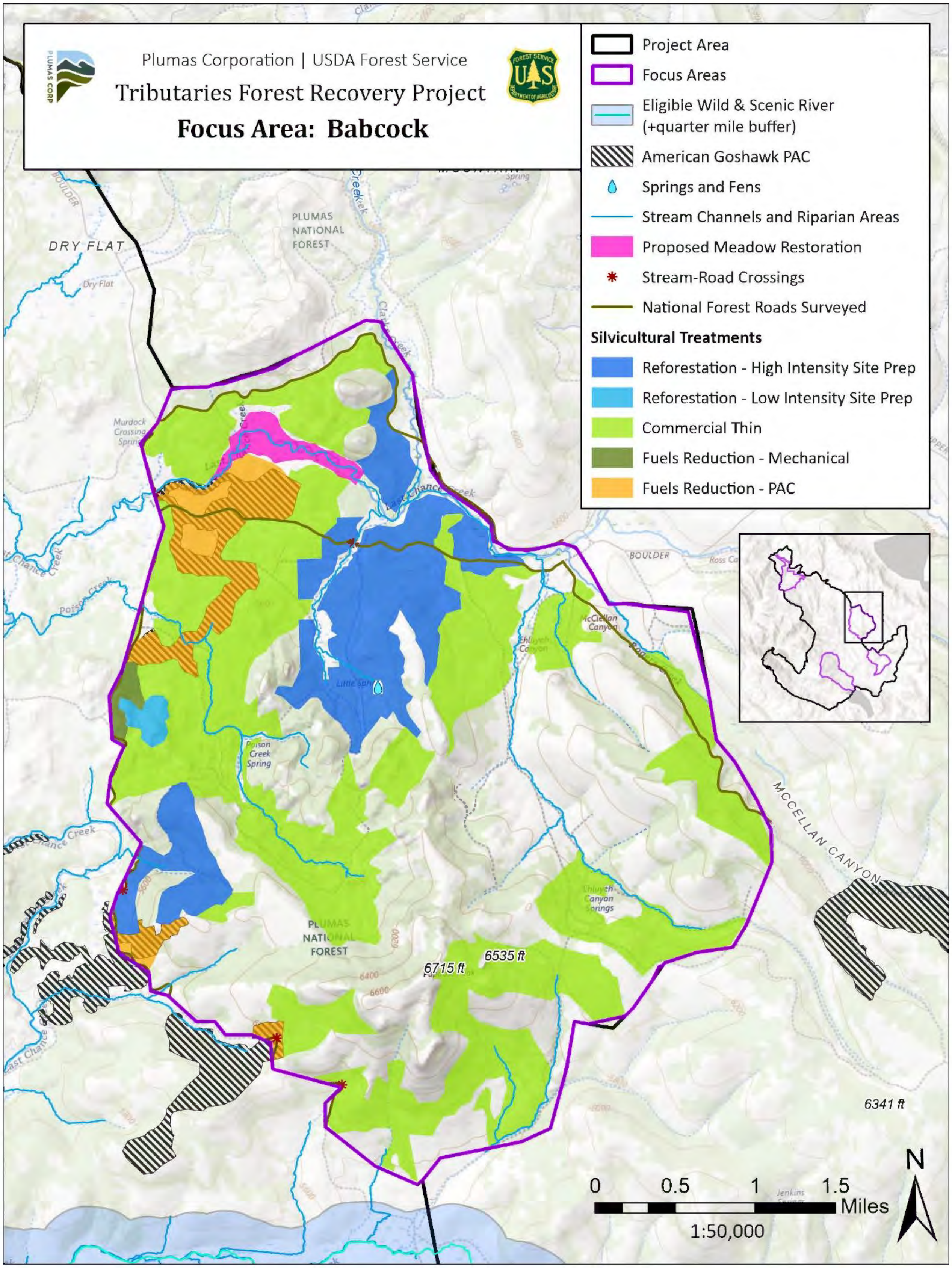

Figure A-8. Proposed actions –silvicultural and watershed treatments—within the Babcock Focus Area.

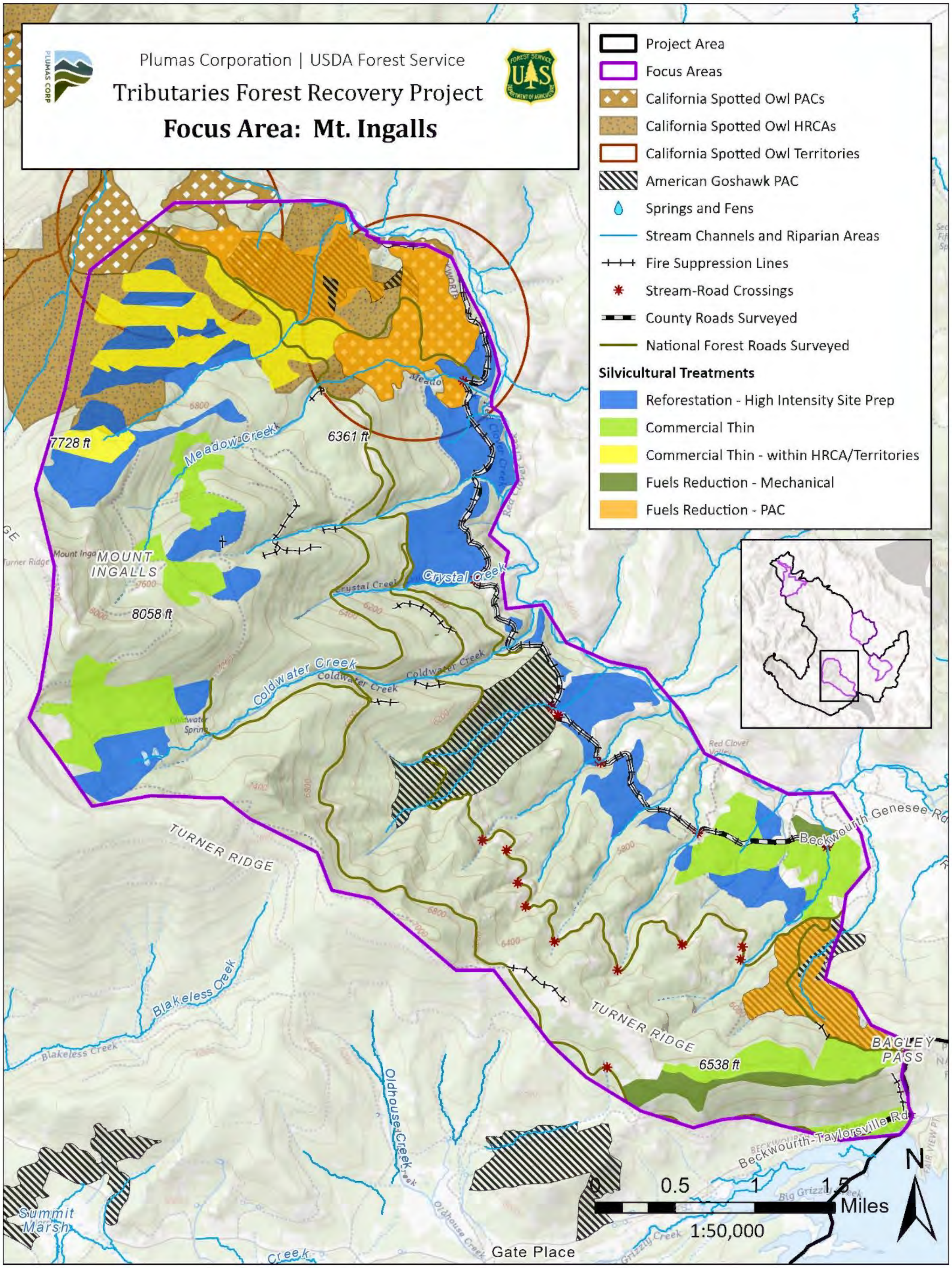

Figure A-9. Proposed actions –silvicultural and watershed treatments—within the Mt. Ingalls Focus Area.

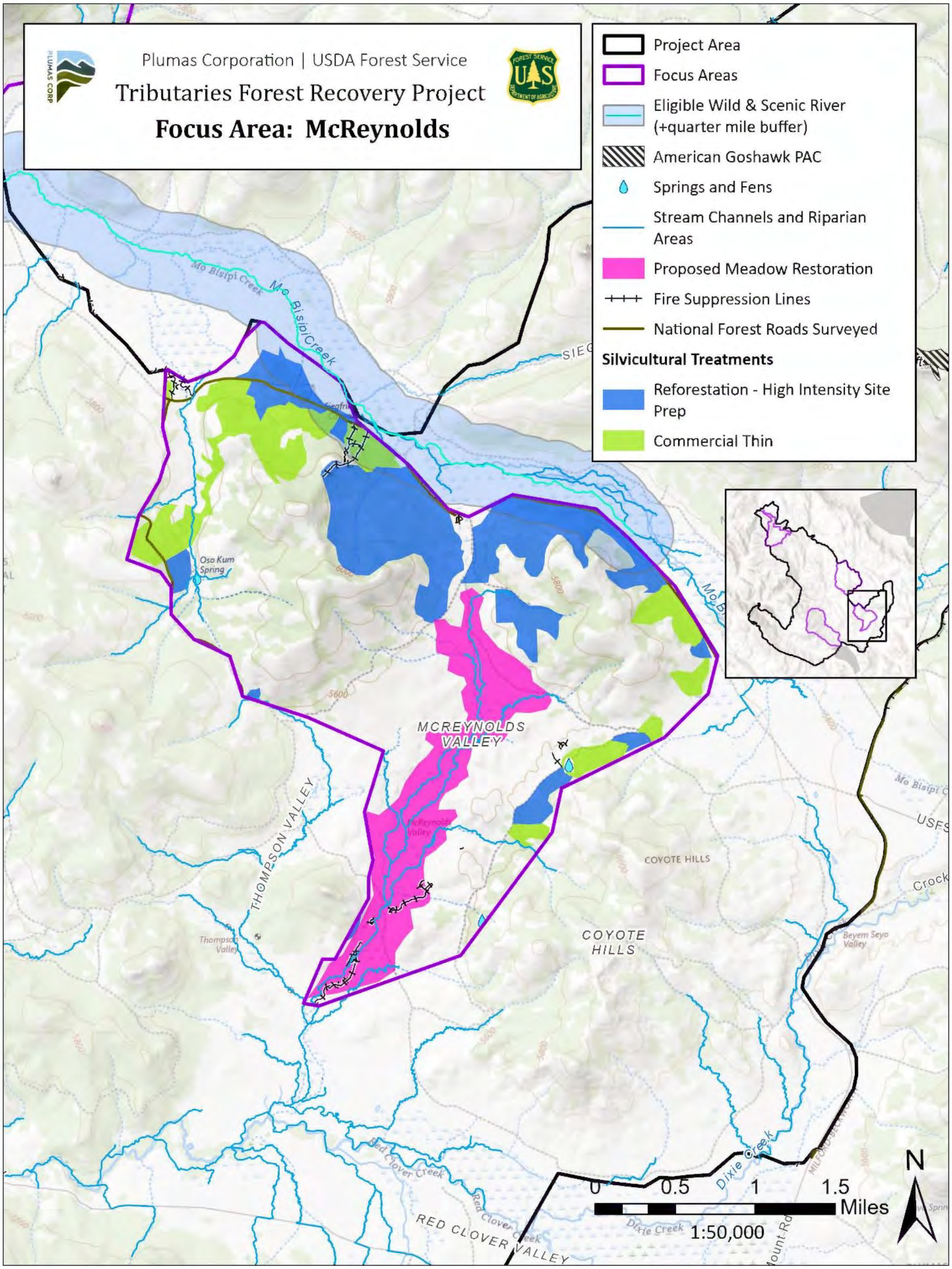

Figure A-10. Proposed actions –silvicultural and watershed treatments—within the McReynolds Focus Area.

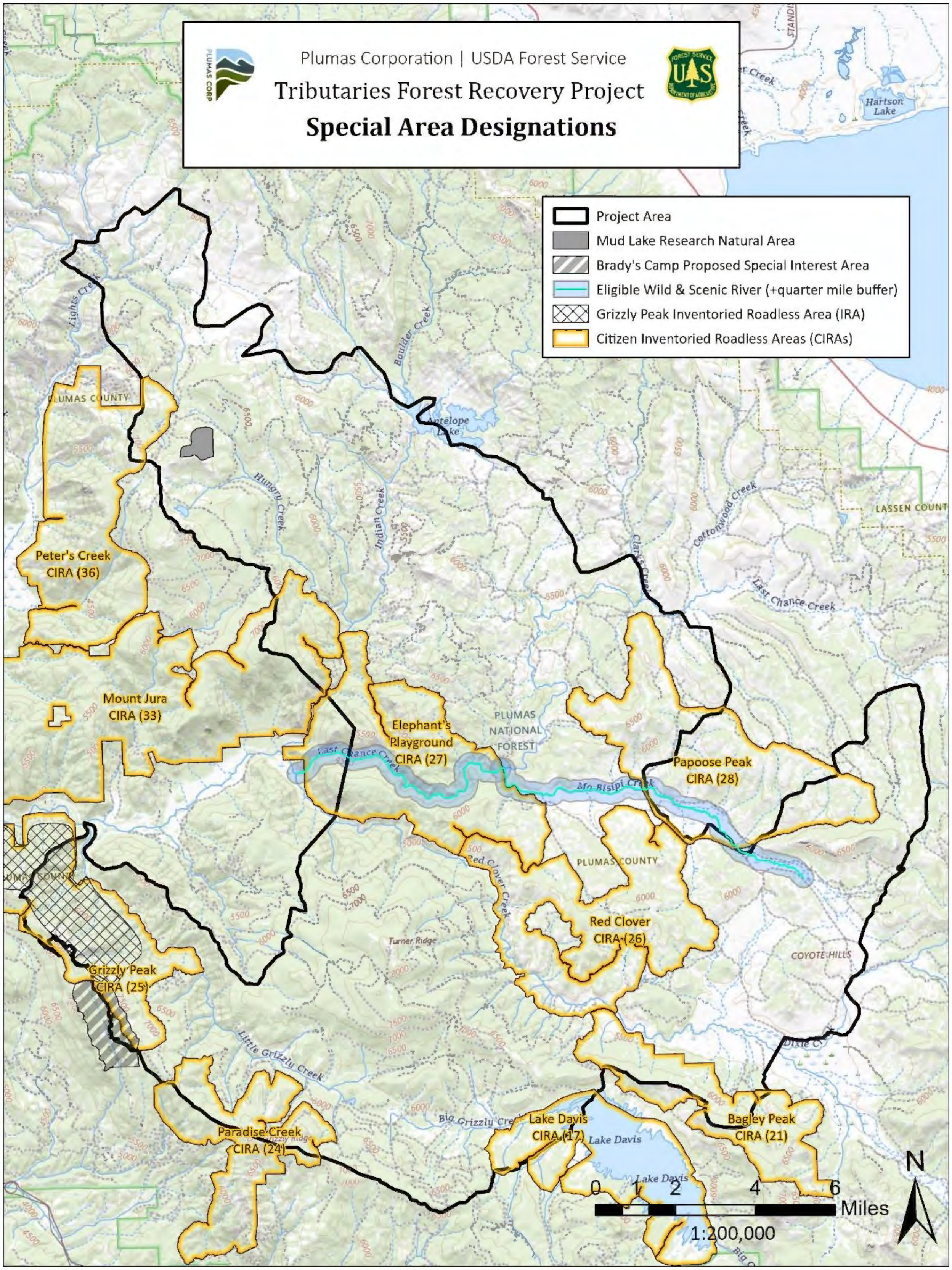

Figure A-11. *Special Area Designations within the Tributaries Forest Recovery Project.*

Appendix B Proposed Actions

Table B-1: Silviculture Treatments

Main treatment type	Sub treatment type	Condition	Example Treatment Descriptions* **Treatments will be objective-based and vary depending on stand type and feasibility.*	Treatment Methods^ *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Reforestation - High Intensity Site Prep	Site prep and reforestation	High intensity stands composed of dead trees generally greater than 12" DBH	Fell dead trees greater than 10" DBH, and mechanically pile or skid to a landing for burning or biomass utilization. Complete site prep on dead and downed trees less than 10" DBH as needed. Apply site prep methods as needed, generally where 1-2 growing seasons of brush has occurred. Generally plant to 100-300 trees per acre with site appropriate trees avoiding single species plantings where feasible. Complete 1-2 release/maintenance treatments post planting as needed. Complete maintenance treatments every 5-10 years as needed, including thinning release every 10 years.	mechanical and hand felling, skidding and decking, mastication, machine felling/piling/burning, hand cut and lop, or pile and burn, prescribed burn, hand planting, release/maintenance (hand, mechanical, herbicide^, prescribed grazing; *see Decision Matrix in Appendix F.*)
Reforestation - Low Intensity Site Prep	Open ground reforestation	High intensity stands which are composed of dead trees generally less than 12" DBH	Complete site prep on dead and downed trees as needed. Apply site prep methods as needed, generally where 1-2 growing seasons of brush has occurred. Generally plant to 100-300 trees per acre with site appropriate trees avoiding single species plantings where feasible. Complete 1-2 release/maintenance treatments, as needed. Complete maintenance treatments every 5-10 years as needed, including thinning release every 10 years.	mastication, machine felling/piling/burning, hand cut and lop, or pile and burn, prescribed burn, hand planting, release/maintenance (hand, mechanical, herbicide^, prescribed grazing; *see Decision Matrix in Appendix F.*)

Main treatment type	**Sub treatment type**	**Condition**	**Example Treatment Descriptions*** **Treatments will be objective-based and vary depending on stand type and feasibility.*	**Treatment Methods^** *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Commercial Thin (outside California spotted owl HRCAs and Territories)	Commercial fuels reduction - westside Sierra Mixed Conifer (SMC)	Low intensity green stands which are currently above target tree density	Thin from below to 16-36% of relative SDI using a mixture of individual trees, clumps, and openings and variable density retention. Favor large, healthy, site-suitable trees for retention. This will generally result in stands between 30-100 trees per acre. Treat excess surface fuels such as downed wood and brush as needed.	whole tree logging, mastication, machine pile/burn, hand thin/pile/burn, prescribed burn, cultural burn
	Commercial fuels reduction - eastside pine		Thin from below to 14-30% of relative SDI using a mixture of individual trees, clumps, and openings and variable density retention. Favor large, healthy, site-suitable trees for retention. This will generally result in stands between 30-100 trees per acre. Treat excess surface fuels such as downed wood and brush as needed.	
	Commercial fuels reduction - true fir		A mosaic of cut areas and leave areas will be created. Prescriptions in cut areas may include group selection and seed tree residual cuts. Cut areas will generally be less than 10 acres. In leave areas, dead, dying, and diseased trees may be thinned. Treat excess surface fuels such as downed wood and brush as needed.	
Commercial Thin – within HRCAs/Territories	Commercial fuels reduction - westside Sierra Mixed Conifer (SMC)	Low intensity green stands which are currently above target tree density	Thin to the following residual canopy cover: • CWHR 4M/D to 40% canopy cover • Maintain CWHR 5M as 5M • CWHR 5D to 50% canopy cover Cut 90% of trees and brush less than 10"DBH. Treat excess surface fuels such as downed wood and brush as needed.	whole tree logging, mastication, machine pile/burn, hand thin/pile/burn, prescribed burn, cultural burn
	Commercial fuels reduction - true fir		Thin to 50% canopy cover. Cut 90% of trees and brush less than 10"DBH. Treat excess surface fuels such as downed wood and brush as needed.	

Main treatment type	**Sub treatment type**	**Condition**	**Example Treatment Descriptions*** **Treatments will be objective-based and vary depending on stand type and feasibility.*	**Treatment Methods^** *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Fuels Reduction – Mechanical	Fuels reduction westside SMC	Low to moderate intensity green stands currently at target overstory live tree density, with excess surface and ladder fuels	Fell and treat dead trees larger than 10" DBH as needed. Thin trees less than 10" DBH such that relative SDI is 16-36% on the stand level. Treat excess surface fuels such as downed wood and brush as needed.	Mastication, machine pile/burn, hand thin/pile/burn, prescribed burn, cultural burn, prescribed grazing
	Fuels reduction eastside pine		Fell and treat dead trees larger than 10" DBH as needed. Thin trees less than 10" DBH such that relative SDI is 14-30% on the stand level. Treat excess surface fuels such as downed wood and brush as needed.	
Fuels Reduction – PAC (within AGOS and CSOW Protected Activity Centers)	Fuels Reduction Protected Activity Center (PAC)	Low to moderate intensity PAC stands	Hand thin trees less than 10" DBH. Treat excess surface fuels such as downed wood and brush as needed.	hand thin/pile/burn, prescribed burn, cultural burn, prescribed grazing
Shaded Fuelbreak	Fuelbreak - High Severity Fire	Areas along ridgelines and select roadways which burned at a severity with 80-100% mortality	Fell dead trees greater than 10" DBH, and mechanically pile or skid to a landing for burning or biomass utilization. Complete site prep on dead and downed trees less than 10" DBH as needed. Apply site prep release methods as needed, generally where 1-2 growing seasons of brush has occurred. Plant to 50-100 trees per acre with site appropriate trees avoiding single species plantings where feasible. Complete 1-2 release/maintenance treatments post planting as needed. Complete maintenance treatments every 5-10 years as needed, including thinning release every 10 years.	mechanical and hand felling, skidding and decking, mastication, machine felling/piling/burning, hand cut and lop, or pile and burn, prescribed burn, cultural burn, hand planting, release/maintenance (hand, mechanical, herbicide^, prescribed grazing; *see Decision Matrix in Appendix F.*)

Main treatment type	**Sub treatment type**	**Condition**	**Example Treatment Descriptions*** **Treatments will be objective-based and vary depending on stand type and feasibility.*	**Treatment Methods^** *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Shaded Fuelbreak	Fuelbreak - Moderate Severity Fire	Areas along ridgelines and select roadways which burned at a severity with 30-80% mortality	Fell and treat dead trees larger than 10" DBH as needed. Thin trees less than 10" DBH to an average total stand density of no more than 50-100 trees per acre including trees outside the thinning spec. Treat excess surface fuels such as downed wood and brush as needed.	mechanical and hand felling, skidding and decking, mastication, machine felling/piling/burning, hand cut and lop, or pile and burn, prescribed burn, cultural burn, hand planting, release/maintenance (hand, mechanical, herbicide^, prescribed grazing; *see Decision Matrix in Appendix F.*)
	Fuelbreak - Low Severity Fire	Areas along ridgelines and select roadways which burned at a severity with less than 30% mortality	Thin from below to 14-18% relative SDI. Favor retention of shade intolerant species. Treat excess surface fuels such as downed wood and brush as needed.	whole tree logging mechanical and hand felling, skidding and decking, mastication, machine felling/piling/burning, hand cut and lop, or pile and burn, prescribed burn, cultural burn, hand planting, release/maintenance (hand, mechanical, herbicide^, prescribed grazing; *see Decision Matrix in Appendix F.*)

Table B-2. Watershed Treatments

Main Treatment type	Sub Treatment type	Condition	Treatment Methods
Meadows	Meadows that have lost their functionality as an ecosystem	Meadow channel(s) disconnected from floodplain; headcutting, erosion, and loss of meadow soil; loss of sediment metering function; degraded meadow habitat -trending to dry vegetation communities, conifer encroachment, presence of non-native invasive species (plants and animals)	Partial ("pond-and-plug") or complete fills; riffle augmentation; instream structures, such as beaver dam analogs and post-assisted log structures; hand or mechanical thin encroaching conifers in and around meadow edges; transplanting/seeding/staking of native wet meadow and riparian plant species; hand and/or herbicide application for eradication and/or control of invasive plant species; prescribed and cultural burn; prescribed grazing; assess control options for non-native animals, such as bullfrogs and signal crayfish; existing, but damaged, fencing will be rebuilt; any new fencing to protect recovering meadow vegetation and soils following restoration will be addressed on a site by site basis in consultation with the Forest range specialist and permittee.
Springs and Fens	Damaged water development infrastructure for wildlife and livestock; fens at risk	Dispersed watering sites for livestock and wildlife are no longer functional; fen conditions are trending to a degraded state	Replace damaged wildlife and livestock water infrastructure; hand remove encroaching conifers around fens; existing, but damaged, fencing and watering infrastructure will be rebuilt; any new fencing to protect spring or fen vegetation and soils or infrastructure will be addressed on a site by site basis in consultation with the Forest range specialist and permittee.
Streams Channels and Riparian Areas	1st & 2nd order channels >2% slope	Channels exhibiting mass sediment movement	Restore large wood channel structure, where applicable, with a focus on restoring sediment metering functions above road crossings, and reducing channel bed and bank erosion.
Stream-Road Crossings	Road erosion, surface flow, and crossings	Roads actively delivering sediment and flow to stream channels; unstable and/or high risk of failure road crossings; barriers to aquatic organism passage (AOP)	To protect water quality, reduce fine sediment delivery from roads by adding drainage structures such as critical dips, rolling dips, dips with leadoff ditches, and ditch relief culverts, and by out-sloping certain segments of road; other activities may include rocking inside ditches and rocking segments of road; improve culvert/channel system function and facilitate AOP at perennial stream crossings through upgrading or replacing existing culvert(s), resetting existing culverts, adding rock material to raise channel elevations to pipe inverts, and clearing debris from blocked culverts.

Main Treatment type	Sub Treatment type	Condition	Treatment Methods
Fire Suppression Lines	Lines that exhibit failure of post-fire rehabilitation measures	Lines actively delivering sediment and flow to stream channels and other waterbodies	Recontouring to remove berms and restore the natural gradient of the hillside; subsoiling or scarification of soil surface to alleviate soil compaction; waterbarring to redirect water captured by fire suppression lines and roads; spreading woody debris throughout to slow runoff; place woody debris or establishing boulder or berm blockades to mitigate use of fire suppression lines as unauthorized roads; installation of erosion control measures to prevent soil loss and gully/rill development; debris removal from blocked culverts (also addressed in Stream-Road Crossing Improvements); and spillway ditch repairs to restore the drainage function of the ditch where filled in by fire suppression activities.
Trail Improvements	Antelope / Taylor Lake Trail System: Antelope/Taylor Lake Trail, Cold Stream Trail, and Middle Creek Trail	Hazard trees, brush reclaiming trails, tread erosion and sloughing on steeper slopes, poor drainage, segments of trail grade greater than 30%, trail signage damaged or missing	Hazard tree removal; trail reconstruction with drain dips or break in grade at a minimum of every 200 feet; re-benching the tread to a minimum of 24 inches where the trail base has sloughed away and/or is actively eroding; hand, mechanical, and/or prescribed grazing vegetation removal (predominantly shrubs and small trees); root ball removal; sign replacement; rerouting trail segments to reduce trail grade to less than 30%, and move away from wet meadow areas; armoring low water crossings with rock.
Signage	Road signs, trail markers, interpretive signs	Burned or damaged signs, areas lacking appropriate signage	Install wood, stone, metal, or composite signage with appropriate information.

Table B-3. Wildlife and Botany Treatments

All proposed habitat enhancement treatments would be monitored for recovery success and adaptive management needs.

Main Treatment type	**Sub Treatment type**	**Condition**	**Treatment Methods^** *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Enhancement of wildlife and botanical habitat	Meadows and Streams	Degraded meadow channels disconnected from floodplain; eroding stream channels (bank and bed erosion); loss of large wood channel structure and habitat; reduced wet meadow vegetation and riparian plant communities; loss of habitat connectivity; presence of non-native species (plants and animals)	Partial or complete fill, riffle augmentation, grade control structures, instream structures, large wood reintroduction, transplanting/seeding/staking of native wet meadow and riparian plant species with consideration/emphasis on willows for willow flycatcher enhancements, pollinator preferred species including milkweed for monarch habitat, and rare/sensitive plant communities; at road/stream interfaces upgrading, resetting, and/or replacing culverts, adding rock material to raise channel elevations to pipe inverts, and clearing debris away from blocked functional culverts to ensure habitat connectivity and aquatic organism passage (AOP); hand, herbicide^ application, or prescribed grazing for eradication and/or control of invasive plant species, and application of mulch in disturbed areas to suppress establishment of invasive plants; management (tending, gathering, burning, planting) of culturally important plants; assess control options for non-native animals, such as bullfrogs and signal crayfish; existing, but damaged, fencing will be rebuilt; any new fencing for habitat recovery and protection will be addressed on a site by site basis in consultation with the Forest range specialist and permittee.
	Perennial and Annual Grasslands, Montane Chaparral, and Sagebrush	Burned and disturbed native grasslands and chaparral communities; presence of non-native invasive plants	Revegetation and reseeding with native grasses, forbs, and shrub species with consideration of historic species composition for ungulate habitat quality and species diversity, pollinator preferred species including milkweed for monarch habitat, and rare/sensitive plant communities; understory burning for habitat maintenance, and/or recovery/expansion of rare/sensitive plant communities; hand, herbicide^ application, or prescribed grazing for eradication/control of invasive plant species; management (tending, gathering, burning, planting) of culturally important plants; existing, but damaged, fencing will be rebuilt; any new fencing for habitat recovery and protection will be addressed on a site by site basis in consultation with the Forest range specialist and permittee.

Main Treatment type	**Sub Treatment type**	**Condition**	**Treatment Methods^** *^ No aerial spraying is proposed in this project. Appropriate spray buffers will apply.*
Enhancement of wildlife and botanical habitat	Forested Uplands (Sierra Mixed Conifer, Red Fir, Eastside Pine)	Not burned or burned at low, moderate, or high severity; High severity burn areas have low potential for natural regeneration; loss of habitat connectivity; presence of non-native invasive plants	Fuel reduction and reforestation treatments (see Appendix A) near known California spotted owl, American (formerly northern) goshawk, and bald eagle occurrences to protect and enhance existing habitat and consider opportunities to create new habitat and/or recover occupancy; understory treatments (fuel reduction and prescribed fire) are evaluated for potential to support ungulate populations, existing and recovery of rare plant communities, carnivore corridor connectivity, and protection of "refugia" habitat (i.e. fire resistant vegetation communities such as aspen, meadows, and riparian areas); hand, herbicide^ application, or prescribed grazing for eradication/control of invasive plant species; management (tending, gathering, burning, planting) of culturally important plants; existing, but damaged, fencing will be rebuilt; any new fencing for habitat recovery and protection will be addressed on a site by site basis in consultation with the Forest range specialist and permittee.
	Baker's Cypress Groves		Confer with Forest Service Ecologist to review any proposed fuel reduction treatments adjacent to groves.

Appendix C Climate Analysis for Tributaries Project

Overview

An evaluation of climate exposure and climatic water deficit within treatment units has been delineated for the Tributaries Project area. Projections for 2010 through 2039 were used to consider both current and predicted near-term future conditions. Climate exposure—the nature and degree to which a system is exposed to significant climate variations (primarily related to temperature and precipitation, in this case)—was classified as >95% =very high, 75-94% = high, 50-75% = moderate, and >50% = low. Climatic water deficit—an estimate of drought stress on soils and plants—was classified using normal breaks in the data, where <18.5 inches (475 mm) = low, 18.5- 22.3 inches (476-541 mm) = moderate, and >22.3 inches (542 mm) = high. These two data sets were combined to include an overall indication of predicted climatic stress based on both exposure and water deficit. Climate data and assessment is based on Thorne et al. (2015, 2016, 2017, 2018)[2].

Climate Exposure

Climate exposure is the nature and degree to which a system is exposed to significant climate variations (primarily related to temperature and precipitation, in this case). Patterns of climate exposure across the project area are shown in Figure C-1. Approximately 6,500 acres of the project area were classified as having very high climate exposure (>95%), including almost 3,700 acres as possible candidates for reforestation. A breakdown of exposure category by treatment type is shown in Table C-1.

Table C-1. Acres in each climate exposure category by treatment type.

	Exposure Category				
Treatment Type	**Low**	**Moderate**	**High**	**Very High**	**Total**
Commercial Thin	5,662	3,664	2,413	2,412	**14,151**
Commercial Thin – within HRCAs/Territories	565	48	175	45	**833**
Shaded Fuelbreak	668	10	5	18	**701**
Fuels Reduction - Mechanical	863	190	106	113	**1,272**
Fuels Reduction - PAC	2,971	246	132	314	**3,663**
Reforestation - High Intensity Site Prep	7,505	2,823	2,640	2,908	**15,876**
Reforestation - Low Intensity Site Prep	2,320	358	215	780	**3,673**
Grand Total	**20,554**	**7,339**	**5,686**	**6,590**	**40,169**

2

Thorne, J. H., Boynton, R. M., Flint, L. E., & Flint, A. L. (2015). *The magnitude and spatial patterns of historical and future hydrologic change in california's watersheds. Ecosphere. 6 (2): 24*.

Thorne, J. H., Boynton, R. M., Holguin, A. J., Stewart, J. A., & Bjorkman, J. (2016). A climate change vulnerability assessment of California's terrestrial vegetation. *California Department of Fish and Wildlife, Sacramento, CA*.

Thorne, J. H., Choe, H., Boynton, R. M., Bjorkman, J., Albright, W., Nydick, K., ... & Schwartz, M. W. (2017). The impact of climate change uncertainty on California's vegetation and adaptation management. *Ecosphere*, *8*(12), e02021.

Thorne, J. H., Choe, H., Stine, P. A., Chambers, J. C., Holguin, A., Kerr, A. C., & Schwartz, M. W. (2018). Climate change vulnerability assessment of forests in the Southwest USA. *Climatic Change*, *148*, 387-402.

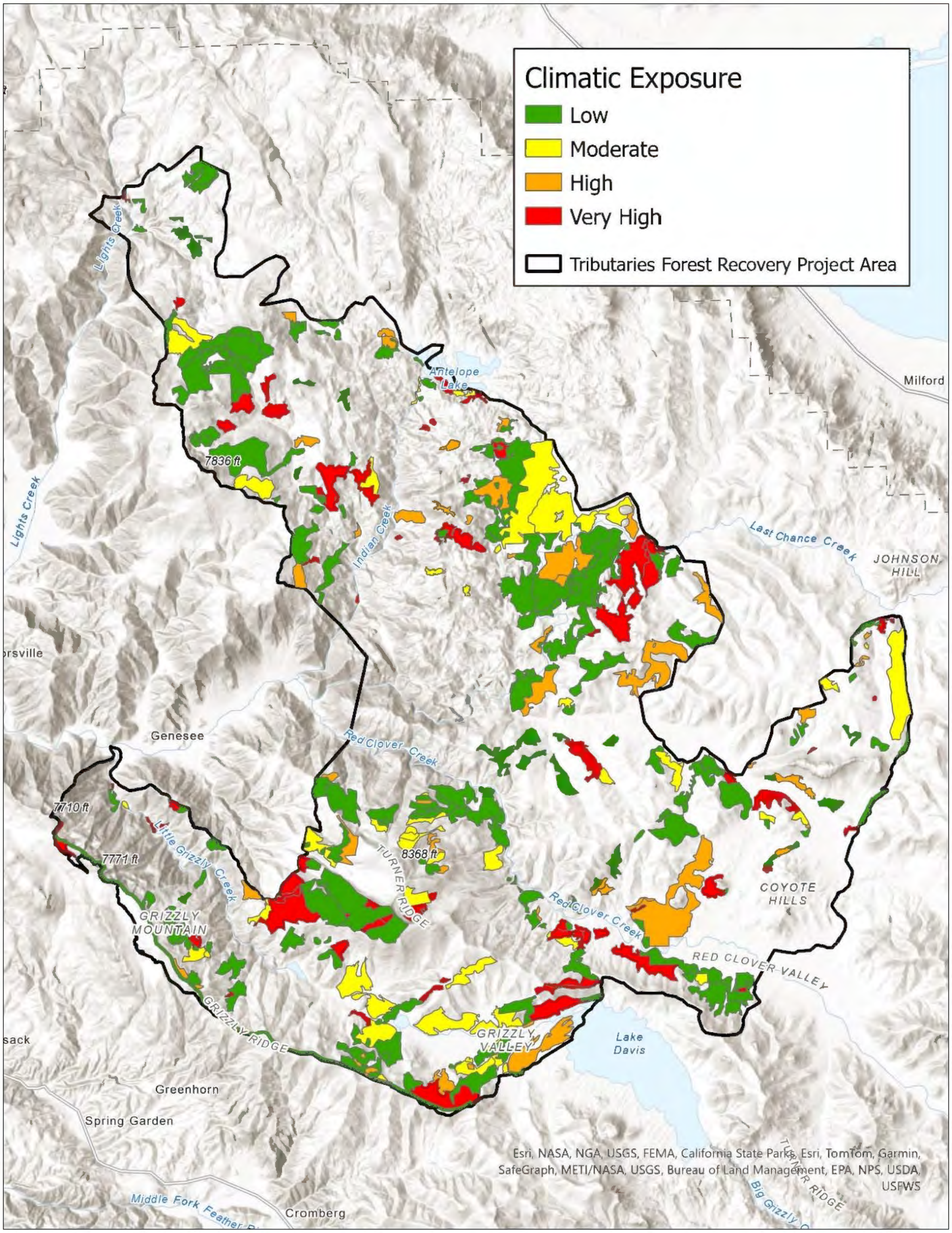

Figure C-1. *Climate exposure categories across the Tributaries Project Area.*

Climatic Water Deficit

Climatic water deficit is an estimate of drought stress on soils and plants. It is the amount of water plants would use if it were available, calculated as the difference between potential evapotranspiration and actual evapotranspiration. Climatic water deficit varied across the project area from 18.7 inches (475 mm) to 24.9 inches (632 mm). Approximately 40% of the project area is within the highest climatic water deficit category, defined as deficits that exceed 21.3 inches (542 mm) (Figure C-2). The distribution of deficit category by treatment type is shown in Table C-2.

Table C-2. Acres by climatic water deficit category.

	Climatic Water Deficit Category			
Treatment Type	**Low**	**Moderate**	**High**	**Total**
Commercial Thin	1,004	6,743	6,404	**14,151**
Commercial Thin – within HRCAs/Territories	61	505	267	**833**
Shaded Fuelbreak	471	230	0	**701**
Fuels Reduction - Mechanical	133	184	955	**1,272**
Fuels Reduction - PAC	0	1,552	2,112	**3,664**
Reforestation - High Intensity Site Prep	4,169	7,737	3,970	**15,876**
Reforestation - Low Intensity Site Prep	0	756	2,917	**3,673**
Grand Total	***5,838***	***17,707***	***16,625***	***40,170***

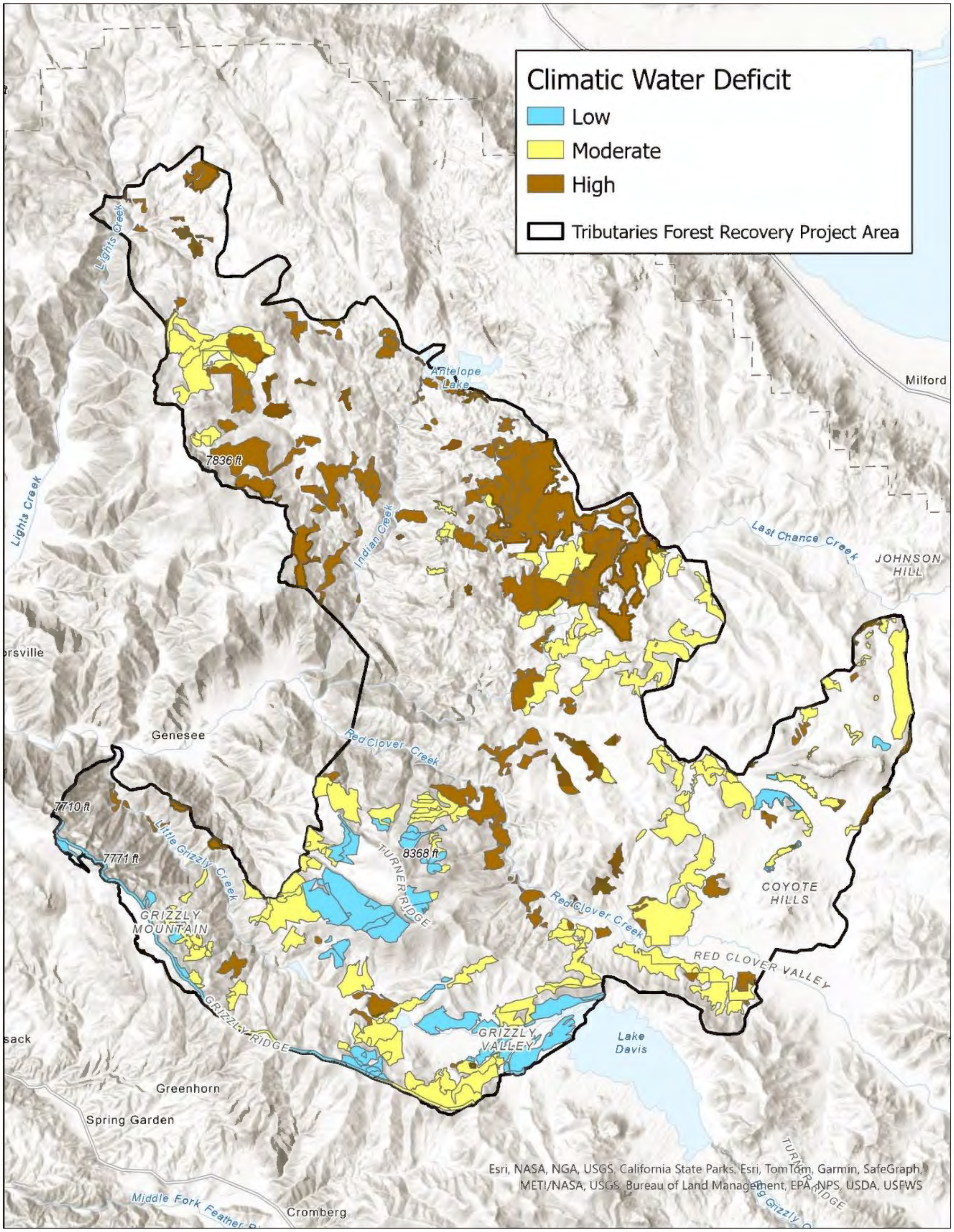

Figure C-2. *Climate water deficit categories across the Tributaries Project Area.*

Combined Climatic Stress

The combined values for climate exposure and climatic water deficit produced a summary of climatic stress in each treatment unit. Summary scores were classified as follows: 6-7 = High, 4-5 = Moderate, and 2-3 = Low (Figure C-3). Approximately 6,800 acres of the Tributaries Project treatment units were delineated as having high climatic stress, including almost 3,500 acres targeted for reforestation. A summary of climatic stress by treatment type is shown in Table C-3.

Table C-3. Acres in each climatic stress (combined climate exposure and climatic water deficit) category by treatment type.

	Climatic Stress			
Treatment Type	**Low**	**Moderate**	**High**	**Total**
Commercial Thin	3,223	8,224	2,704	**14,151**
Commercial Thin – within HRCAs/Territories	0	626	207	**833**
Shaded Fuelbreak	678	23	0	**701**
Fuels Reduction - Mechanical	133	965	174	**1,272**
Fuels Reduction - PAC	1,420	1,930	314	**3,664**
Reforestation - High Intensity Site Prep	6,209	7,093	2,574	**15,876**
Reforestation - Low Intensity Site Prep	192	2,615	866	**3,673**
Grand Total	**11,855**	**21,476**	**6,839**	**40,170**

Management Recommendations Based on Climate

1. Thinning and fuels reduction prescriptions could be more aggressive where climatic stress is moderate or high.
2. Reforestation should be prioritized where climatic stress is low to increase the probability of success. Consider lowering seedling densities where climatic stress is moderate. Areas with high stress may not be suitable for conifers, so reforestation in these areas may be unlikely to succeed. If reforestation does occur in these areas, seedling densities and seed sources should be carefully considered. Microsite cluster planting designs may be appropriate in these areas. Monitoring would be critical to evaluate reforestation outcomes in these areas.

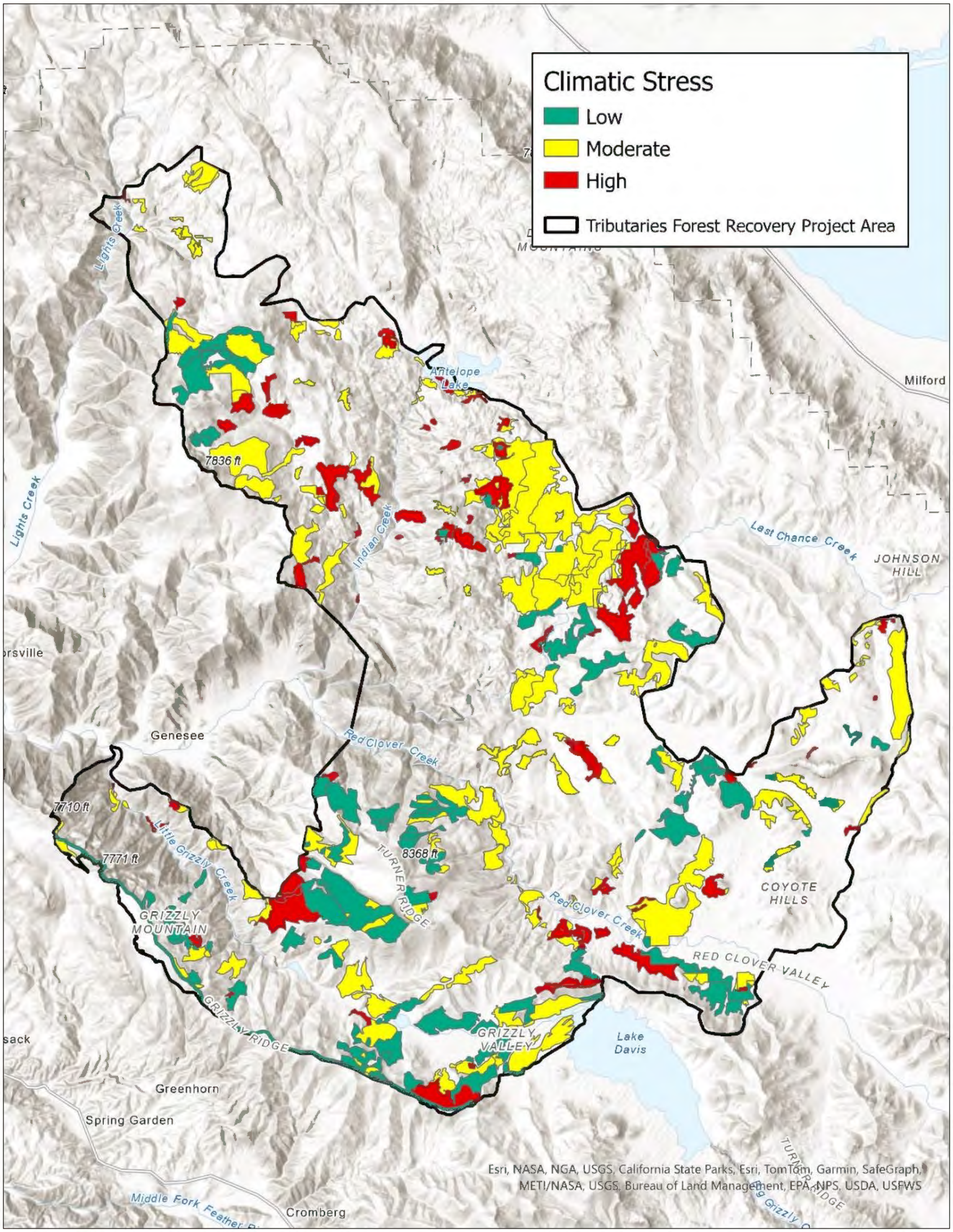

Figure C-3. *Climatic stress (combined climate exposure and climatic water deficit) for the Tributaries Project area.*

Appendix D Forest Plan Amendments and Substantive Requirements

Table D-1. Existing Forest Plan Standards and Guidelines language (Sierra Nevada Forest Plan Amendment (SNFPA) 2004 Record of Decision (ROD)) and Plan Amendment replacement language proposed for the Tributaries Forest Recovery Project.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
DES-PAC-01	**Modify component language – California Spotted Owl Protected Activity Center Designation (SNFPA 2004 ROD p. 37):** California spotted owl protected activity centers (PACs) are ~~delineated surrounding each territorial owl activity center detected on National Forest System lands since 1986. Owl activity centers are designated for all territorial owls based on: (1) the most recent documented nest site, (2) the most recent known roost site when a nest location remains unknown, and (3) a central point based on repeated daytime detections when neither nest or roost locations are known. PACs are delineated to: (1) include known and suspected nest stands and (2) encompass the best available 300 acres of habitat in as compact a unit as possible. The best available habitat is selected for California spotted owl PACs to include: (1) two or more tree canopy layers; (2) trees in the dominant and co-dominant crown classes averaging 24 inches dbh or greater; (3) at least 70 percent tree canopy cover (including hardwoods); and (4) in descending order of priority, CWHR classes 6, 5D, 5M, 4D, and 4M and other stands with at least 50 percent canopy cover (including hardwoods). Aerial photography interpretation and field verification are used as needed to delineate PACs.~~	**Replace with:** California Spotted Owl (CSO) Protected Activity Center (PACs) Designation. California spotted owl PACs are defined by the following characteristics: • National Forest System lands surrounding territorial owls based on a documented nest site; recent roost site if nest location is unknown; or central point of repeated daytime detections when neither nest nor roost locations are known. • 300 acres of nesting and roosting habitat in as compact a unit as possible, including all the elements (a through f) defined[3] under Highest Quality Nesting and Roosting (HQNR) habitat or, if HQNR is scarce, areas including at least the elements a through c listed[1] under Best Available Nesting, Roosting, and Foraging (BANRF) habitat. • Includes sites that provide the most sustainable nesting and roosting habitat that currently meets near-term habitat needs to support reproductive success and can be resilient to natural disturbances and climate change. PACs may be delineated using a variety of tools including field verification, aerial photography interpretation or other remotely sensed data as needed.

[3] See Table D-2 for definitions.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
MGT-PAC-01	**Modify component language - Fires and Fuel Management Strategy (SNFPA 2004 ROD p. 35):** Direction for locating area treatments is included in the standards and guidelines in Part D of this appendix. Treatment patterns are to be developed using a collaborative, multi-stakeholder approach. Resource considerations factored into the strategic placement of fuels treatments include objectives for locating treatments to overlap areas of condition class 2 and 3, high density stands, and pockets of insect and disease. ~~Treatment areas are located to avoid PACs to the greatest extent possible.~~	**Replace with:** Direction for locating area treatments is included in the standards and guidelines in Part D of this appendix. Treatment patterns are to be developed using a collaborative, multi-stakeholder approach. Resource considerations factored into the strategic placement of fuels treatments include objectives for locating treatments to overlap areas of condition class 2 and 3, high density stands, and pockets of insect and disease. Treatment areas should only overlap PACs to the extent necessary to reduce the threat of habitat loss due to wildfire. Treatments shall avoid reducing habitat quality in the HQNR habitat within PACs.
GDL-PAC-01	**Modify component language – S&G 1. Fires and Fuel Management (SNFPA 2004 ROD p. 49)** Strategic placement of fuels treatments should also consider objectives for locating treatment areas to overlap with areas of condition class 2 and 3, high density stands, and pockets of insect and disease. ~~Avoid PACs to the greatest extent possible when locating area treatments.~~ Incorporate areas that already contribute to wildfire behavior modification, including timber sales, burned areas, bodies of water, and barren ground, into the landscape treatment area pattern. Identify gaps in the landscape pattern where fire could spread at some undesired rate or direction and use treatments (including maintenance treatments and new fuels treatments) to fill identified gaps.	**Replace with:** Strategic placement of fuels treatments should also consider objectives for locating treatment areas to overlap with areas of condition class 2 and 3, high density stands, and pockets of insect and disease. Treatment areas should only overlap PACs to the extent necessary to reduce the threat of habitat loss due to wildfire. Treatments shall avoid reducing habitat quality in the HQNR habitat within PACs. Incorporate areas that already contribute to wildfire behavior modification, including timber sales, burned areas, bodies of water, and barren ground, into the landscape treatment area pattern. Identify gaps in the landscape pattern where fire could spread at some undesired rate or direction and use treatments (including maintenance treatments and new fuels treatments) to fill identified gaps.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
GDL-PAC-PB	**Modify guideline for prescribed burning- S&G 74 (SNFPA 2004 ROD p. 60)** ~~In PACs located outside the WUI, limit stand-altering activities to reducing surface and ladder fuels through prescribed fire treatments. In forested stands with overstory trees 11 inches dbh and greater, design prescribed fire treatments to have an average flame length of 4 feet or less. Hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), may be conducted prior to burning as needed to protect important elements of owl habitat.~~	**Replace with:** To restore forest vegetation within California spotted owl PAC, when practical based on existing conditions, use prescribed fire, alone or in combination with mechanical thinning, To minimize loss or damage to known nest and roost trees, include mitigation measures when conducting prescribed fire in PACs. To minimize impacts to overstory canopy and provide conditions for continued use for nesting and roosting within PACs, reduce fuel loads with thinning and/or prescribed burning to minimize the risk of high-severity fire and promote conditions that lead to lower intensity predicted fire effects (generally flame lengths averaging 4 to 6 feet).
STD-PAC-01	**Remove components and add new language – S&G 7. Mechanical Thinning Treatments (within PACs), 72, 73, and 74. (SNFPA 2004 ROD p. 60)** S&G 7. For mechanical thinning treatments in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6) outside WUI defense zones: • ~~Within California spotted owl PACs: Where treatment is necessary, remove only material needed to meet project fuels objectives. Focus on removal of surface and ladder fuels~~. **S&G 72.** ~~Mechanical treatments may be conducted to meet fuels objectives in protected activity centers (PACs) located in WUI defense zones. In PACs located in WUI threat zones, mechanical treatments are allowed where prescribed fire is not feasible and where avoiding PACs would significantly compromise the overall effectiveness of the landscape fire and fuels strategy. Mechanical treatments should be designed to maintain habitat structure and function of the PAC.~~ **S&G 73.** ~~While mechanical treatments may be conducted in protected activity centers (PACs) located in WUI defense zones and, in some cases, threat zones, they are prohibited within a 500-foot radius buffer around a spotted owl activity center within the designated PAC. Prescribed burning is allowed within the 500-foot radius buffer. Hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches DBH), may be conducted prior~~	**Replace with:** In California Spotted Owl PACs, all management activities must maintain or improve habitat quality in HQNR habitat by: 1. Maintaining or improving existing California Wildlife Habitat Relationship (CWHR) class (do not reduce 5D to 5M); 2. Retaining clumps of the largest available trees greater than 24 inches DBH; and 3. Retaining at least two canopy layers at the stand/patch scale in areas where trees with 30” DBH or greater occur. Where necessary to increase long-term resilience, vegetation treatments that may reduce near-term habitat quality may be authorized in up to 100 acres of a PAC outside of HQNR habitat. Throughout PACs all vegetation treatments must: • Retain the largest/oldest trees, known nest trees, and other trees with 30” DBH or greater and snags with cavities, deformities, broken tops, or other habitat features of value to old forest species; • Retain connected areas of moderate (at least 40 percent) and high (at least 60 percent) canopy cover between the known nest site (if nest site is not known, use the most recent known roost site) and areas in the rest of the PAC;

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
	~~to burning as needed to protect important elements of owl habitat. Treatments in the remainder of the PAC use the forest-wide standards and guidelines for mechanical thinning.~~ **S&G 74.** ~~In PACs located outside the WUI, limit stand-altering activities to reducing surface and ladder fuels through prescribed fire treatments. In forested stands with overstory trees 11 inches dbh and greater, design prescribed fire treatments to have an average flame length of 4 feet or less. Hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), may be conducted prior to burning as needed to protect important elements of owl habitat.~~	• Avoid mechanical treatments within a 10-acre area surrounding the most recent known nest; • Avoid creating new landings, new temporary roads, or canopy gaps larger than 0.25 acres comprising no more than 5 acres in total; • Increase the Quadratic Mean Diameter (QMD) of trees at the PAC scale; and • Maintain the average canopy cover of the PAC above 50 percent. Prescribed burning is allowed within the 10 acres surrounding a nest tree or structure. Pre-treatment in preparation of prescribed burning may be conducted prior to burning, as needed, including handline construction, tree pruning, and cutting of small trees (less than 8 inches DBH). **Exceptions:** This standard may be modified as specified in Wildland Urban Intermix (WUI) defense zones or when constructing a fuelbreak where avoiding overlap with a PAC is not feasible. To limit fragmentation and maintain connectivity of HQNR and BANRF habitat, construction of fuelbreaks should avoid intersecting with California spotted owl PACs. Treatments in WUI defense zones and creation of a fuelbreaks must: • Avoid the 10 acres surrounding the most recent known nest site; • Avoid existing HQNR habitat; and • Maintain at least 40 percent overstory canopy cover and 10 percent understory cover in shaded fuelbreaks, whenever fuels and fire behavior objectives can be met with this level of vegetation retention.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
STD-PAC-02	**Modify component language – S&G 33. California Spotted Owl Survey (SNFPA 2004 ROD p. 54)** ~~Conduct surveys in compliance with the Pacific Southwest Region's survey protocols during the planning process when proposed vegetation treatments are likely to reduce habitat quality in suitable California spotted owl habitat with unknown occupancy. Designate California spotted owl protected activity centers (PACs) where appropriate based on survey results.~~	**Replace with:** Before authorizing and before implementing mechanical vegetation treatments within existing PACs or vegetation treatments in CSO nesting and roosting habitat of unknown occupancy, forests must follow current guidance for the Pacific Southwest region to: • Determine occupancy status; • Identify owl nest sites (where nest location is not known, the most recent daytime roost); and • Delineate new or modify existing PACs and Territories, as necessary, within the project area.
DES-TERR-01	**Modify component language – Old Forest Ecosystem and Associated Species Strategy (SNFPA 2004 ROD p. 31)** A network of land allocations, including California spotted owl and northern goshawk protected activity centers (PACs), California spotted owl ~~home range core areas~~, forest carnivore den sites, and the southern Sierra fisher conservation area, with management direction […]	**Replace with:** A network of land allocations, including California spotted owl and American (formerly northern) goshawk protected activity centers (PACs), California spotted owl Territories, forest carnivore den sites, and the southern Sierra fisher conservation area, with management direction […]
DES-TERR-02	**Replace HRCA designation with Territory designation (SNFPA 2004 ROD p. 39)** ~~California Spotted Owl Home Range Core Areas (HRCAs) Designation. A home range core area is established surrounding each territorial spotted owl activity center detected after 1986. The core area amounts to 20 percent of the area described by the sum of the average breeding pair home range plus one standard error. Home range core area sizes are as follows: 2,400 acres on the Hat Creek and Eagle Lake Ranger Districts of the Lassen National Forest, 1,000 acres on the Modoc, Inyo, Humboldt-Toiyabe, Plumas, Tahoe, Eldorado, Lake Tahoe Basin Management Unit and Stanislaus National Forests and on the Almanor Ranger District of Lassen National Forest, and 600 acres of the Sequoia and Sierra National Forests.~~ ~~Aerial photography is used to delineate the core area. Acreage for the entire core area is identified on national forest lands. Core areas encompass the best available California spotted owl habitat in the closest proximity to the owl activity center. The best available contiguous habitat is selected to incorporate, in descending order of~~	**Replace with:** California Spotted Owl Territories Designation Territories are defined by the following characteristics: A 1,000-acre circle, which includes the 300-acre PAC, surrounding territorial owls, centered on a documented nest site or roost site if nest location is unknown or central point of repeated daytime detections when neither nest nor roost locations are known. • Territory boundaries should include the entire PAC and be adjusted to include suitable habitat in the most sustainable areas (moist vegetation types and site conditions, often in drainages or on north-facing slopes) and to exclude unsuitable habitat. • Contains diverse structural and seral conditions to facilitate nesting, roosting, and foraging. • May overlap adjacent Territories. • Territories are established and retired together with PACs.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
	~~priority, CWHR classes 6, 5D, 5M, 4D and 4M and other stands with at least 50 percent tree canopy cover (including hardwoods). The acreage in the 300-acre PAC counts toward the total home range core area. Core areas are delineated within 1.5 miles of the activity center.~~ ~~When activities are planned adjacent to non-national forest lands, circular core areas are delineated around California spotted owl activity centers on non-national forest lands. Using the best available habitat as described above, any part of the circular core area that lies on national forest lands is designated and managed as a California spotted owl home range core area.~~	When activities are planned adjacent to non-national forest lands containing known CSO nest stands, a 1,000-acre circle Territory should be delineated around known CSO activity centers on non-national forest lands. Any part of the circular core area that lies on national forest lands is designated and managed as a CSO Territory.
DC-TERR-1A	**Replace HRCA desired condition with Territory desired condition (SNFPA 2004 ROD p. 40 & 46)** ~~**California Spotted Owl Home Range Core Areas (HRCAs) Desired Conditions**~~ ~~HRCAs consist of large habitat blocks that have: (1) at least two tree canopy layers; (2) at least 24 inches DBH in dominant and co-dominant trees; (3) a number of very large (greater than 45 inches DBH) old trees; (4) at least 50 to 70 percent canopy cover; and (5) higher than average levels of snags and down woody material.~~ ~~**California Spotted Owl Home Range Core Areas (HRCAs) Management Objectives:**~~ ~~Establish and maintain a pattern of fuels treatments that is effective in modifying wildfire behavior. Design treatments in HRCAs to be economically efficient and to promote forest health where consistent with habitat objectives.~~ ~~**California Spotted Owl Home Range Core Areas (HRCAs) Management Intent:**~~ ~~Treat fuels using a landscape approach for strategically placing area treatments to modify fire behavior. Retain existing suitable habitat, recognizing that habitat within treated areas may be modified to meet fuels objectives. Accelerate development of currently unsuitable habitat (in non-habitat inclusions, such as plantations) into suitable condition. Arrange treatment patterns and design treatment prescriptions to avoid the highest quality habitat (CWHR types 5M, 5D, and 6) wherever possible.~~	**Replace with:** **California Spotted Owl Territories Desired Conditions** At least 60 percent of each California spotted owl Territory, including the PAC, consists of HQNR habitat in large enough patches to provide interior stand conditions (generally 1 to 2 tree heights from an edge) surrounded by BANRF, preferably with a greater proportion of HQNR to BANRF, particularly closer to the nest. The remainder of the Territory consists of a diversity of many different structure and canopy classes. For areas where multiple Territories comprise over 75 percent of a watershed (typically a HUC 12 unit and greater than 10,000 acres in size) at least 30-50 percent of the watershed consists of the HQNR and BANRF habitat and the remainder of the Territory consists of a diversity of many different structure and canopy classes.

<table>
<tr><th>ID</th><th>Existing Forest Plan Direction</th><th>Proposed Project-Level Forest Plan Amendment</th></tr>
<tr><td>STD-TERR-1A</td><td>Modify component language – S&G 7. Mechanical Thinning Treatments (within Territories) (SNFPA 2004 ROD p. 50)

~~For mechanical thinning treatments in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6) outside WUI defense zones:~~
• ~~Design projects to retain at least 40 percent of the existing basal area. The retained basal area should generally be comprised of the largest trees.~~
• ~~Where available, design projects to retain 5 percent or more of the total treatment area in lower layers composed of trees 6 to 24 inches dbh within the treatment unit.~~
• ~~Design projects to avoid reducing pre-existing canopy cover by more than 30 percent within the treatment unit. Percent is measured in absolute terms (for example, canopy cover at 80 percent should not be reduced below 50 percent.)~~
• ~~Within treatment units, at a minimum, the intent is to provide for an effective fuels treatment. Where existing vegetative conditions are at or near 40 percent canopy cover, projects are to be designed remove the material necessary to meet fire and fuels objectives.~~
• ~~Within California spotted owl Home Range Core Areas: Where existing vegetative conditions permit, design projects to retain at least 50 percent canopy cover averaged within the treatment unit. Exceptions are allowed in limited situations where additional trees must be removed to adequately reduce ladder fuels, provide sufficient spacing for equipment operations, or minimize re-entry. Where 50 percent canopy cover retention cannot be met for reasons described above, retain at least 40 percent canopy cover averaged within the treatment unit.~~
• ~~Outside of California spotted owl Home Range Core Areas: Where existing vegetative conditions permit, design projects to retain at least 50 percent canopy cover within the treatment unit. Exceptions are allowed where project objectives require additional canopy modification (such as the need to adequately reduce ladder fuels, provide for safe and efficient equipment operations, minimize re-~~</td><td>Replace with:

1. When a Territory contains less than 60 percent HQNR and BANRF habitat, <u>maintain or improve</u> all HQNR and BANRF habitat wherever it exists throughout the Territory.
2. When a Territory contains 60 percent or more HQNR and BANRF habitat, retain[4] at least 60% suitable habitat. Treatments will promote heterogenous structure across the Territory and prioritize <u>maintaining or improving</u> HQNR habitat in drainages and north- or east-facing slopes.</td></tr>
</table>

[4] Retain refers to the extent of habitat. It does not prevent treatments.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
	~~entry, design cost efficient treatments, and/or significantly reduce stand density.) Where canopy cover must be reduced below 50 percent, retain at least 40 percent canopy cover averaged within the treatment unit.~~	
STD-TERR-02	**Add new standard** *[None]*	When mechanical treatments create canopy gaps within California spotted owl Territories, but outside of PACs, individual openings shall not exceed 1.25 acres (and should generally not exceed 0.5 acre) and shall not comprise more than 30 percent of the total area in the Territory. This includes openings created for the construction of landings or temporary roads (restricted to 1.0 mile or less).
GDL-TERR-01	**Add new guideline** *[None]*	To promote high-quality nesting and denning habitat for old-forest-associated species, thinning in CSO Territories to increase heterogeneity and resilience should retain the oldest and largest trees and trees with 30" DBH or greater with habitat features (such as deformities, broken tops, large branches, and cavities) that benefit these wildlife species. Desired conditions for large tree density vary by vegetation type and site conditions.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
GDL-TERR-02	**Add new guideline** *[None]*	To facilitate development of future nest sites, vegetation treatments in California spotted owl Territories should: • Promote growth of trees greater than 24 inches DBH and especially trees greater than 30" DBH, and • Retain clumps or groups of trees greater than 24 inches DBH and/or 100 feet tall, and especially trees greater than 30 inches DBH and/or 150 feet tall, with canopy cover greater than 60 to 70 percent.
GDL-PROJ-01	**Add new guideline** *[None]*	To promote habitat connectivity at the watershed scale, when conducting vegetation treatments in California spotted owl Territories, retain connected areas of moderate and high canopy cover in large/tall trees.
GDL-PROJ-02	**Add new guideline** *[None]*	To provide for continued availability of patches of nesting, roosting, and foraging habitat (6, 5D, 5M, and 4D in descending order of priority), in ecologically sustainable areas, consider aspect and position on slope as follows: • On north and east facing slopes, drainages, swales and canyon bottoms – when conducting treatments to improve resilience – maintain patches of large/tall trees with moderate and high canopy cover large enough to provide beneficial thermal or predatory protection, amongst more heterogenous conditions. To facilitate movement, retain connectivity between patches when possible. • On south- and west-facing slopes and on ridges, prioritize restoration toward forest conditions resistant to stressors.
GDL-PROJ-03	**Add new guideline** *[None]*	To promote connectivity of old-forest habitat by prioritizing restoration-focused treatments in areas between isolated old-forest patches, avoid creating large areas of open canopy habitat (vegetation cover less than 30 percent) that would isolate patches of old, dense forest and limit wildlife movement.
STD-DNA-01	**Do Not Amend: S&G 16. Salvage (SNFPA 2004 ROD p. 53)** S&G 16. Outside of WUI defense zones, salvage harvests are prohibited in PACs and known den sites unless a biological evaluation determines that the areas proposed for harvest are rendered unsuitable for the purpose they were intended by a catastrophic stand-replacing event.	*[Do not replace or remove]*

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
STD-PROJ-1B	**Modify component language – S&G 6. Mechanical Thinning Treatments (SNFPA 2004 ROD p. 50):** For all mechanical thinning treatments, design projects to retain ~~all live conifers 30 inches DBH or larger. Exceptions are allowed to meet needs for equipment operability.~~	Retain all live conifer trees 30 inches DBH or larger when implementing mechanical thinning treatments, except in the case of imminent threat to life and property, or if one of the scenarios below is met: • Outside of American (formerly northern) goshawk PACs, California spotted owl PACs, California spotted owl HRCAs, and suitable habitat within California spotted owl Territories, conifers greater than 30 inches DBH but less than 40 inches DBH may be felled to create coarse wood debris (where it is lacking), or removed, under the following circumstances: 5. In overly dense stands that exceed the target stand density for their forest type, to favor retention or promote the growth of even larger or older shade-intolerant trees to more effectively meet project objectives for tree species composition and forest stand density; 6. To improve the growth and vigor of mid to late-seral stage sized shade-intolerant Jeffrey and ponderosa pine, black oak, rust-resistant whitebark pine, and rust-resistant sugar pine greater than 16” DBH by reducing competition from surrounding trees; 7. When removing trees is needed for aspen, oak, or meadow restoration treatments or for cultural or Tribal importance. 8. Within homogenous plantations, to reduce loss of trees 30” DBH or greater due to competition in overly dense stands. No more than an average of one 30-40” DBH shade-intolerant tree per ten acres of commercial thin units will be removed. Trees with desired wildlife characteristics will be retained. • Where required for equipment operability and safety, individual trees less than 35 inches DBH may be removed on an incidental basis.
STD-PROJ-02	**Add new standard** *[None]*	Known nest, roost, rest, or den trees used by at-risk species, including surrounding trees that provide beneficial thermal or predatory protection, must not be purposefully removed, except for the reasonably unavoidable removal of hazard trees and as required to meet other State or Federal regulatory requirements.

ID	Existing Forest Plan Direction	Proposed Project-Level Forest Plan Amendment
STD-PROJ-03	**S&G 7. Mechanical Thinning Treatments (outside of PACs and Territories) (SNFPA 2004 ROD p. 50):** For mechanical thinning treatments in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6) **outside WUI defense zones**: • Design projects to ~~retain at least 40 percent of the existing basal area. The retained basal area should generally be comprised of the largest trees.~~ ~~• Where available, design projects to retain 5 percent or more of the total treatment area in lower layers composed of trees 6 to 24 inches DBH within the treatment unit.~~ ~~• Design projects to avoid reducing pre-existing canopy cover by more than 30 percent within the treatment unit. Percent is measured in absolute terms (for example, canopy cover at 80 percent should not be reduced below 50 percent.)~~ ~~• Within treatment units, at a minimum, the intent is to provide for an effective fuels treatment. Where existing vegetative conditions are at or near 40 percent canopy cover, projects are to be designed remove the material necessary to meet fire and fuels objectives.~~	**Replace with:** For mechanical thinning treatments mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6) **outside WUI defense zones**, **American (formerly northern) goshawk PACs, California spotted owl PACs, and California spotted owl Home Range Core Areas (HRCAs), and suitable habitat within California spotted owl Territories**: •Design projects to a relative stand density index (rSDI) of 14-36%.
STD-PROJ-04	**S&G 8. Mechanical Thinning Treatments (SNFPA 2004 ROD p. 51):** For mechanical thinning treatments outside defense zones in the eastside pine type: in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6), design projects to ~~retain 30 percent of the existing basal area. The retained basal area should be generally comprised of the largest trees. Projects in the eastside pine type have no canopy cover retention standards and guidelines.~~	**Replace with:** For mechanical thinning treatments outside defense zones in the eastside pine type: in mature forest habitat (CWHR types 4M, 4D, 5M, 5D, and 6), design projects to a relative stand density index (rSDI) of 14-36%. Favor large, healthy, site-suitable trees for retention. Projects in the eastside pine type have no canopy cover retention standards and guidelines.

Table D-2. Definitions used in amendments.

Term	Definition
Highest Quality Nesting and Roosting Habitat (HQNR)	**HQNR**[5] habitat are areas preferred by CSO for nesting and roosting. It includes all of the following: a. Forests within CWHR classes 6, 5D, 5M with greater than 50 percent canopy cover; b. Trees in the dominant and co-dominant crown classes averaging 24 inches DBH or greater, c. Large trees (≥ 30” DBH) and/or tall trees (greater than 150 feet tall) and some very large trees (≥ 36” DBH). d. High (> 60%) or moderately high (50-59.9%) canopy cover with areas greater than 70 percent, including hardwoods; e. Two or more tree canopy layers; and f. Contains some very large snags (≥ 45” diameter) and snags and down woody material levels on the high end of the range appropriate for the forest type. *Operationally, using CWHR classes 6, 5D, and 5M when designing projects is acceptable.*
Best Available Nesting, Roosting, and Foraging Habitat (BANRF)	**BANRF**[6] habitat is important for CSO for foraging and may provide conditions that support current spotted owl reproduction in the absence of preferable **HQNR**. **BANRF** habitat include the following: a. Forests within CWHR classes of 5M, 4D, or 4M with very large (≥ 36” DBH) remnant trees; b. Trees in the dominant and co-dominant crown classes ideally average 20 inches QMD or greater and including some large trees (≥ 30” DBH); c. High (> 60%) or moderately high (50-59.9%) canopy cover, including hardwoods, or moderate (40.0-59.9%) canopy cover in trees greater than 20 inches DBH where higher canopy cover is not available; BANRF habitat should be selected based on areas that may also include: d. Two or more tree canopy layers; and e. Contains some very large snags (≥ 45” diameter) and medium to large snags and down woody materials levels as on the moderate to high end of the range appropriate for the forest type. *Operationally, using stands with CWHR classes 4D and 4M when designing projects is acceptable.*
Suitable habitat	Suitable habitat for CSO includes both **HQNR** and **BANRF** habitat. Stands outside of these designations are classified as unsuitable. *Operationally, this includes CWHR classes 6, 5D, 5M, 4D, and 4M.*

[5] Adapted from the CSO Strategy Habitat Suitability and Quality (p. 22-23) and Approach 1: PACs 1.C and 4.C (p. 26 and 28, respectively).
[6] Adapted from the CSO Strategy Habitat Suitability and Quality (p. 22) and Approach 1: PACs 1.C and 4.C (p. 26 and 28, respectively).

Term	Definition
Maintain habitat	Maintaining a habitat type will keep its habitat classification in **HQNR** and **BANRF**. Treatments may still occur, but they cannot result with the stand **downgrading** to a lower habitat type or being **removed** from suitable habitat (i.e. **HQNR** → **HQNR**, **BANRF** → **BANRF**). *Operationally for **HQNR**, CWHR classes 6, 5D, and 5M → 6, 5D, and 5M.* *Operationally for **BANRF**, CWHR classes 4D and 4M → 4D and 4M.*
Improve habitat	Improving a habitat occurs when treatments improve the habitat quality via thinning or removal of smaller trees that increase overall QMD. **HQNR** can be improved within the **HQNR** classification. **BANRF** → **HQNR**. *Operationally for **BANRF**, CWHR classes 4D and 4M → 5D and 5M.*
Downgrade habitat	Downgrading occurs when altering a habitat so that it no longer functions in the same way pre-treatment but still serves as suitable habitat for CSO. Characterized by **HQNR** → **BANRF. BANRF** cannot be downgraded, reduction of quality results in habitat **removal**. *Operationally for **HQNR,** this occurs when CWHR classes 6, 5D, or 5M → 4D or 4M.* *Operationally for **HQNR,** this occurs when CWHR classes 4D or 4M → unsuitable habitat.*
Remove habitat	Habitat removal occurs when suitable habitat loses its functionality for CSO nesting, roosting, foraging, or dispersal habitat post activity. *Operationally, **HQNR** or **BANRF** → unsuitable habitat.*
Retain	Retain is used in these components to keep the described element during treatments. Often this explicitly means to keep certain features (snags, clumps, large trees, corridors, etc.), but it can also be used to specify the extent, or area, of habitat that is to be kept. In these instances, treatments can still occur as long as the extent of acreage is not reduced beyond the specified threshold.
Occupancy Status	Occupancy and historical occupancy status shall be assessed as defined in the 2019 Conservation Strategy for the California Spotted Owl in the Sierra Nevada, or more current guidance provided by the Pacific Southwest region.
Unknown occupancy	Nesting and roosting habitat of unknown occupancy is a contiguous patch of at least 300 acres of **HQNR** or **BANRF** habitat not overlapping with known Territories and not surveyed during the prior three years.

Table D-3. Consistency with the Substantive Requirements for a Forest Plan Amendment

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
36 CFR 219.8 Sustainability 36 CFR 219.8 requires forest plans to provide for social, economic, and ecological sustainability with Forest Service authority and consistent with the inherent capability of the plan area. 36 CFR 219.8(a) Ecological sustainability (1) Ecosystem integrity	The overarching purpose of 36 CFR 219.8(a)(l) is to provide for ecological sustainability through maintaining and restoring ecosystem integrity in the plan area. Forest plans must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds, including plan components to maintain or restore ecosystem structure, function, composition, and connectivity. Ecologica1 sustainability refers to the capability of ecosystems to maintain ecological integrity (36 CFR219.19). Ecological integrity is the quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity, and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence (36 CFR 219.19).	Ecological sustainability requires a persistent, present, functioning ecosystem. Under current forest conditions, both ecological sustainability and integrity are compromised because, compared to historic conditions, the existing forested landscape is unnaturally dense with substantially higher numbers of less fire-resistant, small- to medium-sized trees; excessive accumulations of surface and understory ladder fuels; and is in an overly stressed condition due to changes in precipitation (less snowpack and increasing rain to snow ratio leading to drought-stress), increasing temperature, and over a century of fire exclusion. Together, these existing conditions greatly reduce the forested landscape's ability to persist under changing conditions or severe disturbances. Competition for limited resources in stressed, overly dense forest stands increases the landscape's vulnerability to extensive insect and disease infestations, drought, and the persistent and growing threat and occurrence of large-scale, high severity megafires (USDA-FS 2019, pp. 17-19). The project-specific plan amendment is integrated with existing Forest Plan direction to encourage and support maintaining ecological sustainability in the Project Area. The amended Forest Plan meets the purpose of maintaining and restoring ecological integrity because it contains plan components, including desired conditions, standards, guidelines, and potential management approaches, aimed at restoring resilient forest conditions. These plan components are guided by scientific literature analyzing and addressing historic forest conditions that developed under active fire regimes and anticipated changes in climate. The amended Forest Plan allows the Tributaries Forest Recovery Project to develop forest stands that are more resilient to severe disturbances from wildfire, drought,	Ecological sustainability of forest ecosystems in the Project is highly compromised. Beneficial low-to-moderate severity fire has been largely absent in this landscape for more than a century. As a result of decades of fire exclusion, past harvest activities and current management direction, structure and composition of the landscape's forests have been substantially altered from historic conditions. Forests in this landscape were historically less dense and characterized by high levels of variability in stand structures (structural heterogeneity); greater numbers of larger, shade-intolerant, fire-resistant trees; and less continuous tree canopy cover with more forest gaps and openings. Stands under these historic conditions were substantially more resilient to severe impacts from natural disturbances compared to the highly altered forests that exist in this landscape today. Forests today are overly dense with greater numbers of small- and medium-sized trees, generally have continuous tree canopy cover, are dominated by less fire-resilient, shade-tolerant conifers, and contain significant ladder fuels and diseased trees. Forests in this condition are highly susceptible to severe and widespread impacts from wildfire, drought, and insect and disease infestations. This is already evident by the many acres impacted by high severity fire both within and surrounding the Project area from the Walker (2019) and Dixie (2021) Fires. Another large, high- severity wildfire or drought in the Project area would cause significant damage to ecosystem integrity. The project-specific Forest Plan amendment is integral to accomplishing the Project's objectives. The proposed action, which includes the project-specific Forest Plan amendment, meets the purpose and need

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
		insects, and diseases, thereby providing for ecological sustainability and ecosystem integrity.	compared to the no action alternative.
36 CFR 219.9 Diversity of Plant and Animal Communities 36 CFR 219.9 adopts a complementary ecosystem (coarse filter) and species-specific (fine filter) approach to maintaining the diversity of plant and animal communities and the persistence of native species within the plan area 36 CFR 219.9(a) Ecosystem plan components (1) Ecosystem integrity and (2) Ecosystem diversity	The overarching purpose of 36 CFR 219.9(a) is to provide the ecological conditions to maintain the diversity of plant and animal communities and support the persistence of most native species in the plan area. Requirements for plan components under 36 CFR 219.9(a)(1) mirror those for 36 CFR 219.8(a)(l) addressed in the preceding section. Under 36 CFR 219.9(a)(2), forest plans must include plan components, including standards or guidelines, to maintain or restore the diversity of ecosystems and habitat types throughout the plan area. In doing so, the plan must include plan components to maintain or restore: (i) key characteristics associated with terrestrial and aquatic ecosystem types; (ii) rare aquatic and terrestrial plant and animal communities; and (iii) the diversity of native tree species similar to that existing in the plan area.	Since Euro-American settlement, grazing, logging, mining, and fire exclusion have interacted to greatly alter the historical fire regime and vegetation patterns in Sierra Nevada forests (Knapp et al. 2013; Stephens et al. 2015), including forests across the Plumas National Forest. The current landscape is now dominated by fuel-rich, early- to mid-seral stage, overstocked forests comprised disproportionately of less fire-tolerant species (Hessburg et al. 2005; Knapp et al. 2013; Stephens et al. 2015; Storer and Usinger 1963). Given the uncharacteristically high canopy cover, tree density, and continuity of abundant surface fuels, the landscape has become less resilient to disturbance events and agents and is especially susceptible to extensive and uncharacteristically severe fires (Beaty and Taylor 2007; Hessburg et al. 2005; Meyer et al. 2008). The amended plan maintains the diversity of plant and animal communities and supports the persistence of native species in the project area through plan components designed to enhance ecosystem integrity and ecosystem diversity. The amended plan, meets the substantive requirement’s purpose by directing, guiding, and, in some cases, limiting active management to: (1) establish, favor retention, and/or promote growth of larger or older shade-intolerant trees in overly dense stands to more effectively meet project objectives for tree species composition and forest stand density; (2) promote heterogeneity within stands; and (3) reduce loss of large diameter trees due to competition in overly dense stands. (USDA-FS 2019)	The absence of frequent, low- to moderate-severity fires in the Project area has resulted in the homogenization and development of overly dense stands with an overabundance of shade-tolerant, less fire-resistant trees and led to excessive accumulations of surface, ladder, and canopy fuels. The shift in tree species composition, coupled with overly dense forests and heavy accumulations of surface and ladder fuels has reduced ecosystem diversity and resilience of the landscape, thereby compromising ecosystem integrity. Lack of structural and species diversity creates conditions that are highly susceptible to large, high severity fire as well as large-scale mortality due to insect or disease outbreaks or drought conditions. The Tributaries Forest Recovery Project was developed with the recognition that maintaining the diversity of plant and animal communities and the persistence of native species in the plan area is dependent on a resilient landscape comprised of diverse, heterogenous forests more closely aligned with historic conditions that developed under an active fire regime. Historically, lower stand densities and fuel loading, more clumps, gaps, and openings; and greater numbers of large and very large fire-resistant tree species all contributed to a resilient forest that supported a diverse plant and animal community. The Project will create conditions more closely aligned with an historical fire regime by reducing fuel loading; retaining the largest, healthiest trees; and increasing stand structural heterogeneity.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
36 CFR 219.9(b) Additional species- specific plan components	The overarching purpose of 36 CFR 219.9(b) is to provide for additional ecological conditions for individual species not otherwise provided under 36 CFR219.9(a) above. The responsible official must determine whether or not the plan components required by 36 CFR 219.9(a) provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area. Additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area. The Regional Forester has determined California Spotted Owl (CS) as a species of conservation concern (SCC) for the Forest Plan Area and the USFWS will be listing the Sierra Nevada Distinct Population segment of California spotted owl as Federally Threatened, likely within the year.	The proposed project-specific Forest Plan amendments are based on recommendations in the Conservation Strategy for the California Spotted Owl in the Sierra Nevada (USDA-FS 2019, Approach 1, p. 25 -28 and Approach 2, 29-33) and the Project-specific Forest Plan Amendments for California Spotted Owl Habitat (USDA-FS 2024). The Conservation Strategy was developed to achieve three main goals for the California spotted owl across the species' range: (I) promote and maintain well-distributed owl habitat by developing key habitat elements and connectivity; (2) promote California spotted owl persistence by enhancing habitat resilience to multiple disturbances, considering climate change; and (3) maintain a well-distributed and stable California spotted owl population by minimizing impacts from non-habitat threats. The Conservation Strategy's approaches, which are designed to achieve desired conservation outcomes for the Ca1ifomia spotted owl, guided development of the project-specific plan amendment. The Project-specific Forest Plan Amendments for California Spotted Owl Habitat (USDA-FS 2024) was developed to align vegetation and fuels reduction treatments in CSO habitat with new Best Available Scientific Information, cumulative effects of climate change and wildfire on CSO habitat, and draft Conservation Measures from the forthcoming USFS California spotted owl Programmatic Biological Opinion (2024 draft). The landscape beyond PACs, HRCAs, and the new Territories provides important habitat for sensitive wildlife species that depend on mature and old forest conditions, including the California spotted owl and American goshawk. Forest stands in this project area historically had complex stand structures, diverse species compositions, and greater numbers of large, shade-intolerant trees. Departure from the natural range of variation across the Project area is exhibited in today's	The California spotted owl depends on large and structurally diverse trees and snags for nesting, roosting, and foraging. (USDA-FS 2019). The Tributaries Forest Recovery Project was developed to re-establish forest where it was lost from the Dixie (2021) and Walker (2019) Fires and to maintain and promote these important habitat characteristics for the California spotted owl and other species associated with old forest ecosystems. Consistent with the Conservation Strategy for the California Spotted Owl in the Sierra Nevada (USDA-FS 2019), more intensive treatments could occur outside of PACs, HRCAs, and Territories. The Ca1ifomia spotted owl and American goshawk effects analyses in the project record demonstrates the Project's effectiveness at maintaining and improving highest quality California spotted owl and American goshawk habitat from two perspectives (1) how the proposed treatments would maintain existing highest quality habitat, within PACs, HRCAs, and Territories and (2) how the proposed treatments lead to long-term maintenance of habitat as represented by a reduction in wildfire risk and resulting loss of habitat. These results further support the finding that the Project's actions, including the project-specific Forest Plan amendment and unamended components in the existing Forest Plan, are consistent with the complementary ecosystem and species-specific approach to maintaining the diversity of plant and animal communities and the persistence of native species in the plan area.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
		simplified stand structures and altered species compositions. Current forest ecosystems in this project are characterized by an overabundance of younger, smaller shade-tolerant trees and reduced abundance and diversity of the important structural characteristics of late seral forest habitat, including large snags, large down wood, and forest openings. The amended Forest Plan includes new designations, desired conditions, and standards and guidelines that specify the desired ecological conditions to best support the California spotted owl, while retaining standards and guidelines that constrain management actions within PACs. The plan amendments aim to maintain high quality and best available habitat within and around CSO PACs, HRCAs, and Territories while protecting it from risk of loss from high severity wildfire and other stressors.	
36 CFR 219.10 Multiple Use While meeting the requirements of 36 CFR 219.8 and 36 CTR 219.9 (addressed in the sections above), 36 CFR 219.10 requires forest plans to provide for ecosystem services and multiple uses. 36 CFR219.10(a) Integrated resource management for multiple use	The overarching purpose of substantive requirement 36 CFR 219.10(a) Integrated Resource Management for Multiple Use is to ensure that forest plans provide for ecosystem services and multiple uses, including outdoor recreation, range, timber, watershed, wildfire. and fish, within Forest Service authority and the inherent capability of the plan area. To do so, Section 219.10(a) stipulates that forest plans must include plan components, including standards and guidelines, for integrated resource management to provide for ecosystem services and multiple uses in the plan area. This substantive requirement then lists 10 items the responsible official must consider when developing the plan components for integrated resource management. Not every item listed- or aspects of each item listed - are directly	Refer to below sections addressing individual requirements of 36 CFR 219.10(a)	Refer to below sections addressing individual requirements of 36 CFR 219.10(a)

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
	related to the scope and scale of the proposed project-specific plan amendment. The directly related considerations include aspects (emphasized in bold below) of items (1), (5), (7), and (8). The project-specific Forest Plan amendments recognize the interdependence of ecological and societal resources and values.		
36 CFR 219.10 (a)(1)	36 CFR 219.10(a)(1) stipulates that when developing the plan components for integrated resource management, the responsible official shall consider to the extent relevant to the plan area and public participation and the requirements of 36 CFR219.7, 219.8, 219.9, and 219.11: (1) aesthetic values, air quality, 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, wilderness, and other relevant resources and uses.	The California spotted owl and American goshawk, both Forest Service sensitive wildlife species, and their critical habitat needs were directly considered in development of the proposed project-specific Forest Plan amendments as well as retention of existing Forest Plan management direction. Proposed changes include modifying, removing, and adding specific Forest Plan components to improve forest resilience in the areas within, surrounding, and outside of California spotted owl and American goshawk PACs and California spotted owl HRCAs and Territories. The project-specific Forest Plan amendments are integrated with existing retained Forest Plan direction to allow actions that will make the landscape more resilient while providing for critical habitat needs. The project-specific Forest Plan amendment, integrated with retained existing Forest Plan direction, supports effective use of mechanical thinning of vegetation, fuel reduction activities and prescribed fire to reduce stand densities and ladder fuels to increase the resilience of forests to fire, drought, and other disturbances exacerbated by climate change. The Forest Plan's desired conditions, standards,	The responsible official considered the relevant effects of the proposed plan amendment in this Environmental Assessment, which determined that plan the amendment would have no significant effect on aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, geologic features, habitat and habitat connectivity, recreation setting and opportunities, riparian areas, scenery, soil, surface water quality, timber, trails, vegetation, viewsheds, wilderness, and other resource values.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
		guidelines, and management approaches will be achieved through fuels and vegetation management actions.	
36 CFR 219.10 (a)(5)	When developing the plan components for integrated resource management, the responsible official shall consider 36 CFR 219.10(a)(5), which stipulates that the responsible official shall consider 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).	The aspects of substantive requirement Section 219.10(a)(5) that are directly related to the scope and scale of the proposed project-specific plan amendments are narrow. The above sections (see Section 219.9 (a) and (b)) demonstrate how wildlife habitat conditions subject to the requirements of Section 219.9 were considered in development of the proposed project-specific amendment. The proposed project-specific Forest Plan amendments does not directly modify or impact opportunities to hunt, fish, trap, gather, observe, gather subsistence, or other public uses. Each of these common uses of public lands, however, are at risk due to the imminent threat of large, high severity wildfire. The proposed project-specific Forest Plan amendment promotes the ability to move the Project area toward a condition more resilient to large-scale, stand-replacing disturbances, such as high severity wildfire or insect outbreaks. Maintaining habitat conditions and a healthy ecosystem is key to providing persistent and sustainable opportunities for the public to hunt, fish, trap, gather, observe or other activities.	The responsible official considered the relevant effects of the proposed plan amendment in this Environmental Assessment, which determined that plan amendment would have no significant effect on applicable wildlife, fish, and plants commonly enjoyed and used by the public; for bunting. fishing, trapping, gathering. observing, subsistence, and other activities.
36 CFR 219.10 (a)(7)	When developing the plan components for integrated resource management, the responsible official must consider reasonably foreseeable risks to ecological, social, and economic sustainability to the extent relevant to the plan area and public participation and the requirements of 36 CFR 219.7, 219.8, 219.9, and 219.11.	The proposed project-specific Forest Plan amendments were developed in consideration of the threat of large, severe wildfire and other major disturbances to impact ecological, social, and economic sustainability. Until recent megafires, fire had been largely excluded from the landscape for nearly a century. Large, severe wildfires (Dixie in 2021 and Walker in 2019, in particular) on the landscape will have long-term consequences for local communities, forests, air, soils, water, habitats, scenery, recreational opportunities, and local and downstream economies. The sections on 36 CFR219.8(a)(l) and 219.9(a)(1) above describe how the amended plan addresses risks to	The responsible official considered the relevant effects of the proposed plan amendment in this Environmental Assessment, which determined that plan amendment would have no significant effect on socioeconomics and ecological sustainability.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
		ecological sustainability. Social and economic sustainability is considered as the amended plan will allow Tributaries Forest Recovery Project to conduct more effective thinning and prescribed fire treatments for enhanced forest resiliency.	
36 CFR 219.10 (a)(8)	36 CPR 219.10(a)(8) stipulates that, in providing for integrated resource management, the responsible official shall consider 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 terrestrial and aquatic ecosystems of the plan area to adapt to change (Section 219.S(l)(iv)). This consideration re-emphasizes the importance of ecological. sustainability and integrity as addressed in 36 CFR 219.S(a)(l) above.	Climate change projections anticipate periods of extended drought and temperatures that will make the landscape hotter and drier (USDA-FS 2020). These factors were critical considerations in determining the need for the Forest Plan amendments. Resilient forests more closely aligned with an historical fire regime provide the range of conditions in which terrestrial and aquatic ecosystems evolved and survived prior to European settlement. Reduced stand densities with an emphasis on retaining the largest, healthiest trees and increased stand structural and tree species heterogeneity increase forest resilience to severe disturbances, including large-scale, high severity wildfire; insects; disease; drought; and climate change. Aligning forest composition and structure with ecological processes, particularly historic active fire regimes, is linked to greater resilience to wildfire, climate change. and other stressors (Kalies and Kent 2016, Larson et al. 2013, Stephens et al. 2016). The amended plan recognizes important system drivers of wildfire and climate change. The amended plan directs active management to: (1) establish, favor retention, and/or promote the growth of larger or older shade-	The Project's goals and objectives are rooted in the assumption that a resilient landscape is healthier overall and more able to support a fully functioning ecosystem and opportunities for a variety of uses. Increasing ecosystem resilience and integrity are aimed at ensuring the landscape will experience less severe or catastrophic losses because of wildfire, insects, disease, and drought. This is the essence of landscape sustainability and resiliency. To provide a full suite of multiple uses across the Project area, the landscape must be able to support and maintain ecological processes and a diverse community of organisms.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
		intolerant trees in overly dense stands to meet project objectives more effectively for tree species composition and forest stand density; and (2) promote heterogeneity by providing for opening creation in sub-basins that are departed from ERV for openings. These objectives, which are supported by the project-specific plan amendment, are critical to mitigating the threat of large, high severity wildfire and increasing the landscape's resilience to climate change (USDA-FS 2019).	
36 CFR219.11 Timber requirements based on the NFMA The overarching purpose of 36 CFR 219.11 is to ensure forest plans address timber management requirements based on the National Forest Management Act 36 CFR 219.11(c) Timber harvest for purposes other than timber production	Compliance with paragraph (c) of this section is intended to support plan components that allow timber harvest for the purposes other than timber production throughout the plan area, or portions of the plan area, as a tool to assist in achieving or maintaining one or more applicable desired conditions or objectives of the plan in order to protect other multiple use values, and for salvage, sanitation, or other public health or safety needs.	To address the landscape's current departure from historic conditions the amended plan recognizes the important role timber harvesting plays in achieving desired forest structure, density, and composition across the landscape. The project-specific Forest Plan amendments allows vegetation management (including timber harvest) for the purposes of improving forest health, reducing the risk of undesired wildfire effects, restoring meadow ecosystems, and increasing landscape resilience to natural disturbances.	The Project's proposed actions include timber harvest as a mechanism for achieving treatment objectives, such as reducing stand density, improving stand structural heterogeneity through retention of tree groups and clumps and creation of gaps and openings, enhancing tree species composition, and restoring meadow habitat. Mechanical thinning would be utilized as one tool to achieve these objectives. Forest thinning objectives are aimed at improving forest health and wildlife habitat by making it more resilient to severe disturbances and reducing the risk of loss of forest resources from catastrophic wildfire.

Directly Related Substantive Requirement	Purpose of the Substantive Requirement	How the Amended Plan Meets the Substantive Requirement's Purpose	Project Consistency with the Substantive Requirement's Purpose
36 CFR 219.11 (d)(3) Limitations on Timber Harvest	Compliance with paragraph (d) item (3) of this section is intended to ensure that timber harvest would be carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and aesthetic resources The aspects of item (3) directly related to the proposed project-specific Forest Plan amendment are limited to those related to wildlife.	The amended plan is focused on the immediate need for maintaining fire-resilient habitat across the landscape as recommended in Management Approach 2 of the Conservation Strategy (USDA-FS 2019, p. 25). The amended plan provides immediate stability for individual California spotted owls while allowing thinning (including timber harvest) and prescribed fire treatments to be conducted to enhance stand- and landscape-level forest health and resiliency.	See sections for 36 CFR 219.9(a) and (b) above.

Appendix E Design Features

Determinations and approvals described in the following Design Features will be resolved by a line officer in coordination with a qualified Forest Service staff specialist.

Cultural Resources

Design Feature Number	Design Feature Description	Source
General Measures		
CUL-1	A qualified Archaeologist will conduct pedestrian surveys of accessible portions of the project area that were not previously adequately surveyed consistent with the terms of the Heritage Implementation Plan (HIP). Cultural resources will be designated on the ground with flagging and/or by other effective protection measures prior to implementation of project activities. Buffer zones may be established to ensure added protection where a qualified Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of cultural resource sites (e.g., historic buildings or structures with associated historic landscapes, or traditional cultural properties important to Native Americans), or where heavy equipment is in used proximity to cultural sites. The size of buffer zones needs to be determined by a qualified Archaeologist on a case-by-case basis. Monitoring by a qualified Archaeologist may be used as a protection measure and/or to enhance other protection measures.	National Programmatic Agreement for Phasing Section 106 of 2021 – Heritage Implementation Plan (HIP); HIP Appendix C 1.0
CUL-2	If heritage resources are inadvertently discovered during project implementation, the Forest or District Archaeologist would be contacted immediately. The heritage resources would be recorded, clearly delineated, and protected.	HIP section VI and VII
CUL-3	Vegetation to be burned shall not be piled within the boundaries of cultural sites unless locations (e.g., a previously disturbed area) have been specifically approved by qualified Plumas NF Heritage staff.	HIP Appendix C 2.2 (b)
CUL-4	Manual treatments with directional felling methods may be used within site boundaries, working with a qualified Archeologist to protect cultural resources.	HIP Appendix C 2.2 (a)

Design Feature Number	Design Feature Description	Source
CUL-5	Mechanical treatments and skidding will be avoided within site boundaries and buffers. In specific instances, the Forest or District Archaeologist may approve the use of mechanical equipment to remove brush or woody material from within specifically identified areas within site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with the Forest or District Archaeologist authorization of certain equipment types within site boundaries. Any approved use of mechanical equipment within a site or buffer shall be approved and monitored by a qualified Archaeologist.	HIP Appendix A 3.0; HIP Appendix C
CUL-6	Notify an appropriate Tribal Historic Preservation Officer, or tribal representative of new discoveries that would be relevant to Tribes.	
CUL-7	If any sensitive cultural resources are discovered during project implementation, project activities would cease in that area and the Forest Service Archaeologist would be notified.	
CUL-8	An on-site cultural monitor will be present during treatment within units with identified sensitive cultural resources.	
Standard Protection Measures established in the Heritage Implementation Plan (HIP) developed under the National Programmatic Agreement for Phasing of Section 106 of the National Historic Preservation Act.		
CUL-9	Linear sites (e.g., historic trails, roads, railroad grades, ditches) may be crossed or breached by equipment in areas where their features or characteristics clearly lack historic integrity (i.e., where those portions do not contribute to site eligibility or values). (1) Crossings are not to be made at the points of origin, intersection, or terminus of linear site features. (2) Crossings are to be made perpendicular to linear site features, unless review by a qualified archaeologist determines that site disturbance can be minimized by crossing at a different angle. (3) The number of crossings is to be minimized by project and amongst multiple projects in the same general location.	HIP Appendix C 2.1 (a)

Design Feature Number	Design Feature Description	Source
	(4) The remainder of the linear site is to be avoided, and traffic is to be clearly routed through designated crossings.	
CUL-10	Accumulation of sufficient snow over archaeological deposits or historic features to prevent surface and subsurface impacts as determined by the Forest or District Archaeologist. Undertaking activities may be implemented over snow cover on historic properties under the following conditions: (1) The cover must have at least 12 inches depth of compacted snow or ice throughout the duration of undertaking activities on sites. (2) All concentrated work areas (e.g., landings, skid trails, turnarounds, and processing equipment sites) shall be located prior to snow accumulation and outside historic property boundaries.	HIP Appendix C 2.1 (b)
CUL-11	Placement of foreign, non-archaeological material (e.g., padding or filter cloth) within transportation corridors (e.g., designated roads or trails, campground loops, boat ramps, etc.) over archaeological deposits or historic features to prevent surface and subsurface impacts caused by vehicles or equipment. Such foreign material may be utilized on historic properties under the following conditions: (1) Engineering will design the foreign material depth to acceptable professional standards. (2) Engineering will design the foreign material use to assure that there will be no surface or subsurface impacts to archaeological deposits or historic features. (3) The foreign material must be easily distinguished from underlying archaeological deposits or historic features. (4) The remainder of the archaeological site or historic feature is to be avoided, and traffic is to be clearly routed across the foreign fill material. (5) The foreign material must be removable should research or other heritage need require access to the archaeological deposit or historic feature later; and (6) Native American tribe or other public concerns about the use of the foreign material will be addressed prior to use.	HIP Appendix C 2.1 (c)
CUL-12	Felling and removal of hazard, salvage, and other trees within historic properties under the following conditions: (1) Trees may be limbed or topped to prevent soil gouging during felling.	HIP Appendix C 2.2 (a)

Design Feature Number	Design Feature Description	Source
	(2) Felled trees may be removed using only the following techniques: hand bucking, including use of chain saws, and hand carrying, rubber-tired loader, crane/self-loader, helicopter, or other non-disturbing Forest or District Archaeologist approved methods. (3) Equipment operators shall be briefed on the need to reduce ground disturbances (e.g., minimizing turns). (4) Where monitoring is a condition of approval, its requirements or scheduling procedures should be included in the written approval.	
CUL-13	For fire, and hazardous fuels and vegetation management projects, the Forest or District Archaeologist, in conjunction with fuels, vegetation management, or fire specialists as necessary, shall develop treatment measures for at risk historic properties (as defined in SHPO approved Region 5 modules and agreements as well as the HIP) designed to eliminate or reduce potential adverse effects to the extent practicable by utilizing methods that minimize surface disturbance, and/or by planning project activities in previously disturbed areas, or areas lacking cultural features. The following standard protection measures apply to fire, hazardous fuels, and vegetation management projects: (1) Mechanically treated (crushed/cut) brush or downed woody material may be removed from historic properties by hand, through the use of off-site equipment, or by rubber-tired equipment approved by the Forest or District Archaeologist. Ground disturbance shall be minimized to the extent practicable during such removals. (2) Woody material may be chipped within the boundaries of historic properties so long as the staging of chipping equipment on-site does not affect historic properties and staging areas are specifically approved by the Forest or District Archaeologist. (3) Forest or District Archaeologist may approve the use of tracked equipment to remove brush or woody material from within specifically identified areas of site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with certain equipment types within site boundaries.	HIP Appendix C 2.2 (b)

Design Feature Number	Design Feature Description	Source
CUL-14	Routine maintenance of roads or trails over 50 years old may be approved by the Forest or District Archeologist in order to maintain current uses provided work is confined to the existing alignment/prism and previously maintained surfaces, and proposed work or methods are unlikely to affect historic integrity (e.g. brush clearing, cleaning culverts, maintaining ditches and erosion control features, etc.)	HIP Appendix C 2.2 (d)

Biological Resources

Design Feature Number	Design Feature Description	Source
Federally Listed and General Amphibians		
AMPHIB-1	**Listed Amphibian Surveys** Foothill yellow-legged frog and Sierra Nevada yellow-legged frog habitat occupancy will be assessed by the Forest Service or other qualified and FS approved Biologist within suitable habitat adjacent to proposed treatment areas. Occupancy will be determined through surveys by the qualified biologists. The Forest Service District Biologist will have documented training in the biology and field identification of frogs in addition to demonstrable experience surveying for and positively identifying Sierra Nevada yellow-legged frogs and/or foothill yellow-legged frogs. Any amphibian State species of concern will also be documented. The survey will cover all suitable habitat areas, and should any life stages of the species be found (i.e., the site is occupied), work activities for that area will occur outside the limited operating period and applicable buffers mandated by the Forest Service conservation measures. Should any life stages of State species of concern be found, work activities for that area will occur outside of applicable limiting operating periods. Three surveys will occur prior to implementation of proposed treatments within suitable habitat.	Endangered Species Act; Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)

Design Feature Number	Design Feature Description	Source
AMPHIB-2	**Listed Amphibian Avoidance** If any foothill yellow-legged frogs or Sierra Nevada yellow-legged frogs are found at any time during implementation of the proposed project, operations will cease in the vicinity of the frog. The immediate area around the frog will be vacated and the frog will be left alone. No activity will occur in that area until such time as the frog has left the area on its own. Foothill yellow-legged frogs and Sierra Nevada yellow-legged frogs will not be handled. The occurrence will be reported as soon as possible to the Forest Service District Biologist and communicated to the appropriate line officer. Coordination with US Fish and Wildlife Service (USFWS) will be initiated. If an amphibian State species of concern is found during implementation, operations will cease in the vicinity of the amphibian until it is safely relocated by a qualified biologist authorized under a valid Scientific Collection Permit issued by the California Department of Fish & Wildlife. If a suitable relocation site is not available, the amphibian will not be moved and the area will be flagged and avoided.	Endangered Species Act; Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)
AMPHIB-3	<u>Suitable habitat</u> - Herbicide and other chemical treatments would not occur within 107-feet of all perennial and intermittent streams or within suitable Sierra Nevada yellow-legged frog or foothill yellow-legged frog habitat. <u>Occupied habitat</u> - Herbicide application within 500-feet of occupied FYLF or SNYLF habitat will require Forest Service or other qualified and FS approved biologist to be present to ensure no adverse impacts.	Endangered Species Act; Sierra Nevada Forest Plan Amendment S&G 98 (2004); Habitat Use, Home Range, and Movements of Mountain Yellow-legged Frogs in Bean and Spanish Creeks on the Plumas National Forest (2008); Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014); Plumas National Forest Community Protection – Central and West Slope Project BO, Conservation Measures (2019); Pacific Gas

Design Feature Number	Design Feature Description	Source
		and Electric Company (PG&E) Herbicide Vegetation Management Program on Transmission Line Right-Of-Ways Project, Conservation Measures (2014)
AMPHIB-4	Comply with all applicable standards and guidelines and BMPs listed as Conservation Measures in the USFWS Programmatic Biological Opinion (PBO) on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog and Threatened Yosemite Toad (USFWS 2014). All applicable standards, guidelines, and BMPs shall also apply to foothill yellow-legged frog habitat. Applicable standards, guidelines, and BMPs include general measures; measures for timber harvest, vegetation management, and watershed restoration projects; and measures for road and trail maintenance programs.	Endangered Species Act; Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)
AMPHIB-5	**Occupied habitat, or suitable habitat with no surveys, or suitable habitat greater than 35% slope:** No heavy equipment allowed within 82-feet of perennial or intermittent streams that have suitable habitat for frogs unless surveys conducted prior to equipment use confirms that listed amphibians are not present. Heavy equipment includes road decommission equipment and skid steer. This does not apply to project activities on existing roads and stream crossings. 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 amphibians. **Suitable but unoccupied habitat less than 35% slope:** No heavy equipment allowed within 25-feet of perennial or intermittent streams or other aquatic feature. Chainsaw thinning allowed within the inner RCA, but no piling of material within 82-feet of perennial or intermittent streams (to prevent risk of burning frogs that choose to hibernate in piles). Where surveys are complete and suitable habitat was	Endangered Species Act; Plumas National Forest Community Protection – Central and West Slope Project BO, Conservation Measures (2019); Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)

Design Feature Number	Design Feature Description	Source
	determined to be unoccupied by listed amphibians, the pile-exclusion buffer may be reduced to 25 feet.	
AMPHIB-6	No active ignitions within 82 feet of perennial or intermittent streams. Where surveys are complete and suitable habitat was determined to be unoccupied by listed amphibians, the active ignition-exclusion buffer may be reduced to 25-feet. Pile burning will be in directional light, which means that the fire must start at one point only and let fire burn through to allow any wildlife species within the pile to escape. Piles for wildlife retention inside of the 82-foot riparian buffer could be built with wildlife pile prescriptions and will not be burned to provide for Sierra Nevada yellow-legged frog shelter habitat.	Endangered Species Act; Plumas National Forest Community Protection – Central and West Slope Project BO, Conservation Measures (2019); Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)
AMPHIB-7	Follow all design features identified for Herbicide Use (HU) to avoid potential adverse impacts to listed amphibians and their habitats.	Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014); Sierra Nevada Forest Plan Amendment S&G 97-99 (2004)
AMPHIB-8	Construction activities for in stream channel work, construction or repair of crossings, and road work near streams would occur during the dry time of the year when stream flow is at its lowest, and reproductive cycles for most aquatic species have reached the dispersal stage, from mid-August to mid-November.	. Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)

Design Feature Number	Design Feature Description	Source
AMPHIB-9	To protect water quality and riparian habitat for aquatic organisms, all temporarily impacted riparian and meadow areas will be mulched and/or re-vegetated to minimize erosion and reestablish native vegetation. Only native plant species will be used in revegetation. Weed free rice straw and/or native grass seed shall be used for erosion control or other purposes within yellow-legged frog habitat, regardless of occupancy, to ensure that individual frogs do not get trapped, injured or killed. Plastic mono-filament netting or similar material will not be used anywhere on the project because amphibians may become entangled or trapped in it.	Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)

Design Feature Number	Design Feature Description	Source
Gray Wolf		
WOLF-1	To determine whether gray wolves have been documented in or in the vicinity of a treatment area, Plumas National Forest (PNF) will contact the California Department of Fish and Wildlife (CDFW) before implementation of project activities to obtain general information about documented gray wolf activity within the vicinity and the need for protection measures. • A limited operating period (LOP) restricting all noise above ambient levels or smoke generating activities would be instated from April 1 through July 15 within one mile of an active den site. Further discussions and coordination with CDFW and USFWS may result in a modified distances or extended 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 USFWS. 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 USFWS determines it is necessary. • Early rendezvous sites are typically close to dens: implementing a LOP within one (1) mile of active den sites will generally mitigate effects to early rendezvous sites when pups are still vulnerable. Coordination with CDFW and USFWS 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 USFWS shall be pursued.	Endangered Species Act; USFWS Biological Opinion standard design features.

Design Feature Number	Design Feature Description	Source
USDA Forest Service Sensitive Raptor Species (CSOW and AGOS)		
CSOW and AGOS-1	**California spotted owl and American goshawk Surveys** Prior to implementation of treatments, surveys for California spotted owls and American goshawks will be conducted within forest habitats suitable for the species following USFS and USFWS protocols. If surveys are not conducted or do not follow approved methods, assume owls are present in suitable nesting/roosting and foraging habitat (i.e., 4M, 4D, 5M, and 5D stands).	Sierra Nevada Forest Plan Amendment S&G 33 and 34 (2004); R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PAC-02
CSOW and AGOS-2	**California spotted owl or American goshawk PAC Establishment** If an active California spotted owl or American goshawk nest is detected during pre-treatment surveys outside of an established PAC, then existing PAC boundaries will be adjusted to include the nest, or a new PAC will be designated as appropriate.	Sierra Nevada Forest Plan Amendment S&G 33 and 34 (2004); R5 Project-specific Forest Plan Amendments for CSOW Habitat DES-PAC-01

CSOW and AGOS-3	**Limited Operating Period**
	Within 0.25 mile of Protected Activity Centers (PACs) and if California spotted owl (CSOW) or American goshawk (AGOS) nests are found or suspected, limited operating periods (LOPs) will be implemented following SNFPA 2004 ROD and 2024 USFWS guidelines:
	• **CSOW**: March 1 through August 31 (March 1–July 9 for noise and smoke disturbance; March 1– August 31 for habitat manipulation/vegetation treatments).
	   ◦ In an active nest stand, the full CSOW LOPs must be implemented. These limited operating periods may be discontinued in a given year if protocol-level surveys for determining reproductive status confirm owls are not nesting or fledglings have dispersed in that calendar year.
	   ◦ In coordination with USFWS during consultation, CSOW LOPs outside of an active nest stand may be modified in size or timing. A biological analysis conducted by the Forest or District Biologist and associated rationale that concludes that a project may still minimize or avoid breeding disturbance or failure must be provided in the Project Documentation Form during the
		Sierra Nevada Forest Plan Amendment S&G 75 and 76 (2004), USDA Forest Service's draft Conservation Measures for the Programmatic Biological Assessment for the Sierra Nevada Distinct Population Segment of California Spotted Owl (forthcoming)

Design Feature Number	Design Feature Description	Source
	consultation process. The biological analysis should consider the intensity, duration, timing, specific location of the activity, and other relevant factors such as topography and vegetation that buffers sound levels. ◦ The buffer for CSOW PACs may be reduced to the 10-acre nest stand for chainsaw work as determined appropriate by a site-specific evaluation by a PNF biologist. If CSOW PACs are determined to be unoccupied during the season of planned implementation, the LOP may be removed by the Forest Service District Wildlife Biologist. • **AGOS**: February 15 through September 15 will be implemented following SNFPA 2004 guidance.	
CSOW and AGOS-4	Follow all applicable standards and guidelines set forth in the Sierra Nevada Forest Plan Amendment regarding treatments where California spotted owl and/or American goshawk occupied habitat and/or PACs overlap with WUI defense or WUI threat zones (S&G 72-74).	Sierra Nevada Forest Plan Amendment S&G 6-9, 72-74 (2004), consistent with the USDA Forest Service's Programmatic Biological Assessment for the Sierra Nevada Distinct Population Segment of California Spotted Owl (forthcoming)
CSOW and AGOS-5	**Mechanical Treatment Buffer** Mechanical treatments conducted inside PACs located in wildland urban interface (WUI) defense zones will not be conducted within 500 feet of a known California spotted owl or American goshawk nest, regardless of current occupancy.	Sierra Nevada Forest Plan Amendment S&G 73 (2004)
CSOW and AGOS-6	Where a California spotted owl or American goshawk PAC overlaps with a fire management feature, fuel break treatments will be designed to retain existing structure, function, and habitat types (i.e., nesting/roosting, foraging) as classified by California Wildlife Habitat Relationship (CWHR): • Maintain a minimum of 60 percent canopy cover in CWHR 5D stands. • Maintain a minimum of 40 percent canopy cover in 4M, 4D, and 5M stands. • Maintain a minimum of 50 percent canopy cover, averaged at the PAC scale. Where fire management features overlap with CSOW territories, fuelbreak treatments will be designed as follows:	Sierra Nevada Forest Plan Amendment S&G 33 and 34 (2004); R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PAC-01

Design Feature Number	Design Feature Description	Source
	• If the territory contains less than 40% suitable habitat pre-treatment, retain all suitable habitat. • If the territory contains more than 40% suitable habitat pre-treatment, retain all suitable nesting/roosting habitat (CHWR classes 5M and 5D), while retaining at least 40% of the total suitable habitat within the territory.	
CSOW-7	Following protocol-level survey work, treatments may change to incorporate new or amended CSOW PACs and Territories to ensure that treatments within these areas follow the Conservation Measures developed by US Fish and Wildlife Service.	R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PAC-02
CSOW-8	Maintain or enhance special habitat elements for owls throughout the project area to: • Support current and future owl life history activities, retain enough large, old trees and snags, maintaining and promoting large, old, and structurally complex trees and snags throughout the landscape to provide and promote quality owl nesting and roosting habitat (i.e. containing decadent structures or attributes that require decades to develop). Maintain the largest/tallest trees (generally greater than 150 feet tall and/or 30 inches dbh), especially where biophysical conditions are likely to be sustainable to support both high canopy cover and large/tall trees in the future. (See SILV-5 for description of Forest Plan Amendment allowances of trees between 30 and 40 inches dbh **outside** of AGOS PACs, CSOW PACs, CSOW HRCAs, and suitable habitat within CSOW territories.) • Support current and future nesting sites, retain enough live trees more than 30 inches dbh in occupied PACs, territories, and throughout the landscape. • Maintain habitat for prey populations and promote ecological processes, manage forest stands for coarse woody debris. • Align density of coarse woody debris, including large downed logs in varying states of decay, with old-forest desired conditions for the relevant forest vegetation type according to applicable Forest Plan direction.	R5 Project-specific Forest Plan Amendments for CSOW Habitat GDL-TERR-01, -02; R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PROJ-1B

Design Feature Number	Design Feature Description	Source
CSOW-9	Foster development of nesting/roosting habitat and habitat connectivity at the watershed and PAC scale: • To develop future nesting sites, retain clumps or groups of the largest/tallest trees (generally greater than 150 feet tall and/or 30 inches dbh) with high canopy cover (generally greater than 70 percent). • To promote habitat connectivity at the watershed scale, retain connected areas of moderate (generally at least 40 percent) and high (generally at least 60 percent) canopy cover with the largest/tallest trees (generally greater than 150 feet tall and/or 30 inches dbh). • To provide for continued availability of patches of nesting, roosting, and foraging habitat in ecologically sustainable areas, consider aspect and position on slope: ◦ On north and east facing slopes, drainages, swales and canyon bottoms maintain patches of large (30 in dbh or greater) trees with moderate (40-59 percent) and high (greater than 60 percent) canopy cover; ◦ On south and west facing slopes and on rides, prioritize restoration toward forest conditions resistant to stressors. Increase resiliency to natural disturbances (e.g., large-scale wildfire; tree mortality due to drought, insects, and disease) at the watershed scale by reducing tree density of smaller trees that are competing with larger trees. Thinning treatments should be designed to minimize the loss of and to recruit large and very large trees and snags (e.g., generally at least 24 inches dbh for large trees and at least 45 inches dbh for very large snags).	R5 Project-specific Forest Plan Amendments for CSOW Habitat GDL-PROJ-01, -02 and GDL-TERR-02
CSOW-10	**When treating within PACs,** retain existing habitat types (i.e., nesting/roosting, foraging) and habitat function. Habitat may be maintained/improved. Do not downgrade or remove existing habitat of any type: • Avoid mechanical treatments within a 10-acre nest stand surrounding the most recent known nest tree or nest structure. • Retain historic and recent known owl nest trees or known nest structures. • Maintain or increase the quadratic mean diameter for the PAC as a whole. • Maintain a minimum of 50 percent canopy cover, averaged at the PAC scale.	R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PAC-01

Design Feature Number	Design Feature Description	Source
	• Use existing landings or other openings for equipment staging to the greatest extent possible. If new staging areas must be created, canopy gaps must be less than 0.25 acre. • Prescribed fire and hand treatments are acceptable within a nest stand outside of the Limited Operating Period. ◦ To maintain habitat function and to avoid loss or damage to known nest trees, include mitigation measures when conducting prescribed fire in PACs (e.g., prepare burn units by initially reducing fuel loads with hand treatments, raking around nest trees, putting lines around nest trees).	
Other Wildlife		
WILDLIFE-1	Incidental detections of federally listed and sensitive species prior to or during project implementation will be reported to the Forest or District Wildlife Biologist for protection in accordance with management direction for PNF.	This is standard language in contracts (C6.25) and maintains compliance with ESA and MBTA
WILDLIFE-2	In addition to applicable standards, guidelines, and BMPs for trail construction, if sensitive wildlife species are identified along proposed trail routes during pre-implementation surveys, trails will be re-routed to avoid potential impacts to these species.	
WILDLIFE -3	**US Forest Service Sensitive Birds** The following Limited Operating periods will be implemented to prevent breeding disturbance or abandonment of the nest: • Bald eagle: Jan 1 – Aug 31 within ¼ mile of nest • Golden eagle: Jan 1 – Aug 31 within 1 mile of nest • Greater sandhill crane: April 1 – August 1, up to ½ mile depending on size of meadow (consult with FS District Wildlife Biologist) • Osprey: Mar 15 – Aug 15 within 1/8 mile of nest • Peregrine falcon: Feb 1 – Aug 31 within ¼ mile of nest • Willow flycatcher: May 1 – Jul 31 within occupied habitat and 1/8-mile buffer of occupied habitat.	Bald & Golden Eagle Protection Act (1962) Osprey: Plumas NF Land Resource Management Plan (1988), Migratory Bird Treaty Act (1918) Peregrine Falcon: Migratory Bird Treaty Act (1918) Willow Flycatcher: Sierra Nevada Forest Plan Amendment (2004), Migratory Bird Treaty Act (1918)

Design Feature Number	Design Feature Description	Source
WILDLIFE -4	**US Forest Service Sensitive Mammals** If active pallid bat, fringed myotis, or Townsend's big-eared bat roosts are detected, then a limited operating period during the bat maternity season (i.e., from April 1 through August 31) will be implemented within 1/8 mile of the roost. Carnivore den sites (700-acres for Pacific fisher and 100-acres for American marten) will be designated to protect highest quality habitat surrounding the den sites. A limited operating period will be implemented within a 700-acre buffer for all known fisher den sites during the maternity season (i.e., from March 1 through June 30) to prevent disturbance or abandonment of the den. A limited operating period will be implemented within a 100-acre buffer for all known marten den sites during the maternity season (i.e., from May 1 through July 31) to prevent disturbance or abandonment of the den.	Sierra Nevada Forest Plan Amendment S&G 88 (2004);
WILDLIFE -5	During the development of and prior to finalization of implementation plans and contracts the applicable PNF District Wildlife Biologist will be contacted to review and update locations of species, limited operating periods, site buffers, exclusion areas, and other information relevant to project design features to ensure accuracy and incorporation of pre-implementation survey results.	Specialist input
WILDLIFE -6	Exceptions to conifer removal would include circumstances such as retaining trees with signs of wildlife habitation or desirable wildlife habitat characteristics, as well as trees displaying legacy characteristics. Legacy and wildlife habitat trees would be designated for retention by the PNF District Silviculturist, District Wildlife Biologist, or their designated personnel.	Sierra Nevada Forest Plan Amendment S&G 11 (2004)
WILDLIFE-7	In fish-bearing streams, all fish species will be removed prior to channel fill or channel diversion activities, and relocated outside the affected active work zone by a qualified biologist authorized under a Scientific Collection Permit issued by the California Department of Fish & Wildlife.	

Design Feature Number	Design Feature Description	Source
Botanical		
BOTANY-1	PNF will follow the direction in Forest Service Handbook (FSH) 2609.26 Chapter 11 and FSM 2670.22, 2670.32, and 2900 on whether to conduct surveys and the appropriate type of survey documentation. Any habitat potentially suitable for federally listed or proposed threatened or endangered species and US Forest Service sensitive plant, lichen, and fungi species will be surveyed early enough in project planning process that the project can be designed to conserve or enhance threatened, endangered, proposed, and sensitive (TEPS) plants and their habitats. Known locations of special-status plants in moderate to high severity burn areas will be revisited to assess current extent and condition before implementation of project activities.	SNFPA S&G #125 S (Corrected Errata, April 19, 2005)
BOTANY-2	Populations of special-status plant species will be avoided, as per Interim Management Prescriptions, on a site-by-site basis for ground-disturbing activities, including off-road equipment, burn piles, prescribed fire and chipping and spreading slash materials will be prohibited within controlled areas. Hand felling of trees and skidding of logs may be conducted within special-status plant occurrence areas if it is determined by a PNF Botanist or their designee, that effects would be minimal or that there will be beneficial effects on the site or habitat conditions. For large, flagged areas (i.e., greater than 10 acres) with variable special-status plant density, plants may be flagged for avoidance so that necessary fuels reduction can continue within population boundaries if approved by a PNF Botanist or their designee. The PNF Botanist can evaluate proposed activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology. If allowed by the PNF Botanist, burn piles will be staged 20 feet away from plants to ensure that radiant heat will not adversely affect individuals or the surrounding duff layer. Evaluate potential effects of prescribed fire on a site-by-site basis, considering factors such as population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations.	NFMA; PNF LRMP; FSM 2670.22; FSM 2670.31; FSM 2670.32; PNF Interim Management Prescriptions (USDA 2014)

Design Feature Number	Design Feature Description	Source
	Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.	
BOTANY-3	If treatments need to occur within special-status plant avoidance areas, trees may be felled manually but must be left on site to avoid ground disturbance unless removal can occur with minimal effects, at the discretion of a PNF Botanist or their designee. Flagging may be used to further delineate avoidance areas or individual plants. This requirement may be waived by a PNF Botanist or their designee depending on the species present and its phenology (e.g., annuals that have already set seed, species that are old growth and shade-dependent) which will be considered when planning treatments.	FSM 2670.22; 2670.32 PNF Interim Management Prescriptions (USDA 2014)
BOTANY-4	In the event any new populations of special-status species are discovered during the various phases of the project, the area will be flagged and avoided until a PNF Botanist, or their designee determines otherwise. Adherence to Plumas National Forest Interim Management Prescriptions for Threatened, Endangered, Sensitive and Special Interest Plants (Interim Management Prescriptions) is required.	FSM 2670.22; 2670.32
BOTANY-5	For treatments adjacent to populations of special-status plant species, trees will be directionally felled away from the controlled area to avoid disturbing the population. Directionally felled trees will be removed only if a PNF Botanist or their designee determines that ground disturbance within the controlled area can be avoided. If directional felling cannot be done due to safety concerns, trees will be felled as necessary and left on site (BOTANY-3).	FSM 2670.22; 2670.32 PNF Interim Management Prescriptions (USDA 2014)
BOTANY-6	PNF will consult with a PNF Botanist prior to implementation of work within designated and proposed botanical Special Interest Areas (SIAs) (i.e., Mud Lake Research Natural Area and Bradys Camp). Treatments will be designed to maintain the integrity and suitability of these areas for which they were proposed. New permanent fuel breaks will not occur in SIAs.	Plumas LRMP 1988 (p 4-59) Letter from Forest Sup 1996: Proposed SIAs
BOTANY-7	Serpentine soil communities, and other bedrock outcrops will be protected from motorized equipment and off-road vehicles. Landings, skid trails, piling, burning, mastication, and chip spread will not occur in these communities unless a PNF Botanist is consulted. Manual felling may occur, but trees will be left in place unless	Specialist Input

Design Feature Number	Design Feature Description	Source
	they can be removed with full suspension techniques. Road maintenance will be limited on roads that cross serpentine soils and bedrock avoiding special-status plant habitat.	
BOTANY-8	In cases of emergency or where hazard tree removal is necessary within Botany control areas, trees may be directionally felled away from the control area and left on the ground. If remaining fuel build up is not acceptable, full suspension removal of fuel material or reaching in with equipment will be preferred. If this is not possible, a PNF Botanist will determine specific treatments within botany control areas in accordance with the Interim Management Prescriptions.	Plumas LRMP 2004 Riparian Habitat (Standards and Guidelines #92 and #100) Bog and Fen Habitat (Standards and Guidelines #118)
BOTANY-9	Application of magnesium chloride for dust abatement will not occur within 100 feet of roadside occurrences of special-status plants or Special Interest Areas.	PNF LRMP
BOTANY-10	Borate (fungicide) will not be applied within 25 feet of the known veined water lichen (*Peltigera gowardii*) occurrences or other special-status fungi and lichen species identified during pre-implementation special-status plant surveys. Fungicide application in special-status occurrences will be conducted at the discretion of and under the supervision of a PNF botanist or their designee. Spills within special-status occurrence areas or within RCAs containing occurrences of veined water lichen will be immediately reported to the PNF Botanist.	PNF LRMP
BOTANY-11	Watch list plant species encountered during surveys for special-status species will be mapped. Protection measures will be developed and approved by a PNF Botanist on a case-by-case basis, according to the Interim Management Prescriptions. Protection measures will depend on many factors including local abundance, species-specific ecology and tolerance to disturbance etc., and the proposed activity for the specific area.	PNF LRMP PNF Interim Management Prescriptions (USDA 2014)

Design Feature Number	Design Feature Description	Source
BOTANY-12	Allow for the opportunity to evaluate the effect of prescribed fire on special-status plant populations, including federally listed species and FS Sensitive and Watchlist species, in accordance with the Interim Management Prescriptions. Allow PNF Botanist to coordinate pre- and post-monitoring surveys where feasible. Species of interest may include milk vetch (*Astragalus* spp.), *Botrychium* spp., clustered lady's slipper (*Cypripedium fasciculatum*), mountain lady's slipper (*Cypripedium montanum*), Modoc cypress (*Hesperocyparis bakeri*), and closed throated beardtongue (*Penstemon personatus*), among others.	PNF Interim Management Prescriptions (USDA 2014)
BOTANY-13	Allow for the opportunity to maintain and manage areas of culturally significant plant populations for gathering purposes using Traditional Ecological Knowledge. Culturally significant plants may include elderberry (*Sambucus* spp.), black oak (*Quercus kelloggii*), and willow (*Salix* spp.).	
BOTANY-14	Any commercial seed used for revegetation or habitat enhancement will be approved by the PNF botanist prior to dispersal. The seed blend must be sourced from the same ecoregion and elevation band and be tested to be free of noxious weeds.	
INVASIVE-1	Invasive plant surveys will be conducted prior to project implementation unless recent protocol-level surveys (i.e., within 5 years) have been conducted. High-severity burn areas that have never been surveyed post-fire will be surveyed prior to project implementation, even if protocol-level surveys have been conducted within 5 years. Treatment of PNF Priority Species (see Noxious Weed Risk Assessment section of the Project's Botany BE) will be conducted to reduce the risk of invasive plant spread prior to project implementation where feasible using an integrated pest management approach following applicable regulations and label instructions. Otherwise, known invasive plant sites will be flagged prior to implementation and will be avoided. Weeds may be treated within and adjacent to special-status plant flagged areas, and individual plants will be targeted by hand to reduce herbicide drift. Drift will be limited (e.g.,	SNFPA 2004: Noxious weeds (invasive plants) management (Standards and Guidelines #36-49)

Design Feature Number	Design Feature Description	Source
	coarse droplet size, wind restrictions, low nozzle height), and a 50-foot exclusion zone will be implemented around flagged areas. This buffer may be reduced if the special-status plants are covered/shielded during spraying.	
INVASIVE-2	If project activities cannot be completely avoided within flagged weed infestations, risk minimization strategies will be employed, such as working in the infested area last, working in the infested areas when propagules are not viable, and limiting the number of people or equipment within the infestation. If work is done within known infested area, off road equipment must be washed prior to leaving the area.	SNFPA 2004: Noxious weeds (Standards and Guidelines #40). R5 Regional Noxious Weed Strategy 2000
INVASIVE-3	Off-road equipment (US Forest Service and contracted) will be cleaned to ensure it is free of soil, seeds, vegetative matter, or other debris before entering National Forest System lands to prevent the introduction or spread of invasive plants. Use agreements will include clauses to require contractors to meet US Forest Service-approved vehicle and equipment cleaning requirements/standards. Equipment will be inspected by a designated examiner before initial entry and any subsequent re-entries onto the project area. If determined necessary during the inspection, cleaning will occur at a vehicle washing station or agreed upon cleaning location before the equipment enters or re-enters the project area.	FSM 2903 SNFPA 2004: Noxious weeds (Standards and Guidelines #39) R5 Regional Noxious Weed Strategy 2000
INVASIVE-4	Keep hand piles out of weed infestation sites. Burn piles should be kept as small as reasonably possible to avoid soil compaction, sterilization, and noxious weed establishment. Evaluate potential effects of prescribed fire on a site-by-site basis, considering factors such as population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations.	SNFPA 2004: Noxious weeds (Standards and Guidelines #36-49)
INVASIVE-5	If skid trails, landings, or stream crossings require soil stabilization, weed-free equipment, mulches, and seed sources will be used. On-site material will be chipped to use as mulch to the extent possible. If mulch is imported to the site, use weed free rice straw (preferred) or certified weed free straw. Avoid seeding in areas where revegetation will occur naturally unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless	FSM 2070 – Native Plant Policy SNFPA 2004: Noxious weeds (Standards and Guidelines #36-49)

Design Feature Number	Design Feature Description	Source
	contaminated with noxious weeds. All activities that require seeding or planting will use locally collected native seed sources as determined by the PNF Botanist. A seed mix will be developed when specific site locations and conditions (e.g., dry, moist, wet) are determined.	Invasive Species, Executive Order 13112 of February 3, 1999 Healthy Forests Restoration Act of 2003
INVASIVE-6	Project areas at high risk for invasive plant infestation and/or spread will be monitored post-project. If found, newly detected or expanding PNF Priority invasive species will be treated in accordance with approved integrated pest management treatments.	FSM 2903 SNFPA 2004: Noxious weeds (Standards and Guidelines #41 &48).

Hydrology, Soil, and Aquatic Resources

Design Feature Number	Design Feature Description	Source
Riparian Conservation Areas		
HYDRO-1	Mechanical equipment is permitted within designated Riparian Conservation Areas (RCAs) but cannot enter the mechanical equipment exclusion zones (EEZs) for the purpose of removing material (See Table E-1 Riparian Conservation Area Operating and Equipment Specifications, below).	Sierra Nevada Forest Plan Amendment S&G 91, 92, 113
HYDRO-2	Mechanical equipment will be allowed to reach into EEZs with the extendable boom arm without disturbing the ground for the purpose of removing material.	Sierra Nevada Forest Plan Amendment S&G 91, 92, 113
HYDRO-3	Within RCAs but outside of EEZs, one-end suspension will be used to remove felled timber, where feasible. If one-end suspension is not feasible, end-lining is permitted. Excessive soil displacement (i.e., ‘furrowing’) caused by end-lining will be mitigated or repaired following removal.	Sierra Nevada Forest Plan Amendment S&G 91, 92, 113 1988 PNF LRMP Soil (pg. 4-45) 1988 PNF LRMP Water, SMZ (pg. 4-45)
HYDRO-4	To minimize soil displacement, equipment is not allowed to turn around off a skid trail in an RCA. No new benched or sidehill skids are allowed in RCA. No operations over 35% unless there is a flatter area to dissipate water flow and trap sediment	Sierra Nevada Forest Plan Amendment S&G 92, 112, 113

Design Feature Number	Design Feature Description	Source
	before it reaches a watercourse or lake (Forest Practice rules). Some exceptions may be allowed in WUI defense areas upon consultation with hydrologist/soil scientist or biologist prior to implementation.	1988 PNF LRMP Soil (pg. 4-45) 1988 PNF LRMP Water, Watershed Protection (pg. 4-41)
HYDRO-5	Mechanical equipment will be allowed to enter EEZs for the purpose of crossing streams. FS approved Hydrologist/Soil Scientist or FS approved Biologist will work with sale administration to approve stream crossings and need for potential rehabilitation.	Sierra Nevada Forest Plan Amendment S&G 92, 101, 113 1988 PNF LRMP Rx-9, Timber (pg. 4-92)
HYDRO-6	In general, hand cutting and removal of material within the RCA would be permitted. However, hand cutting in areas where water is present as well as cutting of riparian vegetation would not be allowed unless approved FS approved Hydrologist/Soil Scientist prior to implementation.	Sierra Nevada Forest Plan Amendment S&G 92 1988 PNF LRMP Water, SMZ (pg. 4-45)
General Measures		
HYDRO-7	Project implementation will adhere to BMPs in the National Core BMP Technical Guide	Sierra Nevada Forest Plan Amendment S&G 113; 1988 PNF LRMP, Water Quality (pg. 4-39)
HYDRO-8	Riparian species (aspen, cottonwood, alder, willow, dogwood, etc.) will not be cut or removed unless needed for operations and/or safety.	1988 PNF LRMP Riparian Areas (pg. 4-39)
HYDRO-9	Trees that provide bank stability or contribute to channel integrity will not be felled unless they pose a safety risk, in which case they will be felled and left in place.	Sierra Nevada Forest Plan Amendment S&G 113 (pg. 65)
HYDRO-10	Determine retention levels of large down woody material on an individual site basis. Within westside vegetation types, aim to retain an average within the treatment unit of 10-15 tons of large wood per acre, when consistent with surface fuel objectives. Within eastside vegetation types, aim to retain an average of at least three large down logs per acre when consistent with surface fuel objectives.	Sierra Nevada Forest Plan Amendment S&G 10 (pg. 51), HFQLG Land Allocation S&G (pg.69), 1988 PNF LRMP Wildlife, Fish, and Sensitive Plants, Dead and Down Wood (pg. 4-31)
HYDRO-11	Install and maintain suitable stormwater and erosion control measures such as weed-free wattles and/or other material, such as locally gathered wood, wood	Sierra Nevada Forest Plan Amendment S&G 13

Design Feature Number	Design Feature Description	Source
	chips, or pine needles, to stabilize disturbed areas and waterways before seasonal shutdown of project operations or when severe or successive storms are expected.	1988 PNF LRMP Soil (pg. 4-45)
HYDRO-12	Identify staging locations for equipment refueling and servicing and chemical storage sites and develop a Spill Prevention and Response Plan for these sites.	Sierra Nevada Forest Plan Amendment S&G 99 1988 PNF LRMP Rx-9, Water (pg. 4-93)
Timber Harvest, Vegetation Management, and Fuels Management		
HYDRO-13	Ground cover will be maintained at, or above, the minimum effective amount within treated units. Minimum effective ground cover range is between 50 and 70 percent, depending on erosion hazard rating.	Sierra Nevada Forest Plan Amendment S&G 13; 1988 PNF LRMP Soil (pg. 4-44); 1988 PNF LRMP Fire and Fuels (pg. 4-57)
HYDRO-14	Mechanical operations will be allowed to occur when the soils are dry to a depth of 8 inches, when the ground is frozen to a depth of 5 inches, uncompacted snow depth is at least 18 inches or compacted snow depth is 8 inches. Soils are considered dry when soil moisture in the upper 8 inches is not sufficient to allow a soil sample to be squeezed and hold its shape or will crumble when the hand is tapped. Operations on sandy soil types may be considered once the top 5 inches are dry assuming that access routes can support equipment mobilization and vehicle traffic without causing excessive damage to the road system.	1988 PNF LRMP Soil (pg. 4-43) National Forest Management Act (NFMA) of 1976
HYDRO-15	No piling of material or active ignition for burning will occur within 25 feet of perennial, intermittent and special aquatic features; larger buffers will be applied as appropriate based on slope or presence of special status amphibians as indicated in Table E-1 Riparian Conservation Area Operating and Equipment Specifications (below) and design element AMPHIB-1. Where feasible, burn piles will be burned prior to commencement of underburning activities.	Sierra Nevada Forest Plan Amendment S&G 109, 111 1988 PNF LRMP Rx-9, Timber (pg. 4-92)
HYDRO-16	For conifer encroachment treatments within meadows, material within the EEZ may be removed by hand or by equipment reaching into the EEZ. Material outside of the EEZ may be removed by mechanized equipment.	Sierra Nevada Forest Plan Amendment S&G 101; 1988 PNF LRMP Wildlife, Fish, and Sensitive Plants, Meadow Ecotones (pg. 4-31); 1988 PNF LRMP Riparian Areas (pg. 4-39)

Design Feature Number	Design Feature Description	Source
HYDRO-17	Burn piles are allowed in meadows outside of RCA EEZs but can be no greater than 10 feet wide by 10 feet high. Additionally, material in piles in meadows will be no greater than 10 inches in diameter and piles will cover no more than 30 percent per acre in the treated meadow.	Sierra Nevada Forest Plan Amendment S&G 111
HYDRO-18	Machine piling with bulldozers will generally be avoided.	National Forest Management Act (NFMA) of 1976
HYDRO-19	Generally, in the project area, mechanical operations are allowed to operate on slopes up to 50% if skid trail, ground cover, and RCA restrictions are followed.	1988 PNF LRMP Water, Streamside Management Zone (pg. 4-42, 4-43) 2023 Forest Practice Rules, Slide Areas (pg. 29, 40)
HYDRO-20	Remove woody material generated by project activities, including hand piles, that would inhibit flow and/or potentially create erosional issues within the active channel of the RCA.	
Landings, Temporary Roads, Skid Trails, Fire Suppression Lines		
HYDRO-21	When available, existing landings, temporary roads, and skid trails will be used.	Sierra Nevada Forest Plan Amendment S&G 113; 1988 PNF LRMP Soil (pg. 4-44); 2012 National Core BMP
HYDRO-22	No landings and temporary roads are allowed within meadows. If skid trails are necessary in a meadow ecosystem because there are no other alternatives to implement operations, they will be limited and placed in areas designated by a qualified specialist. After implementation, skid trails in meadows will be evaluated by a FS Hydrologist/Soil Scientist for detrimental compaction and soil disturbance. Locations that need repair will be remediated with an appropriate technique(s) such as subsoiling, scarification, spreading of native seed, and/or mulching with woody debris or certified weed-free straw.	Sierra Nevada Forest Plan Amendment S&G 100, 122 1988 PNF LRMP Soils (pg. 4-44)
HYDRO-23	Landing construction will not exceed 20 percent of an RCA's stream reach and/or special aquatic feature (SAF) including other disturbances.	Sierra Nevada Forest Plan Amendment S&G 92, 94, 113

Design Feature Number	Design Feature Description	Source
HYDRO-24	Landings within RCAs will be obliterated following project implementation, and a qualified specialist will evaluate them for compaction or erosion potential. Additional treatment may be recommended such as subsoiling, scarification, spreading of native seed, and/or mulching with woody debris or certified weed-free straw.	Sierra Nevada Forest Plan Amendment S&G 122
HYDRO-25	Skid trails will be perpendicular to the stream course within 50 feet of the stream and spacing of skids will generally be no closer than 100 feet center to center, when trails are parallel.	Sierra Nevada Forest Plan Amendment S&G 92, 113 2012 National Core BMP
HYDRO-26	No more than 15 percent of the unit should be dedicated to landings, permanent skid trails and temporary roads.	Sierra Nevada Forest Plan Amendment S&G 113; 1988 PNF LRMP Soil (pg. 4-44)
HYDRO-27	Unless otherwise agreed upon by Hydrologist/Soil Scientist and Sale Administrator, landings, skid trail approaches to landings (to a distance of 200 feet), temporary roads and non-system access roads will be subsoiled and recontoured. Skid trails on sandy soil types with slopes over 25 percent may not be approved for subsoiling but will be frequently water barred. Where available, slash will be spread out across the restored landing, skid trails temporary roads and non-system access roads. Additional seeding and/or mulching may be required by the NEPA authorizing official based on recommendations from FS Hydrologist/Soil Scientist. Stabilize and strategically place water bar roads, skid trails, temporary roads, and non-system access roads where drainage control issues are evident or expected. After use, these features should be barricaded at or near system and non-system road intersections to discourage vehicle traffic from accessing these features. Available natural materials such as rock boulders, logs, root wads and earth should be used where available to replicate a natural setting.	Sierra Nevada Forest Plan Amendment S&G 69, 122 2012 National Core BMP
HYDRO-28	Where temporary road or skid trail construction involves cut and fill, the feature will be subsoiled, then re-contoured to match the existing topography. Subsoiling will be 18 inches minimum depth on skid trails and temporary roads and landings. The subsoiler will be lifted where substantial root and bole damage to larger trees will occur from subsoiling. Skid trails on sandy soil types with slopes over 25	Sierra Nevada Forest Plan Amendment S&G 122 1988 PNF LRMP Soil (pg. 4-44)

<table>
<tr><th>Design Feature Number</th><th>Design Feature Description</th><th>Source</th></tr>
<tr><td></td><td>percent may not be approved for subsoiling but will be frequently water barred. Subsoiling will not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots. Subsoiling skid trails, temporary roads, and landings within harvest units on coarse textured soils (USDA texture classes: sands, loamy coarse sands; and coarse sandy loams with less than 5 percent clay content) that have developed from granitic parent material will generally not be recommended by hydrologist/soil scientist.</td><td></td></tr>
<tr><td>HYDRO-29</td><td>The general desired spacing for water bars is as follows:
<table>
<tr><td rowspan="2">SLOPE</td><td colspan="4">EROSION HAZARD RATING</td></tr>
<tr><td>LOW</td><td>MEDIUM</td><td>HIGH</td><td>VERY HIGH</td></tr>
<tr><td>%</td><td colspan="4">Spacing in feet</td></tr>
<tr><td>1-6</td><td>400</td><td>350</td><td>300</td><td>250</td></tr>
<tr><td>7-9</td><td>300</td><td>250</td><td>200</td><td>150</td></tr>
<tr><td>10-14</td><td>200</td><td>175</td><td>150</td><td>125</td></tr>
<tr><td>15-20</td><td>150</td><td>120</td><td>90</td><td>60</td></tr>
<tr><td>21-40</td><td>90</td><td>70</td><td>50</td><td>30</td></tr>
<tr><td>41-60</td><td>50</td><td>40</td><td>25</td><td>15</td></tr>
</table>
</td><td>1988 PNF LRMP Water, Water Quality (pg. 4-39)

1988 PNF LRMP Soil (pg. 4-44)

2012 National Core BMP, Chemical Use BMPs

Specialist input to satisfy Clean Water Act</td></tr>
<tr><td colspan="3">Water Drafting</td></tr>
<tr><td>HYDRO-30</td><td>Abate dust from logging traffic with water selected from water drafting sites that have suitable stream flow and access. When water is scarce, chlorite, sulfonate, or other dust abatement materials are allowed outside of the RCA EEZs.</td><td>Sierra Nevada Forest Plan Amendment S&G 101, 106

1988 PNF LRMP Air Quality (pg. 4-46)

1988 PNF LRMP Facilities, Roads (pg. 4-53)</td></tr>
</table>

Design Feature Number	Design Feature Description	Source
HYDRO-31	New and existing (where modifications or improvements are necessary) water drafting sites will be identified in consultation with qualified specialists prior to use.	Sierra Nevada Forest Plan Amendment S&G 101, 106
HYDRO-32	Maintain minimum pool levels during drafting using measurements such as staff gauges, stadia rods, tape measures, etc.	Sierra Nevada Forest Plan Amendment S&G 101, 106; 1988 PNF LRMP Water, Water Quality (pg. 4-39)
HYDRO-33	Water-drafting sites will be designed and constructed so that oil, diesel fuel, or other spilled pollutants do not enter the stream. Back-down ramps will be constructed to ensure the streambank stability is maintained and sedimentation is minimized. Rocking, chipping, mulching, or other effective methods are highly recommended to achieve this objective.	Sierra Nevada Forest Plan Amendment S&G 103, 106 1988 PNF LRMP Water, Water Quality (pg. 4-39)
HYDRO-34	As necessary, earthen or log berm, weed-free straw waffle, certified weed-free hay or rice straw bale berms, or other containment structures will be constructed above the full bank channel water line at the drafting site to protect the streambank.	Sierra Nevada Forest Plan Amendment S&G 103 1988 PNF LRMP Water, Water Quality (pg. 4-39)
HYDRO-35	Forest personnel and contractors will use the Forest Service approved suction strainer (FSM 5161) or other foot vales with screens having openings less than 2mm in size at the end of drafting hoses. The suction strainer will be inserted close to the substrate in the deepest water available; the suction strainer will be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid uptake of substrate or aquatic biota. "Mucked out" debris, bedload sediment, etc. will be transported to an appropriate disposal site (to be designated) if no apparent site is feasible.	Sierra Nevada Forest Plan Amendment S&G 110 1988 PNF LRMP Water, Water Quality (pg. 4-39)

Table E-1. Riparian Conservation Area Operating and Equipment Specifications

Hydrologic Feature	RCA Widths	Mechanical Thinning, Yarding, Mastication, Machine Piling Slash, & Active Landings Equipment Exclusion Buffers[1, 2]		Minimum Distance to Burn Piles & Underburn[3, 4]
		(A) Slope < 35%	(B) Slope 35-50%	
Perennial Streams	300 feet	25 or 82 feet	82 feet	25 or 82 feet
Intermittent Streams	150 feet			
Special Aquatic Features (lakes, wet meadows, wetlands, fens, springs, etc.)	300 feet	25 or 82 feet	82 feet	25 or 82 feet
Ephemeral Streams	150 feet	15 feet	25 feet	15 feet
Other Riparian Features[5] (dry meadows, seasonal wetlands)	150 feet	15 feet	15 feet	15 feet

1 Fell trees away from streams.
2 For streams and SAFs, minimum buffers vary depending on the presence of special-status aquatic species (see Section 4.2.2, Biological Resources).
3 Prescribed burning is allowed in RCAs, but ignitions are not. Prescribed fire must back into this zone.
4 In occupied or unsurveyed suitable habitat for special status amphibians, the minimum exclusion distance is increased to 82 feet.
5 Minimum buffers for meadow features vary depending on the condition of the meadow (e.g., if encroached by conifers, there would be a smaller buffer).

Silviculture

Design Feature Number	Design Feature Description	Source
Silviculture		
SILV-1	To prevent the infection and spread of *Heterobasidion* Root Disease, it may be necessary to treat conifer stumps after harvest operations. Application of a borate compound by hand should follow the most current Region 5 Guidelines. Decision to treat stumps with a borate compound should occur after discussion with the District Silviculturist and/or with Forest Health Protection Staff. Borate (fungicide) will not be applied within 25 feet of the known veined water lichen (*Peltigera gowardii*) occurrences or other special-status fungi and lichen species identified during pre-implementation special-status plant surveys.	Forest Health Protection Handbook, FSH 3409.11, Chapter 60; R5 borate stump direction letter from Regional Forest Pathologist (June 25, 2021)
SILV-2	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous, dominant and co-dominant trees to create a residual stand that would be	Sierra Nevada Forest Plan Amendment S&G 12 (pg. 52)

Design Feature Number	Design Feature Description	Source
	comprised of larger fire-resilient trees. Species preference would be determined by dominant forest type. In general, prefer to retain shade intolerant species including rust resistant sugar pine, black oak, ponderosa and Jeffrey pine, Douglas-fir, and western white pine.	
SILV-3	Following site preparation, plant native conifers using a mixture of planting arrangements and densities. Conifer species prescribed for each unit would be at the appropriate elevation zone, and species would be appropriate for the site. In general conifer species such as rust-resistant sugar pine, Douglas-fir, ponderosa pine, Jeffrey pine, red fir, and incense cedar would be planted. Planting conifers would replace the seed sources of desired species lost during the fire. Planting densities would range from approximately 50 to 300 trees per acre/depending upon site and reforestation objectives.	Forest and Rangeland Renewable Resource Act (1974) as amended by National Forest Management Act (1976) Sec. 4. (d)(1); paragraph (c)(3) 36 CFR 219.27; Silvicultural Practices Handbook FSH 2409.17 (Amendment R5 2409.17-2014-1 (in review))
SILV-4	Release treatments will occur around desired seedlings with the intent to reduce competing vegetation and enhance seedling survival. Release treatments would include no more than two radial applications of herbicide from 7-10 feet surrounding planting site within the lifetime of the plantation. If a planting site needs to be completely replanted, then the two application limit re-initiates. Additional chainsaw, manual, and mechanical releases surrounding the planting site may be used as needed.	Forest and Rangeland Renewable Resource Act (1974) as amended by National Forest Management Act (1976) Sec. 4. (d)(1); paragraph (c)(3) 36 CFR 219.27; Silvicultural Practices Handbook FSH 2409.17 (Amendment R5 2409.17-2014-1 (in review))
SILV-5	In general, unless approved by a Forest Plan Amendment, no trees greater than 30.0” DBH shall be cut during harvest operations unless deemed a hazard per OSHA requirements or is an impediment to operational feasibility. If approved by a Forest Plan Amendment, removal of live trees greater than 30 inches dbh but less than 40 in dbh may occur **outside** of AGOS PACs, CSOW PACs, CSOW HRCAs, and suitable habitat within CSOW territories in the following specific circumstances as described below and/or determined in collaboration with USFWS: • Removal of select shade-tolerant trees to promote retention and growth of existing shade-intolerant pine species in the same area of comparable size, such as ponderosa pine or sugar pine, or shade-intolerant broadleaved species, such as black oak or aspen. • Removal of select shade-tolerant trees to promote the establishment, growth, and development of stands with multiple size and age classes and create small gaps to	Sierra Nevada Forest Plan Amendment S&G 6 (pg. 50); R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PROJ-1B

Design Feature Number	Design Feature Description	Source
	increase resilience of owl habitat to natural disturbances (e.g., large-scale wildfire; tree mortality due to drought, insects, and disease). • Thinning of trees in homogeneous plantations where large diameter trees are at risk due to competition. • Removal of conifers for restoration of other key habitat types such as meadows, oaks, or aspen groves or for cultural or Tribal importance. • In the case of imminent threat to life and property. No more than an average of one 30-40” DBH shade-intolerant tree per ten acres of commercial thin units will be removed. This will be reflected in the prescriptions and/or marking guidelines reviewed and approved by a Forest Service Silviculturist. Trees with desired wildlife characteristics will be retained.	
SILV-6	For treatments reducing conifer encroachment within and around aspen stands outside of EEZs, conifers up to 40” DBH may be felled, per proposed Forest Plan Amendment STD-PROJ-IB. Treatments may occur up to 150 feet out (buffer zone) from the aspen stand. Where aspen stands are surrounded by dense, live conifer stands, no canopy cover or spacing guidelines would restrict removal of conifers. Where aspen stands are surrounded by large patches (generally >100 acres) of high severity fire (≥75% basal area loss), 10-15% of canopy cover within the buffer zone will be retained along the north and northeastern sections of the buffer zone. Canopy cover retention does not apply within the aspen stand itself. Generally, conifers would be retained using the following indicators: • fire-tolerant, shade-intolerant species; • trees with valuable wildlife habitat characteristics such as multiple tops, broken tops, rot, and cavities; • trees occurring where they do not impede the growth of aspen or riparian hardwoods and would provide future coarse woody debris input to streams.	R5 Project-specific Forest Plan Amendments for CSOW Habitat STD-PROJ-1B
SILV-7	For plantations (0x to 2x CWHR size/density classes): generally, design treatments to have less than 5 tons/acre in surface fuels (3 inches and smaller), less than ½ foot fuel bed depth, average less than average 4 feet in flame length (90th percentile fire weather conditions) and that these treatments should be effective for more than 5 to 10 years.	Sierra Nevada Forest Plan Amendment S&G 3 for Plantations (0x-2x) (pg. 50)

Herbicide Use

Design Feature Number	Design Feature Description	Source
General Measures		
HU-1	A spill kit and safety plan will be on-site during herbicide treatments. All applications will follow CA label requirements.	Sierra Nevada Forest Plan Amendment S&G 99 (pg. 63); 1988 PNF LRMP Water, Water Quality (pg. 4-39); 1988 PNF LRMP Rx-9 (pg. 4-93); 2012 National Core BMP, Chemical Use BMPs
HU-2	No more than daily-use quantities of herbicides will be transported to the project site. Exceptions will be made for crews staging in remote locations. Under these circumstances, crews may bring enough quantities of herbicides to last for the planned duration of field work. In these instances, the herbicides will be stored at a minimum of 100 feet from any body of water or stream channel, unless prior approval has been granted by a Forest Service Hydrologist or Forest Service Biologist, to prevent them from entering the water should a spill or leak occur.	Sierra Nevada Forest Plan Amendment S&G 99 (pg. 63); 1988 PNF LRMP Water, Water Quality (pg. 4-39); 1988 PNF LRMP Rx-9 (pg. 4-93); 2012 National Core BMP, Chemical Use BMPs
HU-3	Equipment used for transportation, storage, or application of herbicides will be maintained in leak-proof condition and secured to prevent tipping during transport.	Sierra Nevada Forest Plan Amendment S&G 99 (pg. 63); 1988 PNF LRMP Water, Water Quality (pg. 4-39); 1988 PNF LRMP Rx-9 (pg. 4-93); 2012 National Core BMP, Chemical Use BMPs
HU-4	Impervious containment material will be placed beneath mixing areas to contain any spills associated with mixing/refilling.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs
HU-5	No herbicide application will occur during precipitation, or if precipitation in excess of 0.1 inches is forecasted (>50% probability) 24 hours before or after project activities, or as required by the label. Formulations containing triclopyr butoxyethyl ester (BEE) are not being considered.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs; R-5 Guidance: The ester formulation is highly toxic to aquatic organisms.
HU-6	To prevent overspray and limit human exposure, spray application of herbicides will not be carried out when wind speeds are 10 mph (sustained) or greater.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs

Design Feature Number	Design Feature Description	Source
HU-7	Herbicide spray equipment will not be washed or rinsed within 100 feet of any body of water or stream channel. All herbicide containers and rinse water will be disposed of consistent with the product label and in a manner that would not cause contamination of waters.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 1988 PNF LRMP Rx-9 (pg. 4-93); 2012 National Core BMP, Chemical Use BMPs
HU-8	Prior to initiating herbicide treatment, signs will be posted at public access points to treatment areas. Information on signs will include the herbicides being used, dates of application, and the name and telephone number of a contact person. Signs will be posted two weeks before and after an area has been treated with herbicide.	
HU-9	Recently treated areas shall not be reentered until the herbicide has dried. If the herbicide label specifies a reentry period or restricted entry interval, treated areas must be posted with signs warning visitors to not enter the treated area until the specified interval has elapsed.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs
HU-10	In foliar application treatment areas where members of the public might consume vegetation or fruit growing on site, steps will be taken to avoid the potential for consumption of fruit exposed to herbicides. This may include cutting the edible vegetation or fruit prior to treatment, tarping or adjusting treatments to avoid fruiting time. No measures are needed if the foliar herbicide treatment is >10 feet away from a fruiting plant.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs
HU-11	Culturally significant plant gathering grounds will be identified by cultural monitors and avoided for direct herbicide application. These areas will be identified to herbicide applicators for avoidance, by a PNF Botanist or their designee, or a Cultural Monitor. Identified gathering grounds will be buffered a minimum of 25 feet to prevent spray drift. Best management practices for drift reduction measures will be in place.	
HU-12	The following herbicide application buffers will be observed for milkweed, culturally significant, and special-status plant species within the project area: • For reforestation treatments, no broadcast or direct applications would occur within 25 feet of milkweed, culturally significant, and special-status plant species. Modifications may be made in consultation with a PNF botanist. • For invasive plant treatments, no directed spray or select application would occur within 25 feet of milkweed, culturally significant, and special-status plant species.	USDA NRCS Monarch Butterfly Field Guide (2020)

<table>
<tr><th>Design Feature Number</th><th>Design Feature Description</th><th>Source</th></tr>
<tr><td></td><td>Buffers may be waived if plants are covered by a protective barrier. Under saturated/wet soil conditions, only select herbicide application is permitted within 100 feet of rare plant species. Modifications may be made in consultation with a PNF botanist.
• Herbicide applicators will be instructed on proper plant species identification as needed before implementation.</td><td></td></tr>
<tr><td>HU-13</td><td>All private property boundaries will be protected with a 50-foot buffer for herbicide treatment and mixing. This design feature may be waived through mutual agreement with the adjacent landowner.</td><td></td></tr>
<tr><td colspan="3">Standard Protection Measures Established by Forest Service Directive</td></tr>
<tr><td>HU-14</td><td>The Forest Service Handbook contains general provisions for herbicide transportation, handling, application, and emergency spill response and reporting. This plan requires adherence to the herbicide label and material safety data sheet providing more detailed instructions on handling, storage, protective equipment, and spill cleanup. This information will be available on-site during herbicide treatments. (Forest Service Manual (FSM) 2150 (USFS 2014) and FSM 2509.22 BMP 5-10 (USFS 2011).</td><td>2012 National Core BMP, Chemical Use BMPs</td></tr>
<tr><td>HU-15</td><td>Streamside wet area protection (for instance, leaving an untreated strip of land alongside surface waters, wetlands, and riparian areas) will be implemented during spray applications of herbicides.
<table>
<tr><th rowspan="2">Hydrologic Feature</th><th rowspan="2">RCA Widths</th><th colspan="2">Streamside Wet Area Protection Buffers</th></tr>
<tr><th>Slope < 30%</th><th>Slope 30-50%*</th></tr>
<tr><td>Perennial Streams</td><td>300 feet</td><td>107 feet</td><td>107 feet</td></tr>
<tr><td>Intermittent Streams</td><td>150 feet</td><td>107 feet</td><td>107 feet</td></tr>
<tr><td>Ephemeral Streams</td><td>150 feet</td><td>25 feet</td><td>50 feet</td></tr>
<tr><td>Special Aquatic Features (lakes, wet meadows, wetlands, fens, springs, etc.)</td><td>300 feet</td><td>107 feet</td><td>107 feet</td></tr>
</table></td><td>ORDER NO. R5-2017-0061: Waste Discharge Requirements General Order for Discharges Related to Timberland Management Activities for Non-Federal and Federal Lands, Attachment C (pg. 7-8); Habitat Use, Home Range, and Movements of Mountain Yellow-legged Frogs in Bean and Spanish Creeks on the Plumas National Forest (2008); Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-Legged Frog, Endangered Northern Distinct Population Segment of the Mountain</td></tr>
</table>

Design Feature Number	Design Feature Description	Source
	Other Riparian Features (dry meadows, seasonal wetlands) — 150 feet — 25 feet — 50 feet *Minimum effective groundcover of 50% is required prior to application and documentation needs to be submitted to Water Board.	Yellow-Legged Frog, and Threatened Yosemite Toad, Conservation Measures (2014)
HU-16	An herbicide application monitoring program will be established as a part of the project. The monitoring program will: 1) determine whether herbicides were applied safely, were restricted to intended target areas, and did not result in effects to non-target species, 2) document and provide early warning of hazardous conditions resulting from possible herbicide contamination of water or other non-target areas, and 3) determine the extent, severity, and possible duration of any potential hazard that may exist.	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs
HU-17	The Forest Service will maintain a safety plan specific to this project that includes a job hazard analysis, including personal protective equipment (PPE) needs (FSH 6709.11; USFS 1999) and addresses risk and standard cleanup procedures (Forest Plan, part 2, p. 106; FSM 2153.3 [USFS 1994b]; FSH 2109.14,16 [USFS 1994b]).	1988 PNF LRMP Water, Water Quality (pg. 4-39); 2012 National Core BMP, Chemical Use BMPs
HU-18	Judicial use of herbicides for the targeted treatment of invasive species may be used within stream buffers, in accordance with label requirements and Forest Service regulations, and in consultation with Forest Service Wildlife Biologist.	USFWS biological opinion, herbicide labels.
Water Board Requirements		
HU-19	Where management activities are planned on a burned area with slopes greater than 30%, a minimum of 50% average effective groundcover is required to be documented prior to pesticide application. Documentation shall be provided to the Central Valley Water Board in the pesticide notification 30 days prior to application if the project is enrolled under Category 5A. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application. “Effective Ground Cover”, [...] means any combination of slash (lopped and in close contact with the ground), mulch (large wood chips, wood shreds, wood strand blends,	ORDER NO. R5-2017-0061: Waste Discharge Requirements General Order for Discharges Related to Timberland Management Activities for Non-Federal and Federal Lands, Attachment C (pg. 7-8) ORDER NO. R5-2017-0061: Waste Discharge Requirements General Order for Discharges Related to Timberland Management Activities for Non-Federal and Federal Lands (pg. 32)

Design Feature Number	Design Feature Description	Source
	straw, bark, surface rock fragments larger than ¾ inch), plants, and plant litter. Large wood chips are a minimum of 2 inches in length and at least four (4) times longer than they are wide: If the project is enrolled under Category 5B, Forest Service shall notify the Central Valley Water Board, in writing, at least 15 days prior to any proposed application of pesticides.	

Watershed Treatments

Riparian Channel Improvement		
WSHD-1	Large woody debris installation. Dead trees to be chainsaw felled will be selected for directional felling. Where tree breakage is insufficient for effective bed contact, tree boles will be bucked to ensure >50% of bole length is in contact with streambed. Trees will be >18" dbh, with primary trunk lengths 2 times the channel width. Dead trees with definite lean to the channel to be left for future recruitment.	California Salmonid Stream Habitat Restoration Manual, 4th Edition, Ca. Dept. of Fish & Game, 2010
WSHD-2	Accelerate woody riparian regeneration using locally sourced willow stakes, cuttings and/or container stock.	California Salmonid Stream Habitat Restoration Manual, 4th Edition, Ca. Dept. of Fish & Game, 2010
Meadow Floodplain Restoration- Soil/Rock Fills		
WSHD-3	Meadow floodplain restoration can be accomplished by using partial or complete fill to eliminate an over-sized, incised channel. Fill will be selected that most closely matches native meadow material, and minimizes impacts to flow and to the disturbance area footprint. In fish-bearing streams, all fish species will be removed prior to channel fill and associated channel diversion activities, and relocated outside the affected active work zone by a qualified biologist authorized under a Scientific Collection Permit issued by the California Department of Fish & Wildlife.	Pond & Plug Briefing Paper, Plumas NF May, 2010

WSHD-4	Fills are graded and compacted to approximately 80%, then shallow ripped to improved initial rainfall infiltration.	Pond & Plug Briefing Paper, Plumas NF May, 2010
WSHD-5	Topsoil from borrow areas is removed and stockpiled to top dress bare soil areas with residual fertile soils and seed bank material.	Pond & Plug Briefing Paper, Plumas NF May, 2010
WSHD-6	Established, transplantable herbaceous and woody riparian vegetation is removed from fill and borrow areas and stockpiled for replanting on fills or other areas needing immediate vegetative structural stability.	Pond & Plug Briefing Paper, Plumas NF May, 2010
WSHD-7	All disturbed, bare soil areas are supplemental seeded with locally collected native plant seeds, and mulched with locally sourced materials, such as duff, woodchips, thinning slash, brush, etc. to achieve a minimum of 70% soil cover.	Pond & Plug Briefing Paper, Plumas NF May, 2010
WSHD-8	Meadow floodplain restoration can also be accomplished by raising the existing streambed using riffle augmentation. Design measures WSHD-6 and WSHD-7 are applied as appropriate.	Pond & Plug Briefing Paper, Plumas NF May, 2010
WSHD-9	Valley grade structures may be constructed, generally at a valley constriction, to anchor the restored floodplain elevation. These structures have an earthen core covered with a three- to four-foot-thick layer of 2-foot minus rock/soil mix and vegetation transplants. The structure will have a general slope of 5% or less. A low flow riffle/pool channel at a 3.5% or less gradient is constructed to meander down the structure for fish passage. Design measures WSHD-6 and WSHD-7 are applied as appropriate.	Pond & Plug Briefing Paper, Plumas NF May, 2010
Meadow Restoration- Conifer Encroachment Treatments		
WSHD-10	For treatments reducing conifer encroachment within meadows proposed for hydrologic restoration, conifers up to 40” DBH may be felled, not to include removal of all trees, per proposed Forest Plan Amendment STD-PROJ-IB. Generally, conifers would be retained using the following indicators: • Fire-tolerant, shade-intolerant species; • trees with valuable wildlife habitat characteristics such as multiple tops, broken rot, and cavities; • trees occurring where they do not impede the growth of aspen or riparian hardwoods;	

	• trees that would provide future coarse woody debris input to streams.	
WSHD-11	Boles resulting from treatment of encroaching conifers may be left within the meadow as large down woody debris, provided that appropriate ground fuel loadings are not exceeded. If the PNF Fuels Specialist determines that ground fuel loadings are exceeded, woody material may be hand piled and burned or removed by hand. Depending on soil conditions, boles may be mechanically removed provided impacts to the meadow are minimal or can be mitigated or repaired. Additional fuel reduction activities such as hand piling and burning may need to occur in instances where boles cannot be removed. Conifers less than 10" DBH may be removed via mastication if impacts to the meadow are minimal or can be mitigated or repaired, by hand felling and chipping with tracked equipment, or hand felling/piling/burning. All conifer encroachment treatments within meadows may be applied within a buffer extending out from the meadow perimeter by up to 150 ft. Any equipment operating for hydrologic restoration, conifer removal, or fuel reduction activities would be subject to the terms and conditions of permits obtained for the hydrologic restoration.	

All Other Resources

Design Feature Number	Design Feature Description	Source
Recreation and Public Use		
REC-1	At the discretion of the Forest Service, recreation areas (designated roads, trails, trailheads, staging areas, and dispersed campsites) may be temporarily closed to provide for public safety during active tree removal operations. Advance notice of campground closures will be coordinated with the campground concessionaire, posted at recreation sites, and shared with the public via social media and a press release.	36 CFR 261.50
REC-2	All recreational improvements (directional and informational signs, barriers, etc.) will be protected. If any barriers (including natural barriers) or improvements are damaged or removed during Project activities, they will be	Timber contract language

Design Feature Number	Design Feature Description	Source
	replaced and re-installed in the same location and manner immediately following vegetation management operations.	
REC-3	Skid trails will be treated to prevent post-harvest use by off-highway vehicles (OHV). Skid trails that intersect forest roads or trails will be revegetated, camouflaged, or barricaded with natural materials once they are no longer in use.	Timber contract language
REC-4	Within Recreation Areas, new landings will be sited in coordination with a Recreation Specialist and will be fully decommissioned and closed following use.	Timber contract language
REC-5	Within recreation areas, avoid scheduling implementation work between the Memorial Day and Labor Day holidays. When not possible, avoid disruption to recreation activities and high use recreation sites on weekends and holidays.	Timber contract language
TRAIL-1	Advanced notice of trail closures would be posted at trailheads and on the internet. During active logging, trails would be closed for safety. If possible, trails should be closed after Labor Day to reduce impacts to Forest visitors.	36 CFR 261.50
TRAIL-2	No skidding on non-motorized trails. Motorized trails will be identified in advance of treatments and avoided when possible. If motorized trails must be used, crossings are to be made perpendicular to trails, unless review by recreation staff determines that site disturbance can be minimized, and trail integrity can be preserved. Recontour/smooth and scatter material to conceal and discourage use of skid trails where they cross the trail. Protect all existing structures such as turnpikes, bridges and signs during thinning and burning.	Timber contract language
TRAIL-3	Resource management adjacent to and along the trail corridor is consistent with Recreation Opportunity Spectrum Objectives and desired conditions of adjacent management areas. FSH 2309.18, National Quality Standards for Trails.	FSH 2309.18 National Quality Standards for Trails

Design Feature Number	Design Feature Description	Source
TRAIL-4	New trail construction will follow Forest Service design standards from FSH 2309.18 Trails Management Handbook as appropriate for trail class and user type.	FSH 2309.18 Trails Management Handbook
TRAIL-5	A cultural monitor will be present during trail construction where sensitive resources have been identified. Discovery of culturally significant resources in the pathway of new trail construction will prompt the trail to be rerouted as needed. A cultural monitor will provide feedback on how the trail should be realigned to protect cultural resources.	
Visual Resources		
VQO-1	Within Retention Zones, provide a natural-appearing landscape where management activities are not visually evident. Locate landings and primary skid trails away from the immediate foreground along trails and primary roads.	1988 LRMP VQO Map and as outlined in Standards and Guidelines p. 4-26-4-27.
VQO-2	Within Retention Zones, minimize stump height in both mechanical and hand thinning treatment units within the immediate foreground of trails and primary roads. Target consumption of burn piles to 90% or greater where they are visible from trails and primary roads.	Same as above
Fire and Fuels		
FF-1	Prescribed fire and cultural burn projects, including underburning, broadcast burning, and pile burning will be implemented under an approved Prescribed Fire Plan / Burn Plan.	
FF-2	A cultural monitor will be on site for fire management feature construction and maintenance in culturally sensitive areas. Hand thinning will be used where necessary to protect culturally significant resources.	
FF-3	Control erosion on fire management features and protect aquatic resources by fully installing waterbars (where appropriate for soil and slope conditions) to minimize hydrologic connection. See Hyd-28 for waterbar spacing.	

Design Feature Number	Design Feature Description	Source
FF-4	Remove dense fuel concentrations along and adjacent to fire management features.	
FF-5	Provide a sufficient width (1-2 dozer blades or 8-16ft.) that is not obstructed with large down wood except where needed to block traffic.	
FF-6	Effectively block traffic where fire management features intersect open roads and trails.	
Special Designations		
SD-1	Project activities within special land allocations will be carried out in compliance with prescriptions and limitations identified in the PNF Land and Resource Management Plan, as amended by the SNFPA.	
Minerals		
MIN-1	Mining claimants within the project area will be notified of the project implementation schedule once it is established.	
MIN-2	Protect mining claim corner markers and discovery markers. (This does not apply to signs attached to trees.) Mining claims markers include a corner monument on each of the four corners and one at the discovery point. Any other signs should be approved by the Forest Service and may require a Plan of Operations. Monuments are usually a wooden 4X4 post or a PVC pipe, often with rocks piled up around the base. However, a wide variety of variations can be found.	
MIN-3	Claim signs attached to trees (marked for removal) should be removed from the tree and turned in to the Minerals staff. In most cases, attaching signs to trees is not allowed. However, many mining claims signs are attached to trees. If trees planned for removal have mining claim signs attached to them, the signs should be removed and turned in to the Minerals staff, so the signs may	

Design Feature Number	Design Feature Description	Source
	be returned to the claimant. The location of the sign should be noted when turning it in to the Minerals staff.	
MIN-4	Plan on the ground project activities so as not to interfere with active mining operations. During the planning stages, mining claim owners should be included in public scoping. A separate cover letter for miners may be needed with the scoping information. Any responses from the claimants should be coordinated with the Minerals staff. It is important to remember that miners have a statutory right to access the minerals on their claims. Forest projects must be planned so as not to interfere with any active mining operations. Responses to scoping will help to identify any planned mining activities.	
MIN-5	Check again at implementation time. Time between document input and project implementation may be a few months or a few years. Because mining claims can be dropped or new claims filed at any time, it is important to check with the Minerals staff at the time the project is about to start. A letter to new claimants may be required to allow coordination of the timing of activities.	
Lands		
LAND-1	Land survey signs and monuments will be protected.	
Air Quality		
AQ-1	Prescribed fire and cultural burn projects, including underburning, broadcast burning, pile burning will be implemented under an approved smoke management plan with a valid air pollution permit from the applicable Air Pollution Control District (i.e. Northern Sierra Air Quality Management District).	
AQ-2	Stabilize roadways and abate dust to avoid unacceptable resource damage or to allow use of otherwise impassable or unsafe roads	
AQ-3	Give preference to fuel utilization. Where utilization will not be effective, employ broadcast burning or underburning, pile and burn treatment, and/or fuel break system construction.	

Design Feature Number	Design Feature Description	Source
Roads		
ROADS-1	Maintain function of drainage features to protect forest resources and investment of NFS roads through road maintenance activities. Replace undersized or failed drainage features and install erosion protection at inlets and outlets where needed. Adhere to most stringent Best Management Practices and California State Water Quality Control Board Standards for Best Management Practices.	
ROADS-2	Where feasible and necessary for chip vans to access mastication treatment areas and haul chips off-site, maintain slope embankments and construct curve widening at critical road locations only. Avoid areas where curve widening will cause unacceptable resource damage.	Forest Service Manual (FSM) 7730 and Forest Service Handbook (FSH) 7709.56
ROADS-3	Evaluate the feasibility for potential additional intervisible turnouts on NFS roads that will utilize chip vans and/or log trucks for material removal from project site.	FSM 7730 and FSH 7709.56
ROADS-4	Evaluate the need and feasibility for potential additional turnouts on narrow NFS roads that are near communities for evacuation egress and first responder access.	FSH 7709.56
ROADS-5	Routine NFS road maintenance will include roadside brushing for sight clearance and visibility of traffic control devices. Road prism surfaces will be cleared of overgrown vegetation, repaired, and graded to facilitate safe access to and within the Project area for the critical vehicles. Surface types will not change, but spot locations may be eligible for improvement to facilitate critical vehicle access and/or for forest resource protection. Existing traffic control devices will be brought back up to standard by either repair or replacement.	FSM 7730 and FSH 7709.56 Engineering Manual (EM) 7100-15 (FSM 7160.31); CA-Manual of Traffic Control Devices
ROADS-6	Hazard tree removal may occur on both sides of NFS roads accessing and within Project areas to facilitate safer travel for the public as well as first responders and Project implementation personnel.	Region 5 Hazard Tree Identification and Mitigation March 2022
ROADS-7	Public access and use of NFS roads may be limited or prohibited at times during Project implementation, especially for but not limited to safety reasons.	36 CFR 212

Design Feature Number	Design Feature Description	Source
	During haul of Project generated materials (logs, chips, etc.), some Operational Maintenance Level 2 roads (OP-ML 2) may temporarily be improved through surface grading or other measures to facilitate use by critical vehicles. Temporary improvements will not modify the Forest's Travel Management user vehicle type nor time of use after project completion. Motor Vehicle Use is not expected to change.	
ROADS-8	Construction of temporary roads should attempt to utilize previously decommissioned road or skid trail prisms where possible. Decommission the temporary roads as part of project implementation.	See HYDRO 20-28
ROADS-9	Access to existing approved water drafting sites shall be restored, armored, and protected to prevent soil erosion and degradation to water sources. Water is necessary for dust abatement and other project activities, in addition to need for response to potential fires in or near project area.	See HYDRO 29-34
Range		
RANGE-1	Grazing permittees within the project area will be notified of the project implementation schedule when established.	
RANGE-2	Protect range improvements including fences, cattleguard wings, spring developments and corrals. If any improvements are damaged or removed during Project activities, they will be replaced and re-installed in the same location and manner immediately following vegetation management operations.	
RANGE-3	Grazing permittees within the project area should be included in scoping for project planning.	
Prescribed Grazing		
RXGRZ-1	The appropriate USFS resource specialists, including the PNF botanist, archaeologist, hydrologist, or wildlife biologist, shall determine buffers or other limitations if prescribed grazing is proposed around sensitive areas such as riparian zones, rare plant populations, Threatened or Endangered animal	Burrows et al., 2015; CalVTP, 2019

Design Feature Number	Design Feature Description	Source
	habitat, or archaeological resources. Install temporary exclusionary fencing where necessary.	
RXGRZ-2	• To prevent introduction of seeds from undesirable plant species to each site, consideration should be given to where the animals are coming from, and whether viable seeds of undesirable species are present. If this is the case, the herd should be fed a weed free diet for three days prior to being introduced to a new grazing site. Any supplemental feed brought on site should be free of noxious weeds. • Minimize the spread of invasive plants and pathogens through the use of quarantine periods, holding areas, clean stock water, and personnel, equipment, and vehicle sanitation. • Inspect animals, equipment, and clothing and take appropriate steps to wash or decontaminate prior to entering new treatment area. • Target invasive plant species for removal whenever feasible. Dispose of invasive plant biomass off site at an appropriate quarantine site for the animals. • Protocols to prevent weed spread (diet/quarantine/cleaning) shall be utilized when moving goats from any area with invasive plants into a new un-infested area.	Burrows et al., 2015 CalVTP, 2019
RXGRZ-3	Use appropriate stocking density to achieve uniform utilization of the targeted vegetation.	Burrows et al., 2015
RXGRZ-4	Post signs warning public of danger of electric fences and unleashed guard dogs when the project area is open to the public. Discuss public interactions with the on-site herder and grazing project manager.	Burrows et al., 2015
RXGRZ-5	Conduct appropriate public outreach so that the public will understand the project objectives: • Consider project signage or a one-page pamphlet or brochure available on-site describing the overall project, its objectives, and how herbivory is helping to achieve those objectives.	Burrows et al., 2015; CalVTP, 2019

Design Feature Number	Design Feature Description	Source
	• If a treatment activity would require temporary closure of a public recreation area or facility, the project proponent will coordinate with the owner/manager of that recreation area or facility. If temporary closure of a recreation area or facility is required, the project proponent will work with the owner/manager to post notifications of the closure at least 2 weeks prior to the commencement of the treatment activities. Additionally, notification of the treatment activity will be provided to the PNF Recreation and Lands Program Manager.	
RXGRZ-6	Notify affected grazing permittees prior to implementing a prescribed grazing project. The PNF Botanist will coordinate with the PNF Rangeland Management program during development of prescribed grazing treatments.	
RXGRZ-7	Confirm that the contract grazer has well thought-out animal care procedures and protocols in place to ensure the animals are cared for in a responsible, humane fashion (ample stock watering, safety from predators, and careful animal observation and action for sickness or disease).	Burrows et al., 2015
RXGRZ-8	Develop a monitoring program that determines the effectiveness of the grazing/browsing program compared to the original planned results.	Burrows et al., 2015
RXGRZ-9	Minimize soil erosion by: • Using appropriate stocking density to achieve uniform utilization of the targeted vegetation. • Trampled grasses/herbaceous material may be left on the ground surface to protect soil as long as it does not exceed 4 inches in height. • Graze grasses (annual and perennial), weeds, and thistles to a height of 4 inches. Avoid removal of the mineral soil to minimize erosion. • Avoid grazing in unstable slope areas and slopes greater than 75% (i.e., 37 degrees). Require review of project sites with slopes greater than 50% by a PNF Silviculturist or Hydrologist to determine erosion potential and identify measures to minimize impacts to slope stability (e.g., reducing herd size to retain vegetation, avoiding grazing where	CalVTP, 2019

Design Feature Number	Design Feature Description	Source
	• saturated soil conditions exist, shortening grazing duration, installing temporary exclusionary fencing). • Avoid damage to existing trails, which in turn may result in soil erosion and slope instability following prescribed herbivory, by avoiding established trails on slopes in excess of 50% (i.e., 27 degrees). Suspend grazing activities during heavy precipitation and resume once soils are no longer saturated.	
RXGRZ-10	Maintain water quality by: • Establishing buffers as outlined in RXGRZ-1. • Require grazing contractors to provide on-site water for grazing animals in the form of a temporary portable water source located outside of environmentally sensitive areas. Design treatment prescriptions to protect soil stability. Herd animals out of an area if accelerated soil erosion is observed	CalVTP, 2019

Appendix F Non-timber Vegetation Management Decision Matrix

Various species of shrubs, or "brush," are endemic to forested areas within the Tributaries project area (Common species in Table F-1). Species occurrence and community composition are often dictated by elevation, soil type and moisture regime. These individual shade intolerant plants, or propagules are always present in the forest soil, lying dormant awaiting fire or other disturbance that removes the conifer overstory. These brush species play a valuable role in landscape recovery by rapidly providing cover and holding soil in place on disturbed land, rebuilding soil nutrients and organic matter, sequestering carbon, and providing shade for conifer seedlings. Most conifer seedlings do not survive amongst the brush, but some hardy individuals eventually overtop the brush and begin the process of pushing it back into dormancy, over many decades. This process worked well with natural disturbance in small areas, with adequate nearby conifers to provide a steady supply of seed. However, with the recent large fires leaving many thousands of contiguous acres without surviving conifers, some artificial regeneration is necessary to initiate the forest recovery process, ideally in a shorter planning horizon than could naturally occur.

Table F-1. Common forest-related brush species

Species (Common and *scientific names*)	**Preferred Growing conditions**	**Nitrogen fixing**	**Wildlife Values**
Whitethorn – *Ceanothus cordulatus*	<5,000 elev/wetter	Yes	pollinators, birds
Deerbrush- *Ceanothus integerrimus*	>5,000 elev/drier	Yes	pollinators, birds, mammals
Manzanita- *Arctostaphylos spp*	>5,000 elev/drier	No	pollinators, birds, mammals
Snowberry- *Symphoricarpos spp*	>5,000 elev/drier	No	pollinators, birds, mammals
Bitter cherry- *Prunus emarginata*	<5,000 elev/wetter	No	pollinators, birds, mammals
Tobacco brush- *Ceanothus velutinus*	<5,000 elev/drier	Yes	pollinators, birds
Mahala mat- *Ceanothus prostratus*	>5,000 elev/drier	Yes	pollinators, birds
Choke cherry- *Prunus virginiana*	>5,000 elev/drier	No	pollinators, birds, mammals

The public invests a significant amount of resources into reforestation efforts, post fire. These costs are attributable to site preparation (removing/treating burned materials, treating emerging brush), planting and ongoing maintenance to ensure reasonable stocking after 5 years and beyond. In total, the costs can range from $100s to $1,000s of dollars per acre depending on site preparation, planting and maintenance needs. There are a wide variety of methods, and combinations thereof, available to achieve the desired outcome described above (Table F-2 summarizes the more commonly used methods and techniques used on the Plumas National Forest).

There is a wide array of equipment and materials that can be matched to more precisely meet a desired outcome at any particular location. Masticators, chippers and piling machines are available in numerous configurations and sizes. There are a variety of herbicides that can be used individually, or in combination, to target specific classes and/or species of competing plants—whether herbaceous, woody, broadleaf or conifer—as well as in combination with mechanical reduction of plant material. Manual and chainsaw release further broadens the toolbox to hone the most effective and cost-effective treatments, with the least impacts to other resources. Costs vary significantly with the method/combination of methods used for a desired outcome. Table F-3 is a simplified decision matrix that can be used to identify the most appropriate methods across some common site conditions.

Table F-2: Treatments, methods, outcomes

Treatment Type	Method	Techniques	Outcome	Cost Ranges**	Opportunities & Constraints
Site prep	Commercial salvage	Ground skidding, variety of cable, helicopter	Commercial saw timber removed, other material treated as specified	From a positive net sale revenue up to $200/ac. service costs	Significant ground disturbance, can be mitigated with application of BMPS. Must be performed in Year 1 or 2 post fire.
Site prep	Treating non-merchantable material	In situ mastication, chipping; skidding to landings or disposal sites for removal or burning; grapple or hand pile/burn in situ	Specified amount of biomass removed to allow for adequate planting area	$1,500-$12K per acre service contract	Significant ground disturbance, can be mitigated with residual chips/mastication slash; application of BMPS.
Site prep	Brush management	Mastication, mechanical uprooting, piling/burning, w/without follow up spot/broadcast herbicide treatments; ground-based spot or broadcast herbicide treatments alone	Reduced brush regeneration, allowing planted seedlings a head start with the competition	$750- $1,200 per acre service contract	Possible significant ground disturbance with mechanical treatments; mastication leaves plants in place, residue provides ground cover, but is difficult in rocky locations; full clearing leaves ground disturbed, limited cover; piling/burning requires air quality permits; herbicide after mastication provides the greatest deterrence to brush re-sprouting; ground-based herbicide alone leaves least disturbance.
Site prep	Prescribed grazing	Livestock grazing (including goats, and other livestock)	Fuel reduction, brush management, conifer seedling thinning	$500 to 1,200 per acre	Fuel reduction, and economic opportunity for local ranchers.
Planting	Planting seedlings, 1 or 2 years of age; broadcast seed	Hand planting with tools (hoedads, spades, dibbles); power augers; hand or aerial broadcast seeding	Replanted areas with 100-200 trees/ac. depending on site & species	$300- $800 per acre service contract	Opportunity to accelerate the re-establishment of a conifer forest stand, in lieu of replacement by a fire-dominated chaparral vegetation community.

Treatment Type	Method	Techniques	Outcome	Cost Ranges**	Opportunities & Constraints
Maintenance	Hand release	Hand grubbing brush around surviving seedlings w/brush height <2ft.; chainsaw release w/brush height > 2ft	Increase light & space & moisture for seedlings to grow, usually with a radius of 4 ft from the seedling	$1,000- $1,500 per acre for grubbing; $500- $1,000 per acre for chains saw	Provides short-term < 2-5 years release from competing brush; minimal ground disturbance; maintains early seral habitat values of endemic brush species; chainsaw release can generate re-sprouting for deer browse within the maintenance radius.
Maintenance	Mechanical release	Mastication of intervening brush, w/smaller skid steer-mounted grinder heads/flails	Reduce most competition for light, space and moisture throughout the planted area	$750- $1,500 per acre depending on site conditions/ other constraints	Some ground disturbance, plants remain, residue remains as soil cover. Most useful for older plantings where conifers are readily visible from the machines, and can resist flying debris. Significant short-term reduction in habitat values.
Maintenance	Herbicide release	Ground-based, broadcast spray herbicide application to suppress or kill brush competing with planted conifers	Reduce most competition for light, space and moisture throughout the planted area	$575- $600 per acre service contract	Minimal ground disturbance, plants remain, residue remains as soil cover. Possible significant short-term (3-5 years) reduction in habitat values.
Maintenance	Herbicide release	Ground-based spot spray select radius around each conifer seedling	Increase light & space & moisture for seedlings to grow, usually with a radius of 4 ft. from the seedling	$250- $375 per acre service contract	Provides short-term < 5 years release from competing brush; minimal ground disturbance; maintains early seral habitat values of endemic brush species.
Maintenance	Pruning	Chainsaw or small masticator; possibly in conjunction with mechanical release	Reduce individual tree ladder fuels, improve height to diameter growth ratios	$350- $500 per acre service contract	Anticipated need 7-10 years post planting in shaded fuelbreaks only.

**CalFire Memo- CFIP Practice Rates, 8/25/2022; USDA- NRCS Practice 490- Reforestation Practices

Table F-3. Decision matrix for reforestation vegetation management*

Treatment Method	Slope 0 - 15%	Slope 15 - 35%	Slope 35 - 50%	Rocky, shallow soils	Loamy deeper soils	Brush height <2 ft.	Brush height 2- 6 ft	Brush height >6 ft	Within proximity to waterbody*	Within proximity to people*	Within proximity to sensitive resources*
Mechanical Site Prep	X	X	X		X		X	X	X	X	X
Mechanical Site Prep w/ Herbicides	X	X	X		X		X	X			
Herbicide Site Prep	X	X	X	X	X	X					
Release- Manual	X	X	X		X	X			X	X	X
Release- Chainsaw	X	X	X	X	X		X	X	X	X	X
Release- Ground-based Broadcast Herbicide	X	X	X	X	X	X	X				
Release- Ground-based Spot Herbicide	X	X	X	X	X	X	X				

X - commonly appropriate use

not commonly conducive for use

least cost

moderate cost

greatest cost

**All proposed methods would be implemented per Forest Standards and Guidelines and Best Management Practices and may be adjusted on a site-specific basis.*

Appendix G Herbicides

The Human Health and Ecological Risk Assessment (HHERA) describes potential effects of proposed herbicide applications in detail. The HHERA is available by request and in the project record.

Table G-1. Proposed herbicide active ingredients, application rates and methods, chemical characteristics, and biological timing for proposed treatments.

Active ingredient Measured as active ingredient (a.i.) or acid equivalent (a.e.)	**Proposed use**[1]	**Expected application rate** lbs a.i. or a.e. per acre	**Maximum application rate** lbs a.i. or a.e. per acre	**Application method(s)**	**Selectivity**	**Action mechanism**	**Biological timing**
Aminopyralid (a.e.)	Invasives	0.078	0.11	Backpack-directed foliar spray	Broadleaf species	Growth regulator (auxin mimic)	Post-emergent
Chlorsulfuron (a.i.)	Invasives	0.056	0.25	Backpack-directed foliar spray	Perennial broadleaf species and grasses	Inhibits amino acid synthesis	Pre-emergent, post-emergent
Glyphosate (a.e.)	Invasives, reforestation site prep and release	2.00	8.00	Backpack-directed foliar spray, hack and squirt, cut-stump, wicking	Non-selective	Inhibits amino acid synthesis	Post-emergent
Imazapyr (a.e.)	Invasives	0.45	1.25	Backpack-directed foliar spray, hack and squirt, cut-stump, stem injection, basal bark treatment	Broadleaf species, woody plants, annual and perennial grasses	Inhibits amino acid synthesis	Pre-emergent, post-emergent
Indaziflam (a.i.)	Reforestation site prep	0.065	0.091	Backpack-directed foliar spray	Broadleaf species, grasses, vines	Inhibits cellulose synthesis	Pre-emergent
Triclopyr (a.e.) amine	Reforestation release	1.00	6.00	Backpack-directed foliar spray, hack and squirt, cut-stump, basal bark treatment	Broadleaf species, woody plants	Growth regulator (auxin mimic)	Post-emergent
Clopyralid (a.e.)	Invasives	0.35	0.5	Backpack-directed foliar spray	Broadleaf species	Growth regulator (auxin mimic)	Post-emergent

[1] Future invasives treatments could potentially use any herbicide analyzed within this project.

Table G-2. Target species and proposed herbicides for reforestation treatments.

Scientific name	Common name	Proposed herbicides
Arctostaphylos patula	Greenleaf manzanita	Glyphosate, Indaziflam, Triclopyr
Ceanothus cordulatus	Whitethorn ceanothus	Glyphosate, Indaziflam, Triclopyr
Ceanothus integerrimus	Deerbrush	Glyphosate, Indaziflam, Triclopyr
Ceanothus prostratus	Mahala mat	Glyphosate, Indaziflam, Triclopyr
Ceanothus velutinous	Snowbrush	Glyphosate, Indaziflam, Triclopyr
Chrysolepsis spp.	Chinquapin	Glyphosate, Indaziflam, Triclopyr
Ribes spp.	Gooseberry	Glyphosate, Indaziflam, Triclopyr
Symphoricarpos albus	Snowberry	Glyphosate, Indaziflam, Triclopyr
Prunus emarginata	Bitter cherry	Glyphosate, Indaziflam, Triclopyr

Table G-3. Target species and proposed herbicides for invasives treatments.

Scientific name	Common name	Proposed herbicides
Centaurea solstitialis	Yellow starthistle	Aminopyralid, Glyphosate
Centaurea stoebe ssp. *micranthos*	Spotted knapweed	Aminopyralid, Glyphosate, Clopyralid
Cirsium arvense	Canada thistle	Aminopyralid, Clopyralid
Cytisus scoparius	Scotch broom	Glyphosate, Imazapyr
Elymus caput-medusae	Medusahead	Aminopyralid, Glyphosate, Indaziflam
Isatis tinctoria	Dyer’s woad	Chlorsulfuron, Glyphosate
Linaria dalmatica	Dalmatian toadflax	Chlorsulfuron, Glyphosate, Imazapyr
Linaria vulgaris	Butter-and-eggs	Chlorsulfuron, Imazapyr
Onopordum acanthium	Scotch thistle	Clopyralid
Ventenata dubia	North Africa grass	Glyphosate, Imazapyr

Table G-4. Proposed Tank Mixtures.

Tank Mixture	Proposed Use
Glyphosate (2-8 lb a.e./acre) + Triclopyr (1-6 lb a.e./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Imazapyr (0.45-1.25 lb a.e./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Indaziflam (0.065-0.091 lb a.i./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Aminopyralid (0.078-0.11 lb a.e./acre)	Invasives
Glyphosate (2-8 lb a.e./acre) + Chlorsulfuron (0.056-0.25 lb a.i./acre)	Invasives
Glyphosate (2-8 lb a.e./acre) + Clopyralid (0.35-0.5 lb a.e./acre)	Invasives
Aminopyralid (0.078-0.11 lb a.e./acre) + Imazapyr (0.45-1.25 lb a.e./acre)	Invasives

Table G-5. Characteristics and leaching potential for herbicides proposed in the Tributaries Project.

Herbicide (Active Ingredient)	**Soil Persistence** (Half-life in days)	**Water Persistence** (Half-life in days)	**Potential for leaching**
Aminopyralid	35	127 – 447	Limited, but may leach into groundwater if there are permeable soils and shallow water table.
Chlorosulfuron	40	60	Weakly adsorbs to soils, considered to have high leaching potential.
Clopyralid	40	8-40	High leaching potential, especially in sandy soils and areas with high water tables
Flauzifop-P- Butyl	15	60	Very low
Glyphosate	47 (no soil activity)	4 – 11	Very low as herbicide has high adsorptive capacity
Imazapyr	25 – 142 (soil type)	2 – 730 (avg 40)	Low potential for leaching, but is susceptible to surface runoff, and leaching from dead roots
Triclopyr	10 – 46 (avg 30)	0.5 – 426 (conditions)	Not considered to have high potential for surface or groundwater contamination
Indaziflam	36-178 (laboratory conditions)	5-200 (Dependent on sunlight exposure)	Parent compounds and degradants have moderate to high potential to leach through the soil column.

Grazing Restrictions

Herbicides sprayed on plants are not generally toxic to livestock. Certain unpalatable or poisonous plants treated with certain herbicides may become palatable to livestock. Be certain that livestock are kept out of areas where poisonous plants have been sprayed until the plants have dried up. Attention must be given to grazing restrictions outlined on the label. The restrictions will prevent residues that could stop the meat from being marketed.

Most herbicides have grazing and feeding restrictions stated on the label that limit the use of the treated area for livestock feed. Grazing and harvesting an area for feed following herbicide use often is prohibited because research on residue levels is inadequate. The effect of the chemical or its breakdown products on livestock or retention in the animal's body may not be known. Livestock which consume feed in areas treated with such herbicides probably would not become ill from the chemicals but could retain the chemicals in their systems. The concern is that herbicides could be passed in the milk of lactating animals or cause abortion in pregnant animals. The chemical may also have potential to be retained by the animals and be present in the slaughtered carcass. Although these problems are not likely to occur, labeling restrictions are strict and should be adhered to. The presence of foreign chemicals in milk or meat of animals can result in confiscation and destruction of the products and loss of income from these animals.

Table G-6 presents grazing and feeding restrictions for herbicides proposed in this project. **The herbicide label is always the final authority on herbicide uses and precautions.**

Table G-6. Herbicide grazing restrictions

Herbicide	Application Rate	Application Rate	Lactating Animals Before Grazing	Lactating Animals Before Hay Harvest	Beef and Non-Lactating Dairy Animals Before Grazing	Beef and Non-Lactating Dairy Animals Before Hay Harvest	Removal Before Slaughter	Comments
Aminopyralid	3 -7 oz/acre (7 oz max per acre per year)	0.047 to 0.11 lb a.e./acre (0.11 lb a.e./acre max)	0	0	0	0	0	There are no restrictions on grazing or grass hay harvest following application at labeled rates.
Chlorsulfuron	1 and ⅓ oz/acre	0.056 to 0.25 lb a.i./acre	0	0	0	0	0	There are no grazing or hay restrictions for any livestock, including lactating animals, with application rates up to 1 and ⅓ ounces per acre. No exclosure is required for any animals.
Clopyralid	⅔ pint per acre per annual growing season	0.35 to 0.5 lb a.e./acre	N/A	N/A	N/A	N/A	N/A	Regulation of “Exported Grass Hay” from California.
Imazapyr	12 to 64 oz/acre	0.45 to 1.25 lb a.e./acre	N/A	N/A	N/A	N/A	N/A	
Indaziflam	3.5 to 6.5 oz/acre	0.065 to 0.091 lb a.i./acre	N/A	30 days	N/A	30 days	N/A	Do not cut hay within 30 days of a single application up to 0.04 lb a.i./acre.
Glyphosate (spot applications)	Labeled rate varies	2 to 8 lb a.e./acre	14 days	14 days	14 days	14 days	0	
Glyphosate (broadcast)	Labeled rate varies	2 to 8 lb a.e./acre	8 weeks	8 weeks	8 weeks	8 weeks	0	
Triclopyr	⅔ gal/acre	1 to 6 lb a.e./acre	0	14 days	0	14 days	3 days	Do not harvest hay for 14 days after application.

Appendix H Human Health & Ecological Risk Assessment

1. Introduction

This Human Health and Ecological Risk Assessment (HHERA) was prepared to analyze the risk posed by pesticide application in the Tributaries Forest Recovery Project.

This document is organized in three chapters:

1. Introduction
2. Human Health Risk Assessment
3. Ecological Risk Assessment

Although this is a technical document addressing specialized topics, an effort has been made to ensure that it can be understood by individuals without specialized training in the chemical and biological sciences. A glossary of abbreviations, acronyms, and terms is provided up-front to explain technical and specialized language used throughout this document (Table H-1).

Table H-1. Glossary of abbreviations, acronyms, and terms

Abbreviation, acronym, or term	Definition
Acute exposure	Exposure for 24 hours or less.
Adverse effect	Any effect that decreases the capacity of an organism or a component of the organism to function in a normal manner, or that leads to a frank disease state.
a.e. – acid equivalent	Indicates the amount of an acid herbicide in a formulation.
AEL – adverse-effect level	Signs of toxicity that must be detected by invasive methods, external monitoring devices, or prolonged systematic observations. Symptoms that are not accompanied by grossly observable signs of toxicity.
a.i. – active ingredient	Indicates the amount of non-acid herbicide in a formulation.
bw – body weight	Weight of a person's body
Chronic exposure	Repeated or long-term exposure.
endpoint	An observable or measurable biological event or chemical concentration used as an index of an effect of a chemical exposure.
FEL – frank effect level	Gross and immediately observable signs of toxicity.
HQ – hazard quotient	In Human Health Risk Assessments, the HQ is the ratio of exposure to the reference dose (RfD).
NOAEC – no observed adverse effect concentration	No biologically or statistically significant adverse effects attributable to treatment. Effects that are attributable to treatment but do not appear to impair the organism's ability to function and clearly do not lead to such an impairment. *Term used in Ecological Risk Assessments.*
NOAEL – no observed adverse effect level	No biologically or statistically significant adverse effects attributable to treatment. Effects that are attributable to treatment but do not appear to impair the organism's ability to function and clearly do not lead to such an impairment. *Term used in Human Health Risk Assessments.*
NOEC – no observed effect concentration	No biologically or statistically significant effects attributable to treatment. *Term used in Ecological Risk Assessments.*
NOEL – no observed effect level	No biologically or statistically significant effects attributable to treatment. *Term used in Human Health Risk Assessments.*

LOAEC – lowest-observed-adverse-effect concentration	The lowest dose or exposure level associated with an adverse effect. *Term used in Ecological Risk Assessments.*
LOAEL – lowest-observed-adverse- effect level	The lowest dose or exposure level associated with an adverse effect. *Term used in Human Health Risk Assessments.*
RfD – reference dose	Maximum acceptable oral dose of a toxic substance.
Uncertainty factor	Used in risk assessment to enable risk assessment while avoiding underestimation of the risk due to uncertainties.

Direction for Pesticide-Use Management and Coordination

Forest Service Manual (FSM) 2150 and Forest Service Handbook (FSH) 2109.14 provide guidelines for pesticide use safety for the public and employees from unsafe work conditions when pesticides are involved. Development of a pesticide risk assessment is a part of this planning process. A pesticide risk assessment does not, in itself, ensure safety in pesticide use. The analysis must be tied to an action plan which provides mitigation measures to avoid potential risks identified by the risk assessment. FSH 2109.14, Chapter 20 provides direction on the components of a risk analysis, documentation of risk analysis, risk management, risk communication and risk takings.

- Upon completion of a risk analysis, a number of techniques can be used to determine the best course of action for preventing identified problems. These range from taking appropriate mitigation measures to reduce risk, to not pursuing the proposed action, thus avoiding potential risks.
- Use risk analyses to decide whether, and to what extent, controls on exposure are necessary to protect public health and the environment.
- Managers and decision makers must also recognize the uncertainties associated with risk analyses and incorporate those considerations into their decision making.

Project Context

The Tributaries Forest Recovery Project is a landscape-scale (163,248-acre) forest restoration project on the Plumas National Forest focused on post-fire recovery following the 2019 Walker Fire and 2021 Dixie Fire. The Tributaries Project proposes the use of pesticides for reforestation site preparation and release, invasive species management, and *Heterobasidion* root disease (HRD) prevention. The Forest Service Manual (FSM 2150) defines “pesticide” to mean any substance or mixture of substances intended for:

1. Preventing, destroying, repelling, or mitigating any pest; or
2. Use as a plant regulator, defoliant, or desiccant (abbreviated definition from 7 U.S.C. 136(u)).

There are several categories of pesticides, but the two most relevant to the Tributaries Project are herbicides and fungicides. The Tributaries Project proposes eight herbicides and one fungicide (Table H-2).

Pesticides and application rates and methods would be selected based on target species, current conditions, and desired conditions. Target species refer to the plant or fungi pest that the pesticide is intended to control. Application methods would include ground-level application on foot or using all-terrain vehicles or other similar vehicles with a boom mounted sprayer; no aerial spraying is proposed. Application methods are described in Table H-3.

Table H-2. Proposed pesticide active ingredients, application rates, and use

Pesticide Active Ingredient	Pesticide Type	Expected Application Rate	Maximum Application Rate	Application Methods	Proposed Use
Aminopyralid	Herbicide	0.078 lb a.e./acre	0.11 lb a.e./acre	Backpack directed foliar spray	Invasives
Borate salt	Fungicide	0.5 lb/acre	0.5 lb/acre	Stump application	HRD prevention
Chlorsulfuron	Herbicide	0.056 lb a.i./acre	0.25 lb a.i./acre	Backpack directed foliar spray	Invasives
Clopyralid	Herbicide	0.35 lb a.e./acre	0.5 lb a.e./acre	Backpack directed foliar spray	Invasives
Glyphosate	Herbicide	2.00 lb a.e./acre	8.00 lb a.e./acre	Backpack directed foliar spray Hack and squirt Cut-stump Wicking	Invasives, reforestation site prep and release
Imazapyr	Herbicide	0.45 lb a.e./acre	1.25 lb a.e./acre	Backpack directed foliar spray Hack and squirt Cut-stump Stem injection Basal bark treatment	Invasives
Indaziflam	Herbicide	0.065 lb a.i./acre	0.091 lb a.i./acre	Backpack directed foliar spray	Reforestation site prep
Triclopyr acid	Herbicide	1.00 lb a.e./acre	6.00 lb a.e./acre	Backpack directed foliar spray Hack and squirt Cut-stump Basal bark treatment	Reforestation release

Table H-3. Application methods

Application Method	Description
Foliar application	This method applies herbicide directly to the leaves. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle, a thick, waxy layer present on leaves and stems of most plants. Applicators for foliar application include backpack sprayers and hand-pumped spray or squirt bottles, which can target very small plants or parts of plants.
Spot spraying	Spot spraying is like foliar spraying but would be used for larger sized plants and/or population of plants. The focus still is on treating individual plants, but over a larger area. Applicators would typically be backpack sprayers. Because of the potential to treat larger areas and larger sized vegetation, this method has a slightly higher potential for drift.
Broadcast	Broadcast applications may be used in areas dominated by invasive species, such as yellow star thistle growing throughout a grassland area or Spanish broom along a highway. Selective herbicides would be used where target species are growing amongst desirable species. This application involves using boom or other controlled sprayers to deliver an even spray over the infested area. No aerial herbicide applications would be conducted.
Frill/ Hack and Squirt	The frill method, also called the “hack and squirt” treatment, is often used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment.
Cut-Stump	This method is often used on woody species that normally re-sprout after being cut. The cut down tree or shrub is immediately sprayed or squirted with herbicide to treat the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive, although they support and protect the tree’s living tissues. The cut stump treatment allows for a great deal of control over the site of herbicide application; therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective.
Cut, Re-sprout, and Spray or Paint/Daub	This method is similar to cut-stump, but involves waiting for the cut plant to resprout before application. Cut 1-2 months before spraying. Apply herbicide when resprouts are 2-4 feet tall, but most effective in early fall through winter when plant chlorophyll is transferred to roots. Herbicide should be applied on dry days and during low winds.
Stem injection	Herbicides can be injected into tree stems using a needle, syringe, or special cutting tools, such as basal injectors or breast height injectors.
Basal bark treatment	Herbicide is applied to the base of individual woody plants or stems - individual plant treatment. The herbicide penetrates through the bark to the cambium, where it translocates to roots and stems for complete control. Used for trees less than 6 inches in diameter and trees that are too tall for foliar application.
Wicking application	Applying herbicide using a wick or rope soaked in herbicide from a reservoir attached to a handle. The wetted wick is used to wipe or brush herbicide over the weed.

Herbicide Tank Mixtures

Herbicide tank mixtures refer to the combination of two or more herbicides mixed in a single tank. Combining herbicides with different modes of action in the same tank can increase the likelihood of effective target species control, decrease the number of required applications, and reduce the risk of target species developing herbicide resistance.

When preparing tank mixtures, applicators need to consider several factors, including: chemical compatibility, modes of action, application timing and methods, and label instructions. Not all herbicides are compatible with each other. Some may precipitate or form insoluble compounds when mixed and clog spray equipment. Mixing herbicides with different modes of action targets species through multiple biological mechanisms, increasing the likelihood of effective control. In contrast, combining two herbicides with the same mode of action may not offer significant benefits. Herbicides may have different optimal application timings based on environmental conditions and target and non-target species growth stage. Proper timing ensures maximum control efficacy and minimizes injury to non-target species. Applicators must follow both pesticide labels and comply with the most restrictive instructions.

Table H-4 shows proposed tank mixtures for the Tributaries Project with upper and lower application rates for each herbicide and the proposed use.

Table H-4. Proposed herbicide tank mixtures

Tank Mixture	Proposed Use
Glyphosate (2-8 lb a.e./acre) + Triclopyr (1-6 lb a.e./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Imazapyr (0.45-1.25 lb a.e./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Indaziflam (0.065-0.091 lb a.i./acre)	Reforestation site prep, release
Glyphosate (2-8 lb a.e./acre) + Aminopyralid (0.078-0.11 lb a.e./acre)	Invasives
Glyphosate (2-8 lb a.e./acre) + Chlorsulfuron (0.056-0.25 lb a.i./acre)	Invasives
Glyphosate (2-8 lb a.e./acre) + Clopyralid (0.35-0.5 lb a.e./acre)	Invasives
Aminopyralid (0.078-0.11 lb a.e./acre) + Imazapyr (0.45-1.25 lb a.e./acre)	Invasives

Design Features

Design features have been included in the design of the Tributaries Project Proposed Action to protect resources from potential adverse effects. The effects analysis in this section relies on the incorporation of these design features in evaluating the significance of potential adverse effects from pesticide use within the project. The full list of design features that are included in the Tributaries Project are included in Appendix E of the Tributaries Forest Recovery Project Draft Environmental Assessment (EA).

Risk Assessment Framework

An overview of the standard risk assessment framework used in this document is provided in Figure H-1.

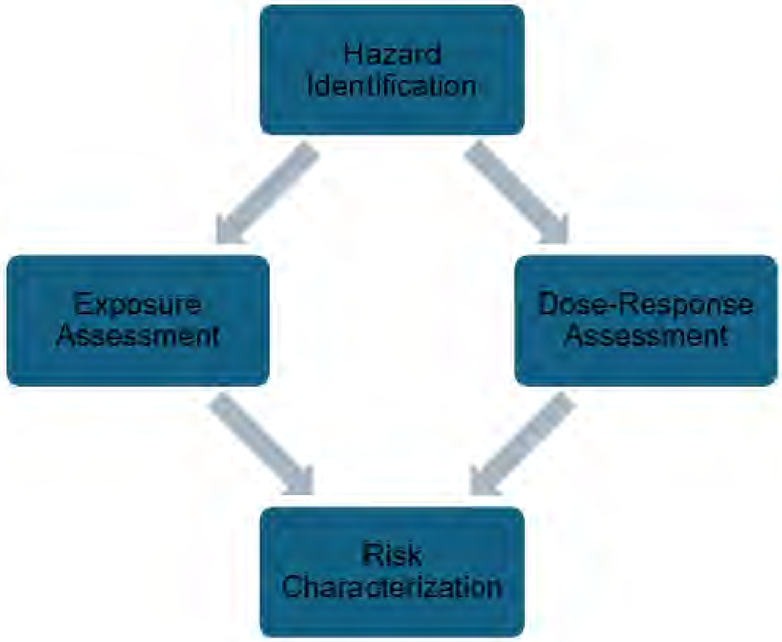

Figure H-1. Overview of Risk Assessment Framework

This framework provides a common, scientifically credible approach used across several Federal agencies. This process is based on guidance from the National Research Council of the National Academy of Sciences (NRC 1983) for Federal agencies which recommends a four-step process: hazard identification, exposure assessment, dose-response assessment, and risk characterization.

- **Hazard identification**: Identifying the potential hazards associated with the pesticide, such as its toxicity to humans, animals, or the environment.
- **Exposure assessment:** Evaluating the potential routes and levels of exposure to the pesticide, considering factors such as application methods, environmental fate, and potential pathways of exposure.
- **Dose-response assessment:** Determining the relationship between the dose of the pesticide and the severity of the potential adverse effects.
- **Risk characterization:** Integrating the hazard, exposure, and dose-response information to estimate the likelihood and magnitude of the potential risks associated with the pesticide's use.

A considerable body of information has been compiled following this framework in risk assessments completed by Syracuse Environmental Research Associates, Inc. (SERA) and Kestrel Tellevate LLC (Indaziflam only) under contract to the Forest Service. This document synthesizes these individual risk assessments to provide a summary of expected resource impacts from the NFFRP Proposed Action.

In this document, the human health assessment chapter follows this four-part process for each pesticide. The ecological risk assessment chapter provides a brief overview of the risks associated with each pesticide, referencing the appropriate SERA report and the tables in Appendix H-2 to H-5, which outline the toxicity to mammals, birds, aquatic species, and terrestrial plants.

For additional details, please refer to the original risk assessments, available online at: https://www.fs.usda.gov/science-technology/forest-health-protection/integrated-pest-management/pesticide-use-risk-assessments-and-worksheets.

2. Human Health Risk Assessment

This section examines the potential health effects on groups of people who might be exposed to the proposed pesticides, including workers and members of the public. Each pesticide is assessed using the four-part risk assessment framework described earlier.

Aminopyralid

Hazard Identification

Aminopyralid is a pyridine carboxylic acid, a class of herbicides that includes two other herbicides considered in this document: clopyralid and triclopyr. The mechanism of action (how these herbicides work) in plants is well-known. These herbicides mimic natural auxin plant growth hormones, disrupting normal growth processes and ultimately killing susceptible plants.

Unlike in plants, the mechanism of action of aminopyralid in mammals is not well characterized. The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects. The most seen effects are on the gastrointestinal tract after oral exposure, and these may be viewed as portal of entry effects rather than systemic toxic effects (SERA 2007).

Aminopyralid is rapidly absorbed and excreted essentially unmetabolized in mammals, including humans. There is no evidence of neurotoxicity, reproductive toxicity, carcinogenicity, immunotoxicity, or increased pre- and/or postnatal susceptibility. No systemic toxicity was observed following a 28-day dermal exposure in rats. Aminopyralid has low acute toxicity via oral, dermal, and inhalation routes of exposure, but the free acid form of the molecule produces severe eye irritation (US EPA 2020).

The U.S. EPA has labeled aminopyralid as a *reduced risk* herbicide (US EPA 2023).

Exposure Assessment

Workers

For a worker applying aminopyralid with a backpack sprayer at an application rate of 0.078 lb a.e./acre, the central estimate for general worker exposure is 0.001 mg/kg/day. The upper bound of expected general worker exposure is 0.006 mg/kg/day.

Accidental/incidental exposure scenarios for workers involve dermal (skin) exposures via contaminated gloves or spills on hands and the lower legs. Except for the scenario involving a spill on the lower legs for 1 hour (an upper bound of 0.003 mg/kg/event), the accidental exposures lead to dose estimates that are substantially lower than the general exposure levels estimated for workers. This reflects the fact that the general exposure estimates are based on field studies of workers in which accidental spills probably occurred and in some cases were specifically noted to occur.

Public

For members of the public, acute exposure levels range from minuscule (e.g., .00000001 mg/kg/day) to about 0.4 mg/kg bw at the expected application rate of 0.078 lb a.e./acre. The highest acute exposure level, 0.4 mg/kg bw, is associated with the consumption of contaminated water by a child shortly after an accidental spill. The upper bound of the dose associated with the consumption of contaminated vegetation is about 0.1 mg/kg bw. The other acute exposure scenarios lead to much lower exposure values, ranging from close to zero to about 0.043 mg/kg for the accidental direct spray of a child. The lowest acute exposures are associated with swimming in or drinking contaminated water.

The modeled chronic or longer-term exposures are much lower than the corresponding estimates of acute exposures. The highest longer-term exposures are associated with the consumption of contaminated vegetation and the upper bound for this scenario is 0.027 mg/kg/day. As with acute exposures, the lowest chronic exposures are associated with the consumption of surface water.

Dose-Response Assessment

This risk assessment uses reference dose (RfD) values established by the EPA. For aminopyralid, the EPA has established a chronic RfD of 0.5 mg/kg/day for the general population. The RfD of 0.5 mg/kg/day was derived by dividing the NOAEL of 50 mg/kg bw/day by an uncertainty factor of 100. The EPA established an acute RfD of 1 mg/kg bw/day based on a NOAEL from a reproduction study of about 100 mg/kg/day and an uncertainty factor of 100. Both RfD values are based on NOAELs for the most sensitive endpoint in the most sensitive species and studies in which LOAEL values were identified.

Risk Characterization

Workers

Hazard quotients (HQs) for accidental and general occupational exposure scenarios are below a level of concern for the proposed application rate of 0.078 lb a.e./acre. As shown in Table H-5, none of the hazard quotients meet or exceed the applicable reference dose (acute for accidental exposure and chronic for general exposure).

Table H-5: Summary of worker hazard quotients (HQs) for backpack sprayer application of aminopyralid at 0.078 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	2E-07	2E-08	4E-06	1
Contaminated gloves, 1 hour	Worker	1E-05	1E-06	2E-04	1
Spill on hands, 1 hour	Worker	4E-05	4E-06	2E-03	1
Spill on lower legs, 1 hour	Worker	1E-04	1E-05	4E-03	1
General exposure	Worker	2E-03	7E-05	1E-02	0.5

Based on the hazard quotients described above, there are no anticipated risks to workers from the proposed application of aminopyralid.

Public

All hazard quotients (HQs) for members of the public are below a level of concern for the expected application rate of aminopyralid at 0.078 lb a.e./acre (Tables H-6 to H-8). Under the most extreme exposure scenario, the consumption of contaminated water by a child immediately after an accidental spill of aminopyralid into a small pond, the hazard quotient is 0.4. Although this value is the largest HQ observed, it remains below the level of concern, described by the acute reference dose value of 1 established by the EPA.

Table H-6. Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of aminopyralid at 0.078 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	2E-03	1E-04	4E-02	1
Direct spray of woman, feet and lower legs	Adult female	2E-04	1E-05	4E-03	1
Water consumption (spill)	Child	3E-02	2E-03	0.4	1
Fish consumption (spill)	Adult male	8E-04	8E-05	8E-03	1
Fish consumption (spill)	Subsistence populations	4E-03	4E-04	4E-02	1

Table H-7. Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of aminopyralid at 0.078 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	7E-05	1E-05	4E-04	1
Contaminated fruit	Adult female	9E-04	4E-04	1E-02	1
Contaminated vegetation	Adult female	1E-02	9E-04	0.1	1
Swimming, one hour	Adult female	2E-09	9E-12	5E-08	1
Water consumption	Child	6E-04	7E-06	5E-03	1
Fish consumption	Adult male	2E-05	4E-07	1E-04	1
Fish consumption	Subsistence populations	9E-05	2E-06	5E-04	1

Table H-8. Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of aminopyralid at 0.078 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	4E-04	1E-04	7E-03	0.5
Contaminated vegetation	Adult female	5E-03	3E-04	5E-02	0.5
Water consumption	Adult male	2E-04	3E-06	1E-03	0.5
Fish consumption	Adult male	9E-07	2E-08	6E-06	0.5
Fish consumption	Subsistence populations	7E-06	2E-07	5E-05	0.5

Borate salts

Hazard Identification

Borate salts are naturally occurring compounds that come from the element boron, and are found in arid regions like the salt plains in eastern California, Nevada, or Utah. Borate salts are applied to recently cut conifer stumps to control the spread of *Heterobasidion* root disease. Given that the exposure to boron, primarily in the form of boric acid, is unavoidable, the purpose of this assessment is to determine the extent to which normal exposures to boron may be increased significantly by Forest Service activities. Following a convention used in most risk assessments on borates, both the exposure assessments and dose-response assessments are based on boron (B) equivalents (SERA 2016b).

Therefore, for the formulation used in the risk assessment, the expected application rate is 0.5 lb DOT/acre, which is equivalent to 0.105 B/acre.

Borate salts are rapidly converted to boric acid under conditions typically found in the environment. Boric acid is readily absorbed following oral exposures but poorly absorbed following dermal exposure. The absorption of borates following inhalation exposure is not well characterized, and the current Forest Service risk assessment (SERA 2016b) is consistent with the most recent EPA risk assessment in using the assumption of 100% absorption for inhalation exposures (US EPA/OPP/HED 2015).

Exposure Assessment

Workers

Because boron is a naturally occurring element, human exposure to boron is unavoidable. Estimates of human exposure to boron are extensively documented. Non-occupational exposures to boron are generally in the range of 1 to 3 mg B/day. Worker exposures to boron are highly variable. In the U.S., average levels of exposure to borax range from about 4 to nearly 25 mg B/day for workers involved in handling or shipping borax (Culver et al. 1994). The Tributaries Project proposes liquid application with a backpack sprayer or handheld sprayer. Therefore, this risk assessment does not discuss the risks to workers involved in dry applications of borax, which may be subject to substantially higher exposures. Worker exposures to boron following liquid stump applications are far below background exposure of about 0.04 mg/kg bw/day.

Public

A standard set of exposure assessments for members of the general public are included in the exposure assessment for borates, except for scenarios associated with the consumption of contaminated vegetation, because these compounds are applied directly to tree stumps and the likelihood of contaminating edible vegetation is minimal. All of the non-accidental exposure scenarios for members of the general public lead to dose estimates that are far below the reference background exposure. The highest non-accidental exposure estimate is about 0.0055 mg/kg bw/day—the peak expected exposure associated with the consumption of contaminated water. This exposure level is below the reference background dose by factor about 7 (SERA 2016b).

Dose-Response Assessment

For borate salts, the EPA has established a chronic RfD of 0.088 mg B/kg bw/day for the general population. This RfD is based on a chronic NOAEL in dogs of 8.8 mg B/kg bw/day and a recommended MOE of 100. For acute exposures, an acute RfD of 3.5 mg B/kg bw is adopted from EPA based on an acute NOAEL of 350 mg B/kg bw in rats with a recommended uncertainty factor of 100.

Human data on borates suggest that adverse effects, including nausea, vomiting, and skin reactions may be observed in humans exposed to doses greater than 20 mg B/kg bw. Doses greater than 60 mg B/kg bw could cause more severe effects that require medical intervention. Lethality is a concern at doses of about 85 mg B/kg bw.

Risk Characterization

Workers

At the application rate of 0.5 lbs/acre worker occupational exposures for the central, lower, and upper exposure levels result in a hazard quotient of less than 1. Given the low hazard quotients for both general occupational exposures as well as incidental exposures, the result imply that long-term employment applying this fungicide can be accomplished without toxic effects. As shown in Table H-9, even under the most conservative set of exposure assumptions, workers would not be exposed to levels of boric acid that are regarded as unacceptable. Protective eyewear is recommended when handling borate salts, which has been found to cause mild eye irritation in rabbits (SERA 2016b).

For liquid applications of borate salts, non-accidental HQs are below the level of concern by a factor of over 300 for workers and over 100 for members of the general public. The highest accidental HQ (i.e., consumption of contaminated water by a small child) is below the level of concern by a factor of 100 (SERA 2016b).

Table H-9: Summary of risk characterization for workers in the application of borate salts at 0.5 lb/acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	1E-07	3E-08	2E-07	3.5
Contaminated gloves, 1 hour	Worker	8E-06	2E-06	1E-05	3.5
Spill on hands, 1 hour	Worker	3E-05	7E-06	6E-05	3.5
Spill on lower legs, 1 hour	Worker	8E-05	2E-05	1E-04	3.5
General exposure	Worker	2E-04	1E-05	2E-03	0.088

Public

None of the accidental acute and chronic exposure scenarios approached a level of concern at an application rate of 0.5 lbs/acre. Scenarios associated with the consumption of contaminated vegetation are not included for the borate risk characterization because these compounds are applied directly to tree stumps and the likelihood of contaminating edible vegetation is minimal. Borate salts are applied in forested areas that may be used by member of the general public such as in or near recreational areas; however it is unlikely that a member of the public would be exposed to freshly treated stumps or water containing borate salts, since it would be applied to freshly cut tree stumps only during harvesting operations when public access to the site would be restricted, and would not be applied within riparian conservation area buffers.

Table H-10: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of borate salts at 0.5 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	1E-03	3E-04	2E-03	3.5
Direct spray of woman, feet and lower legs	Adult female	1E-04	3E-05	2E-04	3.5
Water consumption (spill)	Child	5E-03	6E-04	2E-02	3.5
Fish consumption (spill)	Adult male	2E-04	3E-05	3E-04	3.5

Table H-11: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of borate salts at 0.05 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	*	*	*	*
Contaminated fruit	Adult female	*	*	*	*
Contaminated vegetation	Adult female	*	*	*	*
Swimming, one hour	Adult female	6E-11	4E-19	1E-09	3.5
Water consumption	Child	9E-05	2E-12	1E-03	3.5
Fish consumption	Adult male	3E-06	8E-14	3E-05	3.5
Fish consumption	Subsistence populations	1E-05	4E-13	1E-04	3.5

*Note: blank sections of the table indicate no exposure assessment

Table H-12: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of borate salts at 0.05 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	*	*	*	*
Contaminated vegetation	Adult female	*	*	*	*
Water consumption	Adult male	6E-04	1E-11	9E-03	0.088
Fish consumption	Adult male	2E-06	1E-13	4E-05	0.088
Fish consumption	Subsistence populations	2E-05	8E-13	3E-04	0.088

*Note: blank sections of the table indicate no exposure assessment

Chlorsulfuron

Hazard Identification

Chlorsulfuron is used for pre-emergent and post-emergent control of many grasses and broadleaf weeds. Chlorsulfuron is generally used in Forest Service programs for pre- and post-emergent control of noxious and invasive weeds in rangelands, pastures, and along right-of-ways. The most common methods of ground application for chlorsulfuron involve backpack (selective foliar) and boom spray (broadcast foliar) operations. This project will only use backpack operations for Chlorsulfuron.

In experimental mammals, the acute oral LD50 for chlorsulfuron in rats is greater than 5000 mg/kg, which indicates a low order of toxicity. Acute exposure studies of chlorsulfuron and chlorsulfuron formulations give similar results, indicating that formulations of chlorsulfuron are not more toxic than chlorsulfuron alone. Appropriate tests provide no evidence that chlorsulfuron presents any reproductive risks or causes malformations or cancer. Results of all mutagenicity tests on chlorsulfuron are negative. Chlorsulfuron is mildly irritating to the eyes and skin but does not produce sensitizing effects following repeated dermal exposure. In all mammalian species studied, chlorsulfuron and its metabolites are extensively and rapidly cleared by a combination of excretion and metabolism. Skin absorption is the primary route of exposure for workers.

Exposure Assessment

Workers

For a worker applying chlorsulfuron with a backpack sprayer at an application rate of 0.056 lb a.e./acre, the central estimate for general worker exposure is 0.0005 mg/kg/day. The upper bound of expected general worker exposure is 0.008 mg/kg/day.

Accidental/incidental exposure scenarios for workers involve dermal (skin) exposures via contaminated gloves or spills on hands and the lower legs. In general, the accidental exposure scenarios lead to dose estimates that are lower than the general exposure levels estimated for workers.

Public

For the general public, acute non-accidental exposure levels associated with a single application of chlorsulfuron range from negligible (e.g., ≈6x10-14 mg/kg/day) to about 0.01 mg/kg/event. As with most exposure assessments involving foliar applications of pesticides, the highest levels of exposure are associated with the consumption of contaminated vegetation (i.e., upper bound dose of up to about 0.1 mg/kg bw/day). The lowest exposure levels are associated with swimming in contaminated water (i.e., upper bound doses of about 9x10 -8 mg/kg bw/day). For the accidental exposure scenarios, the greatest exposure levels are associated with the consumption of contaminated water by a small child following an accidental spill, for which the upper bound dose is about 0.3 mg/kg/event.

Dose-Response Assessment

Following standard practices in Forest Service risk assessments, reference doses (RfDs) are adopted from the values proposed by U.S. EPA/OPP. In terms of study selection, the EPA dose-response assessment is unchanged from the previous Forest Service risk assessment on chlorsulfuron (SERA 2004). The EPA, however, reduced the uncertainty factor used to derive both the acute and chronic dose-response assessment from 300 to 100 in response to the submission of an acceptable study on reproductive toxicity. The surrogate acute RfD is 0.75 mg/kg bw based on a developmental NOAEL of 75 mg/kg bw/day and an uncertainty factor of 100. The chronic RfD is 0.05 mg/kg bw/day based on a NOAEL of 5 mg/kg bw/day from a standard chronic feeding study in rats and an uncertainty factor of 100. Dose-severity relationships, although taken into consideration, do not have a substantial impact on the risk assessment because neither the acute nor chronic RfDs are exceeded in any of the exposure assessments.

Risk Characterization

Workers

Pesticide applicators are the individuals most likely to be exposed to a pesticide during the application process. All worker occupational exposure scenarios result in a hazard quotient of less than 1. Given the low hazard quotients for both general occupational exposure as well as accidental exposure scenarios, the results imply that long-term application of this herbicide can be accomplished without toxic effects.

Table H-13: Summary of worker hazard quotients (HQs) for backpack sprayer application of chlorsulfuron at 0.056 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	4E-07	5E-09	4E-06	0.75
Contaminated gloves, 1 hour	Worker	2E-05	3E-07	2E-04	0.75
Spill on hands, 1 hour	Worker	2E-05	1E-07	3E-04	0.75
Spill on lower legs, 1 hour	Worker	4E-05	2E-07	6E-04	0.75
General exposure	Worker	5E-04	5E-05	8E-03	0.05

Public

Across accidental acute scenarios, non-accidental acute exposures, and long-term exposures, none of the low, central, or high exposure scenarios approached the level of concern (i.e., a hazard quotient of 1 or greater) for the typical application rates for Chlorsulfuron.

Further, this risk assessment uses a series of worst-case and very conservative assumptions in the models, leading to assessments in which risks may be unrealistically magnified. The conservative nature of the upper bound assessments is intentional and intended to encompass risks to the Most Exposed Individual (SERA, 2016a). This risk assessment uses an extreme value approach, which also estimates the central estimates and lower bounds of exposure and risk. The central estimates of hazard quotients are intended to reflect exposures that are expected using typical values for consumption rates and other inputs. Lower bounds of exposures are used as best-case estimates and are generally intended to represent the feasibility of risk mitigation. At an application rate of 0.056 lb acid equivalent/acre, the lower, central, and upper bound hazard quotients for all of the acute and chronic scenarios are below a level of concern.

Table H-14: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of chlorsulfuron at 0.056 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	6E-04	4E-06	9E-03	0.75
Direct spray of woman, feet and lower legs	Adult female	6E-05	4E-07	1E-03	0.75
Water consumption (spill)	Child	3E-02	1E-04	0.3	0.75
Fish consumption (spill)	Adult male	8E-04	5E-06	5E-03	0.75
Fish consumption (spill)	Subsistence populations	4E-03	2E-05	2E-02	0.75

Table H-15: Public hazard quotients for non-accidental acute exposure scenarios from the expected application of chlorsulfuron at 0.056 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	3E-05	5E-06	1E-04	0.75
Contaminated fruit	Adult female	9E-04	4E-04	1E-02	0.75
Contaminated vegetation	Adult female	1E-02	8E-04	0.1	0.75
Swimming, one hour	Adult female	6E-09	6E-14	9E-08	0.75
Water consumption	Child	7E-04	1E-08	6E-03	0.75
Fish consumption	Adult male	2E-05	7E-10	1E-04	0.75
Fish consumption	Subsistence populations	1E-04	3E-09	5E-04	0.75

Table H-16: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of chlorsulfuron at 0.056 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	6E-03	3E-03	9E-02	0.05
Contaminated vegetation	Adult female	8E-02	5E-03	0.6	0.05
Water consumption	Adult male	2E-03	4E-08	1E-02	0.05
Fish consumption	Adult male	2E-05	4E-10	9E-05	0.05
Fish consumption	Subsistence populations	1E-04	3E-09	7E-04	0.05

Clopyralid

Hazard Identification

Clopyralid is a selective herbicide used primarily in the control of broadleaf weeds. The Forest Service uses only a single commercial formulation of clopyralid, Transline. The Forest Service uses Transline almost exclusively in noxious weed control.

Although no information is available on the toxicity of clopyralid to humans, the toxicity of clopyralid has been relatively well-characterized in mammals. All of this information is contained in unpublished studies submitted to the U.S. EPA as part of the registration process for clopyralid. In experimental animals, a common symptom of acute, high-dose clopyralid exposure is central nervous system (CNS) depression. Clopyralid also has a low order of chronic toxicity. For chronic or subchronic exposures, no effects have been observed in laboratory mammals at doses of 50 mg/kg/day or less. At doses of 100 mg/kg/day or greater, various effects have been observed in different species and different bioassays.

Technical grade clopyralid has been subject to several chronic bioassays for carcinogenicity and none of the bioassays have shown that clopyralid has carcinogenic potential, although technical grade clopyralid does contain low levels of hexachlorobenzene. Hexachlorobenzene has shown carcinogenic activity in three mammalian species and has been classified as a potential human carcinogen by the U.S. EPA. Thus, this effect is considered both qualitatively and quantitatively in this risk assessment.

No studies specifically mentioning Transline, the formulation used in Forest Service programs, were located in the search of the studies submitted to the U.S. EPA for product registration. Dow AgroSciences (2003) provided clarification of this issue and identified the studies submitted to U.S. EPA that were accepted as relevant to Transline. These studies do not indicate any substantial differences between Transline and clopyralid. This is consistent with the publicly available information on the three inserts contained in Transline, two of which are approved for use as food additives.

Exposure Assessment

Workers

For a worker applying clopyralid with a backpack sprayer at an application rate of 0.35 lb a.e./acre, the central estimate for general worker exposure is 0.03 mg/kg/day. The upper bound of expected general worker exposure is 0.2 mg/kg/day.

Accidental/incidental exposure scenarios for workers involve dermal (skin) exposures via contaminated gloves or spills on hands and the lower legs. In general, the accidental exposure scenarios lead to dose estimates that are lower than the general exposure levels estimated for workers.

Public

For the general public, acute non-accidental exposure levels associated with applying clopyralid with a backpack sprayer at an application rate of 0.35 lb a.e./acre range from extremely small (e.g., ≈3x10-10 mg/kg/day) to about 0.6 mg/kg/event. As with most exposure assessments involving foliar applications of pesticides, the highest levels of exposure are associated with the consumption of contaminated vegetation (i.e., upper bound dose of up to about 0.6 mg/kg bw/day). The lowest exposure levels are associated with swimming in contaminated water (i.e., upper bound doses of about 6x10 -8 mg/kg bw/day). For the accidental exposure scenarios, the greatest exposure levels are associated with the consumption of contaminated water by a small child following an accidental spill, for which the upper bound dose is about 2 mg/kg/event. For chronic exposure scenarios, the greatest exposure levels are associated with the consumption of contaminated vegetables by an adult female, for which the upper bound dose is about 1.7 mg/kg/event.

Dose-Response Assessment

The Office of Pesticide Programs of the U.S. EPA has derived an acute reference dose (RfD) of 0.75 mg/kg/day and a chronic RfD of 0.15 mg/kg/day for clopyralid. The acute RfD is based on a short-term NOAEL of 75 mg/kg/day and an uncertainty factor of 100. The chronic RfD is based on a 2-year dietary NOAEL in rats of 15 mg/kg/day and an uncertainty factor of 100. Other studies in rats, mice, and dogs have noted general decreases in body weight, increases in liver and kidney weight, as well as a thickening in some epithelial tissue. Decreases in body weight and changes in organ weight are commonly observed in chronic toxicity studies and can indicate either an adaptive or toxic response. Changes in epithelial tissue are less commonly observed and the toxicologic significance of this effect is unclear. The data on the toxicity of clopyralid are adequate for additional dose-response or dose-severity modeling. Because none of the anticipated exposures substantially exceed the RfD and the great majority of anticipated exposures are far below the RfD, such additional modeling is not necessary for the characterization of risk.

Risk Characterization

Workers

Pesticide applicators are the individuals most likely to be exposed to a pesticide during the application process. All worker occupational exposure scenarios result in a hazard quotient of less than 1. Given the low hazard quotients for both general occupational exposure as well as accidental exposure scenarios, the results imply that long-term application of this herbicide can be accomplished without toxic effects.

Table H-17: Summary of worker hazard quotients (HQs) for backpack sprayer application of clopyralid of 0.35 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	2E-06	1E-07	4E-05	0.75
Contaminated gloves, 1 hour	Worker	1E-04	7E-06	2E-03	0.75
Spill on hands, 1 hour	Worker	3E-04	2E-05	8E-03	0.75
Spill on lower legs, 1 hour	Worker	8E-04	4E-05	2E-02	0.75
General exposure	Worker	3E-02	1E-03	0.2	0.15

Public

For the accidental acute scenarios, one upper exposure scenario met the level of concern (i.e., a hazard quotient of 1 or greater) for the application of clopyralid. The upper exposure level for the consumption of contaminated water by a child exceeded the level of concern with a hazard quotient = 2 at 0.35 lbs acid equivalent /acre. This exposure assessment indicates that such an event would require measures to ensure that members of the general public do not consume contaminated water. The analyzed scenario is conservative in that it entails a small child (approximately 2 years old) drinking standing water from a pond shortly after an accidental spill of a field solution of 200 gallons with no dilution or pesticide decomposition.

It is highly unlikely that a young child would be exposed to a spill-of-field solution of this magnitude due to project design features. A spill kit and safety plan will be on-site during herbicide treatments, and no more than daily-use quantities of herbicides will be transported to the project site. Disposing of all containers and equipment in accordance with regulations will further prevent the likelihood of water contamination. The on-site safety plan will include reporting procedures, project safety planning, methods of clean-up of accidental spills, and information, including spill kit contents and location as noted in Forest Service Manual (FSM) 2150, Pesticide-Use Management and Coordination and Handbook (FSH) 2109.14, and Pesticide-Use Management and Coordination Handbook.

No other accidental acute scenarios or non-accidental acute exposures for the low, central, and high exposure scenarios approached the level of concern (i.e., a hazard quotient of 1 or greater) for the typical application rates for clopyralid.

For chronic, long-term exposures, one of the upper exposure scenarios met the level of concern (i.e., a hazard quotient of 1 or greater) for the application of clopyralid. The upper exposure level for an adult female consuming vegetation exceeded the level of concern with a hazard quotient = 1.7 at 0.35 lbs acid equivalent /acre. The likelihood of vegetation being consumed after spraying in this project is highly unlikely due to design criteria. For example, prior to initiating herbicide treatment, signs will be posted at public access points to treatment areas. Information on signs will include the herbicides being used, dates of application, and the name and telephone number of a contact person. Signs will be posted two weeks before and after an area has been treated with herbicide. Further, culturally significant plant gathering grounds will be identified by cultural monitors and avoided for direct herbicide application.

These areas will be identified for herbicide applicators for avoidance by a PNF Botanist, their designee, or a Cultural Monitor. In foliar application treatment areas where members of the public might consume vegetation or fruit growing on site, steps will be taken to avoid the potential for consumption of fruit exposed to herbicides. This may include cutting the edible vegetation or fruit prior to treatment, tarping, or adjusting treatments to avoid fruiting time.

Table H-18: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of clopyralid at 0.35 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	1E-02	6E-04	0.3	0.75
Direct spray of woman, feet and lower legs	Adult female	1E-03	6E-05	3E-02	0.75
Water consumption (spill)	Child	0.2	5E-03	2	0.75
Fish consumption (spill)	Adult male	5E-03	2E-04	5E-02	0.75
Fish consumption (spill)	Subsistence populations	5E-03	1E-03	0.2	0.75

Table H-19: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of clopyralid at 0.35 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	7E-04	1E-04	3E-03	0.75
Contaminated fruit	Adult female	5E-03	3E-03	9E-02	0.75
Contaminated vegetation	Adult female	8E-02	5E-03	0.6	0.75
Swimming, one hour	Adult female	4E-09	3E-10	6E-08	0.75
Water consumption	Child	7E-04	1E-04	4E-03	0.75
Fish consumption	Adult male	2E-05	5E-06	7E-05	0.75
Fish consumption	Subsistence populations	1E-04	3E-05	4E-04	0.75

Table H-20: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of clopyralid at 0.35 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	1E-02	4E-03	0.2	0.15
Contaminated vegetation	Adult female	0.2	8E-03	1.7	0.15
Water consumption	Adult male	5E-43	5E-05	1E-03	0.15
Fish consumption	Adult male	2E-06	3E-07	4E-06	0.15
Fish consumption	Subsistence populations	2E-05	3E-06	4E-05	0.15

Glyphosate

Hazard Identification

Glyphosate is a non-selective, phosphonate herbicide that is effective against shrubs, forbs, and grasses. Glyphosate is a Toxicity Category III chemical as decided by the EPA (Toxicity I indicated the highest degree of acute toxicity and Category IV the lowest). Therefore, glyphosate is of a relatively low oral and dermal acute toxicity risk.

The mechanism of action for glyphosate is attributed to the inhibition of the shikimate pathway involved in synthesis of amino acids in plants and microorganisms. Humans and animals do not have this metabolic pathway, and therefore this mechanism is not directly related to human health risks. The mechanism through which glyphosate can have toxic effects to mammals is not clear. In humans, glyphosate is not extensively metabolized.

Available data indicates that mammalian toxicity of glyphosate (including humans) is low, and there are very few specific hazards. Large oral doses (exceeding 300 mg/kg bw) can cause signs of toxicity. The most adverse effects occurring at the lowest doses involve developmental defects. Therefore, the EPA-derived RfDs for glyphosate are based on developmental effects, such as delayed development. Adverse developmental effects only occur at doses causing signs of maternal toxicity.

Exposure Assessment

Workers

For a worker applying glyphosate with a backpack sprayer at an application rate of 2 lb a.e./acre, the central estimate for general worker exposure for one day is 0.026 mg/kg/day. The upper bound of expected general worker exposure is 0.1 mg/kg/day. Accidental exposure scenarios for workers involve dermal exposure via contaminated gloves, clothing, or spills directly to hands and lower legs.

The exposure scenarios involving accidental exposures lead to dose estimates that are substantially lower than the general exposure levels estimated for workers. This reflects the fact that the general exposure estimates are based on field studies of workers in which accidental spills probably occurred and in some cases were specifically noted to occur.

Public

For members of the public, acute exposure levels range from miniscule (e.g. 1x10-8 mg/kg/day) to 0.43 mg/kg bw at the expected application rate of 2 lb a.e./acre. The highest acute exposure level, 4 mg/kg bw, is associated with the consumption of contaminated water by a child shortly after an accidental spill. The upper bound of the dose associated with the consumption of contaminated vegetation is about 2.7 mg/kg bw. The other acute exposure scenarios lead to much lower exposure values, ranging from close to zero to about 0.174 mg/kg for the accidental direct spray of a child. The lowest acute exposures are associated with swimming in or drinking contaminated water.

The modeled chronic or longer-term exposures are much lower than the corresponding estimates of acute exposures. As with acute exposures, the lowest chronic exposures are associated with the consumption of surface water.

Dose-Response Assessment

This risk assessment uses reference dose (RfD) values established by the EPA. For glyphosate, the Forest Service adopts the EPA established chronic RfD of 2 mg/kg/day for the general population. For both workers and members of the public, the RfD of 2mg a.e./kg bw/day is used to characterize risks associated with acute and longer-term exposure levels. This assessment is based on a development study of rabbits done by Rodwell (1980b) identifying a NOAEL of 175 mg/kg bw/day and a LOAEL of 350 mg/kg bw/day. This is considered the definitive RfD (SERA 2014).

Risk Characterization

Workers

Hazard quotients (HQs) for accidental and general occupational exposure scenarios are below a level of concern for the proposed application rate of 2 lb a.e./acre. As shown in Table H-21, none of the hazard quotients meet or exceed the applicable reference dose (acute for accidental exposure and chronic for general exposure).

Table H-21: Summary of worker hazard quotients (HQs) for backpack sprayer application of glyphosate at 2.00 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	4E-06	4E-07	3E-05	2
Contaminated gloves, 1 hour	Worker	2E-04	2E-05	2E-03	2
Spill on hands, 1 hour	Worker	5E-04	6E-05	2E-03	2
Spill on lower legs, 1 hour	Worker	1E-03	1E-04	6E-03	2
General exposure	Worker	1E-02	5E-04	1E-02	2

Public

All hazard quotients (HQs) for members of the public are below a level of concern for the expected application rate of glyphosate at 2 lb a.e./acre (Tables H-22 to H-24). Under the most extreme exposure scenario, the consumption of contaminated water by a child immediately after an accidental spill of glyphosate into a small pond, the hazard quotient is 2. Although this value does exceed the level of concern, it is an incredibly unlikely scenario and safety precautions will be taken by spray crews to ensure there are no spills of glyphosate into bodies of water. In accordance with management and treatment plans, spill plans will be enacted in the event that chemicals are spilled. There is an observed hazard quotient of 1.4 also observed for glyphosate under the scenario that an adult female consumes contaminated vegetation. Although this is also a highly unlikely scenario, signage will be posted in areas treated with glyphosate to prevent entrance of the public into areas receiving treatment.

Rodeo is the planned aquatic formulation of glyphosate. All hazard quotients for the aquatic formulation of glyphosate were similar or lower than those for the non-aquatic formulation, with the exception of the scenario of a child consuming contaminated water. For the purposes of this project, aquatic glyphosate might be applied to control invasives, but will not be applied in wet meadows and streambanks is not likely to be used directly in bodies of water or to control aquatic invasives (as there

are no known aquatic invasives in the project area). For more information regarding the aquatic formulation of glyphosate (i.e. Rodeo), see the individual Herbicide Worksheets.

Table H-22: Public hazard quotients (HQs) for accidental exposure scenarios from the expected application of glyphosate at 2.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	2E-02	2E-03	9E-02	2
Direct spray of woman, feet and lower legs	Adult female	2E-03	2E-04	9E-03	2
Water consumption (spill)	Child	.3	2E-02	**2**	2
Fish consumption (spill)	Adult male	4E-03	3E-04	2E-02	2
Fish consumption (spill)	Subsistence populations	2E-02	2E-03	8E-02	2

Table H-23: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of glyphosate at 2.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	1E-03	3E-04	3E-03	2
Contaminated fruit	Adult female	1E-02	5E-03	.2	2
Contaminated vegetation	Adult female	.2	1E-02	**1.4**	2
Swimming, one hour	Adult female	4E-09	1E-10	1E-07	2
Water consumption	Child	8E-04	6E-05	9E-03	2
Fish consumption	Adult male	9E-06	1E-06	7E-05	2
Fish consumption	Subsistence populations	5E-05	5E-06	3E-04	2

Table H-24: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of glyphosate at 2.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	2E-03	9E-04	3E-02	2
Contaminated vegetation	Adult female	3E-02	2E-03	.2	2
Water consumption	Adult male	5E-06	2E-06	2E-04	2
Fish consumption	Adult male	1E-08	5E-09	3E-07	2
Fish consumption	Subsistence populations	8E-08	4E-08	3E-06	2

Imazapyr

Hazard Identification

Imazapyr is a post-emergence herbicide used in the control of grasses, broadleaf weeds, vines, and brush species. Imazapyr will only be used in this project to control terrestrial weeds, not for aquatic applications. Imazapyr has the potential to damage nontarget vegetation, but does not pose a substantial risk to humans or other species of animals. The EPA classifies imazapyr as “practically non-toxic” to mammals, birds, honeybees, fish, and aquatic invertebrates (SERA 2007). The EPA also categorizes the carcinogenic potential of imazapyr as "Class E: evidence of non-carcinogenicity". Most accidental exposures raise only minimal concerns. Imazapyr can be mildly irritating to the eyes and skin.

Exposure Assessment

Workers

For terrestrial applications using a backpack sprayer, central estimates of exposure for workers are approximately .013 mg/kg/ day. Upper ranges of exposures are approximately 0.08 mg/kg/day for backpack applications. Average acute incidental exposures for workers are very low (e.g., 5.9x10-3 mg/kg/day).

Public

For the general public, acute non-accidental exposure levels associated with terrestrial applications range from very low (e.g., ≈9x10-6 mg/kg/day) to an approximately 0.6 mg/kg event at the unit application rate of 0.45 lb a.e./acre. The upper bound of exposure (0.6 mg/kg event) is associated with the consumption of contaminated vegetation. The other acute exposure scenarios lead to much lower dose estimates. The lowest acute exposure levels are associated with swimming in or drinking contaminated water. Of the accidental exposure scenarios, the greatest exposure levels are associated with the consumption of contaminated water by a small child. The chronic exposure levels are much lower than estimates for the corresponding acute exposures.

Dose-Response Assessment

This risk assessment uses reference dose (RfD) values established by the EPA. The U.S. EPA/OPP derived a chronic RfD of 2.5 mg/kg/day using a dog NOAEL of 250 mg/kg/day and an uncertainty factor of 100 (SERA 2007). This study was conducted on dogs for a year, and studies the effects of dietary concentrations in the subjects. No adverse effects were observed in dogs from any treatment groups.

This is supported by numerous studies in rats and mice, as well as other studies on potential reproduction and developmental effects.

Risk Characterization

Workers

Hazard quotients (HQs) for accidental and general occupational exposure scenarios are below a level of concern for the proposed application rate of 0.45 lb a.e./acre. As shown in Table H-25, none of the hazard quotients meet or exceed the applicable reference dose (acute for accidental exposure and chronic for general exposure).

Table H-25: Summary of worker hazard quotients (HQs) for backpack sprayer application of Imazapyr at 0.45 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	1E-05	1E-06	1E-04	2.5
Contaminated gloves, 1 hour	Worker	7E-04	7E-05	6E-03	2.5
Spill on hands, 1 hour	Worker	1E-04	9E-06	1E-03	2.5
Spill on lower legs, 1 hour	Worker	3E-04	2E-05	3E-03	2.5
General exposure	Worker	2E-03	8E-05	1E-02	2.5

Public

All hazard quotients (HQs) for members of the public are below a level of concern for the expected application rate of imazapyr at 0.45 lb a.e./acre (Tables H-26 to H-28).

Table H-26: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of Imazapyr at 0.45 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	4E-03	3E-04	5E-02	2.5
Direct spray of woman, feet and lower legs	Adult female	4E-04	3E-05	5E-03	2.5
Water consumption (spill)	Child	3E-02	7E-04	.4	2.5
Fish consumption (spill)	Adult male	5E-04	2E-05	4E-03	2.5
Fish consumption (spill)	Subsistence populations	2E-03	9E-05	2E-02	2.5

Table H-27: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of Imazapyr at 0.45 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	5E-04	2E-04	1E-03	2.5
Contaminated fruit	Adult female	2E-03	1E-03	3E-02	2.5
Contaminated vegetation	Adult female	3E-02	2E-03	.2	2.5
Swimming, one hour	Adult female	5E-08	1E-11	1E-06	2.5
Water consumption	Child	3E-04	7E-08	5E-03	2.5
Fish consumption	Adult male	4E-06	2E-09	5E-05	2.5
Fish consumption	Subsistence populations	2E-05	9E-09	3E-04	2.5

Table H-28: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of Imazapyr at 0.45 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	9E-04	2E-04	2E-02	2.5
Contaminated vegetation	Adult female	1E-02	5E-04	.1	2.5
Water consumption	Adult male	4E-05	1E-08	7E-04	2.5
Fish consumption	Adult male	9E-08	4E-11	2E-06	2.5
Fish consumption	Subsistence populations	7E-07	3E-10	1E-05	2.5

Indaziflam

Hazard Identification

Indaziflam is a pre-emergent herbicide. Indaziflam acts in plant cells and tissues where cellulose synthesis is actively taking place. Therefore, fully developed leaves, tissues, and plant organs are not or minimally affected by the compound. Limited research exists on the mechanism of action in plants, though it has been shown to inhibit biosynthesis in both monocotyledonous and dicotyledonous plants. This herbicidal mechanism of action is specific to plants and not relevant to potential human health effects. The mechanism of action in mammals is not discussed in the open literature or in U.S. EPA risk assessments. No human data regarding the behavior of Indaziflam were identified, though data exists for other mammals. Results from studies on rats indicate that oral bioavailability of Indaziflam is high, and that excretion is rapid. Metabolites were determined to have comparable toxicity to Indaziflam.

Exposure Assessment

Workers

For a worker applying Indaziflam with a backpack sprayer at an application rate of 0.091 lb a.e./acre, the central estimate for general worker exposure is 0.009 mg/kg/day. The upper bound of expected general worker exposure is 0.05 mg/kg/day.

Accidental/incidental exposure scenarios for workers involve dermal (skin) exposures via contaminated gloves or spills on hands and the lower legs. The scenario involving a spill on the lower legs for 1 hour leads to an upper bound of 0.003 mg/kg/event. The scenario involving a worker wearing contaminated gloves for 1 hour leads to an upper bound of 0.1 mg/kg/event, the highest of any assessed scenario.

Other accidental exposure scenarios lead to dose estimates that are similar to or lower than the general exposure levels estimated for workers.

Public

For members of the public, acute exposure levels range from low (e.g., 1x10-5 mg/kg/day) to about 0.4 mg/kg bw at the expected application rate of 0.091 lb a.e./acre. The highest acute exposure level, 0.4 mg/kg bw, is associated with the consumption of contaminated fish by subsistence populations after an accidental spill. The upper bound of the dose associated with the consumption of contaminated vegetation is about 0.1 mg/kg bw. The other acute exposure scenarios lead to much lower exposure values, from roughly 1x10-5 mg/kg/day to about 0.06 mg/kg for the accidental direct spray of a child.

The modeled chronic or longer-term exposures are much lower than the corresponding estimates of acute exposures. The highest longer-term exposures are associated with the consumption of contaminated vegetation and the upper bound for this scenario is 0.057 mg/kg/day.

Dose-Response Assessment

This risk assessment uses reference dose (RfD) values established by the EPA. For Indaziflam, the EPA has established a chronic RfD of 0.02 mg/kg/day for the general population. The RfD of 0.02 mg/kg/day was derived by dividing the NOAEL of 2 mg/kg bw/day by an uncertainty factor of 100. The EPA established an acute RfD of 0.5 mg/kg bw/day based on a NOAEL from a reproduction study of about 50 mg/kg/day and an uncertainty factor of 100. Both RfD values are based on NOAELs for the most sensitive endpoint in the most sensitive species and studies in which LOAEL values were identified.

Risk Characterization

Workers

Hazard quotients (HQs) for accidental and general occupational exposure scenarios are below a level of concern for the proposed application rate of 0.091 lb a.e./acre. As shown in Table H-29, none of the hazard quotients meet or exceed the applicable reference dose (acute for accidental exposure and chronic for general exposure).

Table H-29: Summary of worker hazard quotients (HQs) for backpack sprayer application of Indaziflam at 0.091 lb a.i./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	5E-04	8E-05	3E-03	0.5
Contaminated gloves, 1 hour	Worker	3E-02	5E-03	0.2	0.5
Spill on hands, 1 hour	Worker	3E-04	3E-05	3E-03	0.5
Spill on lower legs, 1 hour	Worker	7E-04	7E-04	6E-03	0.5
General exposure	Worker	0.2	1E-02	1.8	0.2

Based on the hazard quotients described above, there are no anticipated risks to workers from the proposed application of Indaziflam.

Public

Most hazard quotients (HQs) for members of the public are below a level of concern for the expected application rate of Indaziflam at 0.091 lb a.e./acre (Tables H-30 to H-32). Under the most extreme acute exposure scenario, the consumption of fish by subsistence populations immediately after an accidental spill of Indaziflam, the upper bound of the hazard quotient is 0.8, greater than the RfD of 0.5, though the central estimate is 0.09. The consumption of water by a child following a spill has an upper hazard quotient of 0.5, equal to the RfD, though the central hazard quotient is 0.03. For chronic exposures, the consumption of vegetation by an adult has a hazard quotient with a central estimate of 0.3, which greatly exceeds the RfD of 0.02. The other scenario where the hazard quotient exceeds the RfD is the consumption of contaminated fruit, with an upper bound hazard quotient of 0.4, compared to the RfD of 0.02.

Table H-30: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of Indaziflam at 0.091 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	1E-02	1E-03	0.1	0.5
Direct spray of woman, feet and lower legs	Adult female	1E-03	1E-04	1E-02	0.5
Water consumption (spill)	Child	3E-02	9E-04	0.5	0.5
Fish consumption (spill)	Adult male	2E-02	8E-04	0.2	0.5
Fish consumption (spill)	Subsistence populations	9E-02	4E-03	0.8	0.5

Table H-31: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of Indaziflam at 0.091 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	1E-03	6E-04	2E-03	0.5
Contaminated fruit	Adult female	2E-03	1E-03	3E-02	0.5
Contaminated vegetation	Adult female	3E-02	2E-03	0.2	0.5
Swimming, one hour	Adult female	3E-06	2E-09	2E-05	0.5
Water consumption	Child	4E-04	3E-07	3E-03	0.5
Fish consumption	Adult male	2E-04	2E-07	1E-03	0.5
Fish consumption	Subsistence populations	1E-03	1E-06	6E-03	0.5

Table H-32: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of Indaziflam at 0.091 lb a.i./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	2E-02	1E-02	0.4	0.02
Contaminated vegetation	Adult female	0.3	2E-02	**3**	0.02
Water consumption	Adult male	4E-05	3E-08	2E-04	0.02
Fish consumption	Adult male	7E-06	6E-09	4E-05	0.02
Fish consumption	Subsistence populations	6E-05	5E-08	4E-04	0.02

Triclopyr acid

Hazard Identification

Triclopyr is used to control both broadleaf and woody plants. It is a systemic herbicide which affects actively growing plants by mimicking a specific type of plant growth hormone, known as an auxin. Plants rapidly take in triclopyr through leaves and roots, ultimately causing uncontrolled plant growth and plant death. The toxicity of triclopyr to mammals is relatively well characterized in numerous standard acute, subchronic, and chronic toxicity studies as well as developmental and reproduction studies required by the U.S. EPA/OPP for pesticide registration. In mammals, the toxicity studies that yield the most sensitive endpoints—i.e., the signs of toxicity that occur at the lowest doses—for triclopyr involve developmental and reproductive effects.

Based on histopathology and clinical chemistry data from standard acute, subchronic and chronic toxicity studies on triclopyr, the liver and kidneys are the primary target organs. At sufficiently high doses, triclopyr may cause toxic effects, including death. Nonetheless, triclopyr has a low order of acute lethal potency. There is no information suggesting that triclopyr causes direct adverse effects on the nervous system, endocrine system, or immune function.

Exposure Assessment

Workers

For a worker applying triclopyr with a backpack sprayer at an application rate of 1.0 lb a.e./acre, the central estimate for general worker exposure is 0.03 mg/kg/day. The upper bound of expected general worker exposure is 2 mg/kg/day.

Accidental/incidental exposure scenarios for workers involve dermal (skin) exposures via contaminated gloves or spills on hands and the lower legs. All accidental exposure scenarios lead to dose estimates that are substantially lower than the general exposure levels estimated for workers. All accidental exposure scenarios also lead to HQs below 1.

Public

For members of the public, accidental acute exposure levels range from very small (e.g., 3x10-5 mg/kg/event) to 2 mg/kg/event at the expected application rate of 1.0 lb a.e./acre. The highest accidental acute exposure level, 2 mg/kg/event, is associated with the consumption of water by a child after an accidental spill.

Non-accidental acute exposure levels range from very small (e.g., 4x10-7 mg/kg/event) to 27 mg/kg/event at the expected application rate of 1.0 lb a.e./acre. The highest non-accidental acute exposure level, 27 mg/kg/event, is associated with the consumption of contaminated vegetation by an adult female. At the central exposure level, consumption of vegetation by an adult female produces a HQ of 3. All other non-accidental acute exposure scenarios lead to exposure levels less than 1.

The modeled chronic or longer-term exposures are also generally low. The highest longer-term exposure is associated with the consumption of contaminated vegetation by an adult female, and the upper bound for this scenario is 6 mg/kg/day. Consuming contaminated fruit by an adult female at the upper bound is 3 mg/kg/day. All other chronic exposure scenarios lead to exposure levels less than 1.

Dose-Response Assessment

The U.S. EPA/OPP has derived acute and chronic RfDs for triclopyr. The acute and chronic reference doses (RfDs) for triclopyr are 1 and 0.05 mg/kg bw/day, respectively. Both RfDs are based on NOAELs in rats, and both use an uncertainty factor of 100. The acute RfD is based on a developmental study in which no effects were noted at 100 mg/kg bw/day, but severe maternal toxicity was noted at 300 mg/kg bw/day. The chronic RfD is based on a two-generation reproduction study in rats in which no adverse effects were noted at 5 mg/kg bw/day but effects on the kidney were noted at 25 mg/kg bw/day.

Because of concerns for the reproductive and developmental toxicity of triclopyr, the acute RfD is not used to assess risks to women of childbearing age. For this group, the chronic RfD is used to assess the risks associated with both acute and longer-term exposures. The acute and chronic RfDs for TCP are lower than those for triclopyr. For TCP, the acute RfD is 0.025 mg/kg bw/day and the chronic RfD is

0.012 mg/kg bw/day. The acute RfD is based on a developmental study in rabbits in which birth defects were noted at a dose of 100 mg/kg bw/day but no adverse effects were observed at 25 mg/kg bw/day. An uncertainty factor of 1000 is applied to the NOAEL to derive the acute RfD. Unlike the case with triclopyr, however, the acute RfD is applied only to women of childbearing age. The chronic RfD is based on a chronic study in dogs in which the NOAEL was 12 mg/kg bw/day. As with the acute RfD, the chronic RfD is derived using an uncertainty factor of 1000.

Risk Characterization

At the typical application rate of 1 lb a.e./acre, the central estimates of the HQs indicate that workers will not be subject to hazardous levels of triclopyr during applications of triclopyr (HQ=0.3). At the upper bounds of the estimated exposures for backpack spray applications, the HQ for triclopyr (HQ = 1.6) exceeds the level of concern based on the chronic RfD.

For members of the general public, the only non-accidental exposure scenarios of concern involve the consumption of contaminated fruit or vegetation with consequent exposures to triclopyr. The non-accidental acute exposure scenario of the consumption of contaminated vegetation by a young woman exceeds the level of concern (HQ=27). In addition, some of the central estimates of exposure to triclopyr involving a young woman consuming contaminated vegetation (HQ=3) also exceed the level of concern. Chronic exposure through the consumption of contaminated fruit or vegetation at the upper bound also exceeds the level of concern (HQ =3 for contaminated fruit and HQ=6 for contaminated vegetation).

Relative to the risks associated with the consumption of contaminated fruit or vegetation, risks associated with other exposure scenarios are marginal.

Workers

Triclopyr has been used as an herbicide for more than 30 years and continues to be used extensively by the Forest Service. No reports of frank adverse effects in workers (male or female) applying any triclopyr formulation are included in the available literature.

The risk characterization for workers involved in terrestrial applications of triclopyr is essentially identical, at least quantitatively, to the risk characterization given in the previous Forest Service risk assessment on triclopyr (SERA 2003). Central estimates of the hazard quotient based on the chronic RfD are below the level of concern (HQ=1) at an application rate of 1 lb a.e./acre. Under typical conditions of application and at the typical application rate of 1 lb/acre, there is no indication that workers will be subject to hazardous levels of triclopyr at the central estimates of exposure. There is no indication that the infrequent application of triclopyr formulations will be associated with identifiable risks to male workers. However, the acute RfD is not applied to women of child bearing age, and the chronic RfD of

0.05 mg/kg/day is used.

To further promote worker protection and safety, numerous mitigation measures have been designed (in addition to Forest Service protocol for personal protective equipment) for the application of triclopyr as well as other herbicides. Individual plants will be targeted by hand to reduce herbicide drift and the potential for unnecessary exposure to skin or clothing. Similarly, to prevent human exposure, spray application will not be carried out when wind speeds are 10 mph or greater. A spill kit and safety plan will be on-site during herbicide treatments, including but not limited to first aid supplies. Equipment used for transportation, storage, or application of triclopyr will be maintained in leak-proof condition and secured to prevent tipping during transport. Similarly, an impervious containment material will be placed beneath mixing areas to contain any spills associated with mixing/refilling. No more than the daily-use quantity of herbicide will be transported to the project site to minimize spill potential. An herbicide monitoring program will be established to determine whether herbicides were applied safely, were restricted to intended target areas, and provide early warning of potential hazards whether human or ecological.

Table H-33: Summary of worker hazard quotients (HQs) for backpack sprayer application of Triclopyr at 1.00 lb a.e./acre

Exposure Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated gloves, 1 min.	Worker	2E-05	6E-06	3E-04	1
Contaminated gloves, 1 hour	Worker	1E-03	4E-04	2E-02	1
Spill on hands, 1 hour	Worker	4E-04	9E-05	6E-03	1
Spill on lower legs, 1 hour	Worker	1E-03	2E-04	1E-02	1
General exposure	Worker	0.3	9E-03	1.6	0.05

Public

Triclopyr is associated with adverse reproductive effects in experimental mammals. While there are no epidemiology studies supporting a link between exposure to triclopyr and adverse reproductive outcomes in humans, reproductive toxicity is an endpoint of particular concern in Forest Service risk assessments.

Additional mitigation measures have been designed to further protect the general public from potential adverse effects from herbicide application. To prevent overspray and limit human exposures, spray application will not be carried out when wind speeds are 10 mph or greater. An herbicide monitoring program will be established to determine whether herbicides were applied safely, were restricted to intended target areas, and provide early warning of potential hazards.

Previous research has shown that three categories of the general public are at unique risk for accidental and non-accident acute exposures as well as chronic or longer-term exposure. In the accidental acute exposure criteria, the scenario of water consumption (spill) by a child receptor exists in the upper hazard quotient and is double the toxicity value (2 mg/kg/event vs 1 mg/kg/event). Mitigation measures which actively address this concern include the following: herbicide spray equipment will not be washed or rinsed within 100 feet of any body of water or stream channel. No herbicide application will take place during precipitation, or if precipitation in excess of 0.1 inches is forecasted with a greater than 50% probability 24 hours before or after project activities. Appropriate buffers will be observed to protect streamside wet areas (riparian conservation areas) including perennial streams (300 feet), intermittent streams (150 feet), ephemeral streams (150 feet), special aquatic features such as lakes, wet meadows, wetlands, fens and spring (300 feet) and other riparian features such as dry meadows and seasonal wetlands (150 feet).

The other two categories exist within the non-accidental acute exposure category with adult females as the receptor. Contaminated fruit registers in the upper hazard quotient and is eight times over the toxicity value (4 mg/kg/event vs 0.5 mg/kg/event). Contaminated vegetation is especially unique and generates the only central hazard quotient to be above toxicity value (3 mg/kg/event vs 0.05 mg/kg/event). Contaminated vegetation for adult females also exists above the toxicity values in the upper hazard quotient (27 mg/kg/event vs 0.5 mg/kg/event).

Chronic or longer-term exposures report similar findings with contaminated fruit and vegetation as the primary concern in adult females. Contaminated fruit (3mg/kg/day vs 0.05 mg/kg/day) and contaminated vegetation (6 mg/kg/day vs 0.05 mg/kg/day) both surpassed the toxicity value in the upper hazard quotient.

For these criteria, specific design features were drafted to reduce toxicity potential amongst the general public, especially children and adult females. Prior to initiating herbicide treatment, signs will be posted at public access points to treatment areas. Information on signs will include the herbicides being used, dates of application, and the name and telephone number of a contact person. Signs will be posted two weeks before and after an area has been treated with herbicide. In foliar application treatment areas where members of the public might consume vegetation or fruit growing on site, steps will be taken to avoid the potential for consumption of fruit exposed to herbicides. This may include cutting the edible vegetation or fruit prior to treatment, tarping or adjusting treatments to avoid fruiting time. Culturally significant plant gathering grounds will be identified by cultural monitors and avoided for direct herbicide application. Populations will be buffered a minimum of 10 feet to prevent spray drift.

Table H-34: Public hazard quotients (HQs) for accidental acute exposure scenarios from the expected application of Triclopyr at 1.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Direct spray of child, whole body	Child	2E-02	3E-03	0.2	1
Direct spray of woman, feet and lower legs	Adult female	3E-02	7E-03	0.5	0.5
Water consumption (spill)	Child	0.1	1E-02	**2**	1
Fish consumption (spill)	Adult male	2E-04	3E-05	2E-03	1
Fish consumption (spill)	Subsistence populations	1E-03	1E-04	1E-02	1

Table H-35: Public hazard quotients (HQs) for non-accidental acute exposure scenarios from the expected application of Triclopyr at 1.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Vegetation contact, shorts and t-shirt	Adult female	4E-02	2E-02	0.1	0.5
Contaminated fruit	Adult female	0.2	0.1	**4**	0.5
Contaminated vegetation	Adult female	**3**	0.2	**27**	0.5
Swimming, one hour	Adult female	4E-07	5E-11	7E-05	0.5
Water consumption	Child	2E-04	5E-08	3E-02	1
Fish consumption	Adult male	4E-07	1E-10	3E-05	1
Fish consumption	Subsistence populations	2E-06	7E-10	2E-04	1

Table H-36: Public hazard quotients (HQs) for chronic/longer term exposure scenarios from the expected application of Triclopyr at 1.00 lb a.e./acre

Scenario	Receptor	Central HQ	Lower HQ	Upper HQ	RfD
Contaminated fruit	Adult female	9E-02	3E-02	**3**	0.05
Contaminated vegetation	Adult female	0.3	9E-03	**6**	0.05
Water consumption	Adult male	6E-04	8E-11	4E-02	0.05
Fish consumption	Adult male	2E-07	3E-14	1E-05	0.05
Fish consumption	Subsistence populations	1E-06	3E-13	8E-05	0.05

Tank Mixtures

Of the tank mixes proposed for use in the Tributaries Project, the tank mix of Glyphosate and Imazapyr is the most utilitarian and likely to be widely used. Similar to the individual risk assessments for the chemicals, the greatest risk to human health is the acute exposure of a child consuming contaminated water, and the acute/chronic adult exposure to contaminated fruit and vegetation. Both scenarios are unlikely to occur. In the event of a spill, spill safe protocols would be followed. Areas designated for treatment with herbicide would be signed for the public's knowledge, and a dye additive will be used in spray mixes to thoroughly signify treated vegetation.

3. Ecological Risk Assessment

This section examines potential effects of pesticide use in the Tributaries Forest Recovery Project on other organisms, including birds, mammals, invertebrates, and plants. A summary of the ecological risks associated with each pesticide is provided. For more information, refer to the tables in Appendix H-2 to H-5, as well as the appropriate SERA assessment for each pesticide (in the section references below).

Aminopyralid

Aminopyralid is an effective herbicide designed to inhibit the growth of terrestrial broadleaf plants. As a result, non-target plant species that are similar to the target species may be adversely affected by aminopyralid application. Aminopyralid is selective in that dicots are much more sensitive to aminopyralid than monocots. Consequently, some nontarget broadleaf that are directly sprayed with aminopyralid are likely to be adversely affected. Direct spraying of sensitive plant species results in a hazard quotient (HQ) value of 390, indicating that an adverse effect is very likely. Drift presents the second highest potential risk to sensitive plants, with HQs exceeding a level of concern between 50 to 100 feet downwind. For tolerant plants such as grasses, accidental direct spray and drift do not meet or exceed a level of concern. Except in areas that are highly susceptible to runoff such as hard packed and predominantly clay soils, offsite losses associated with runoff do not appear to pose a substantial risk. Similarly, risks associated with transport of the herbicide by wind erosion appear to be insubstantial.

Because the hazard quotients (HQs) for other groups of organisms exposed to aminopyralid do not meet or exceed applicable toxicity levels, there is no evidence that these groups of organisms would be adversely affected. These groups include tolerant species of terrestrial plants (such as grasses), aquatic plants (algae or macrophytes), mammals, birds, aquatic or terrestrial invertebrates, terrestrial microorganisms, fish, and amphibians. See Appendices 2-6 for hazard quotient values.

The available toxicity data support separate dose-response assessments in eight classes of organisms: terrestrial mammals, birds, terrestrial invertebrates, terrestrial plants, fish, aquatic invertebrates, aquatic algae, and aquatic macrophytes. Toxicity data for aminopyralid can be found in Appendix 2 - 5, with further detail in SERA 2007.

This ecological risk assessment is based on experimental studies in a limited number of species and under controlled laboratory conditions that may not well-represent populations of free-ranging nontarget species. For some groups of organisms including soil microorganisms and amphibians, this limitation is severe in that the available information is sparse and not well-suited to quantitative risk assessment. In other groups of organisms, there are uncertainties in the application of the different types of information that are available for the characterization of risk. These uncertainties are particularly evident in the assessment of potential risks to birds in which the current risk assessment takes an extremely conservative approach in the application of gavage toxicity data to the assessment of risks from dietary exposures. Exposure routes in real-world dietary scenarios and oral gavage studies differ in meaningful ways. Oral gavage studies involve force-feeding test animals via a tube, which induces stress and bypasses exposure to the mouth and esophagus. The SERA risk assessment uses oral gavage studies in the absence of dietary exposure studies, but they may not appropriately describe dietary toxicity.

Borate salts

As discussed in the Human Health Assessment section, borate salts are rapidly converted to boric acid under conditions typically found in the environment. At physiological pH and in most surface waters, most organisms are exposed primarily to boric acid. Therefore, information on boric acid is reviewed as appropriate and used as surrogate data in this risk assessment for borax and DOT (SERA 2016b). Adverse reproductive effects, including skeletal defects and testicular pathologies are characteristic of over-exposure to boron in several groups of organisms including mammals, birds, and aquatic phase amphibians. While the mechanism of action of borates is not fully characterized, these reproductive and developmental effects could be related to the suppression of normal cell proliferation by boron.

Although boron appears to reduce oxidative stress in mammals, sublethal exposure to borates appears to increase oxidative stress in some insects. Boron is an essential trace element in plants. Boron has not been shown to be clearly essential in other groups of organisms; yet, biphasic dose-response curves (i.e., beneficial effects at low doses) have been noted in mammals, birds, and aquatic phase amphibians.

Boron is a naturally occurring element, and like most naturally occurring elements can be toxic at high levels of exposure. There is, however, little indication that boron is toxic to most organisms at normal (i.e., background) levels of exposure.

Chlorsulfuron

Chlorsulfuron is an effective and potent herbicide likely to cause adverse effects on some nontarget terrestrial and aquatic plant species unless measures are taken to limit exposure. If chlorsulfuron is applied directly to either sensitive or tolerant species, adverse effects in the exposed plants are virtually certain. The hazard quotients (HQs) associated with drift are also substantial, particularly for sensitive species. At an application rate of 0.056 lb ae/acre, and a distance of 900 feet downwind, the HQ for sensitive species is 22. The HQs associated with soil exposures are also substantial but less than those associated with direct deposition. For runoff, the HQ is 412 for sensitive species and 17 for tolerant species. For the use of contaminated irrigation water, the HQ is 20,934 for sensitive species and 15 for tolerant species. The HQs associated with wind erosion of contaminated soil is 10 for sensitive species and 0.007 for tolerant species. The product labels for the formulations designated by the Forest Service specifically note potential hazards to terrestrial vegetation associated with the use of contaminated water for irrigation and with the transport by wind of contaminated soil.

For aquatic plants, risks to sensitive species of macrophytes are greater than risks to sensitive species of algae. For sensitive species of aquatic macrophytes, the acute HQ is 154 and the longer- term HQ is 89. For acute exposures in algae, the acute HQ is 4 for sensitive species but below the level of concern (0.004) for tolerant species. For tolerant species of both macrophytes and algae, all longer-term HQs are below the level of concern.

Just as there is little doubt that chlorsulfuron may adversely affect some plant species, there is no clear basis for suggesting that effects on terrestrial or aquatic animals are likely or would be substantial.

Adverse effects in mammals and birds are not likely at the application rate of 0.056 lb a.e./acre. Under the most extreme exposure scenarios, a small mammal with chronic exposure to contaminated short grass produces the HQ of 3, and for small birds with chronic exposure to contaminated short grass the HQ is 1.6.

The risk characterization for aquatic animals is relatively simple and unambiguous. Chlorsulfuron appears to have a very low potential to cause any direct adverse effects in aquatic animals. All of the upper bounds of the HQs for aquatic animals (e.g., fish and invertebrates) are below the level of concern.

While the risk characterization for chlorsulfuron focuses on the potential for direct toxic effects, there is also a potential for indirect effects in virtually all groups of nontarget organisms. Alterations in vegetation following the application of any effective herbicide, including chlorsulfuron, could alter vegetation in ways that may be beneficial to some species and detrimental to others. The magnitudes of these indirect effects are likely to vary over time. If algae are adversely affected by chlorsulfuron, cumulative impacts on aquatic invertebrates and fish could be detrimental due to a decrease in available food and habitat modification. In the event of an accidental spill, oxygen depletion due to decaying vegetation could be detrimental to many aquatic animals.

Clopyralid

Clopyralid is an herbicide and the most likely damage to non-target species will involve terrestrial plants. Sensitive plant species could be adversely affected by the off-site drift of clopyralid under a variety of different scenarios depending on local site-specific conditions that cannot be generically modeled. If clopyralid is applied in the proximity of desirable sensitive plant species, site-specific conditions and anticipated weather patterns will need to be considered if unintended damage is to be avoided. Within the North Fork Forest Recovery Project area drift will be limited (e.g., coarse droplet size, wind restrictions, low nozzle height), and a 50-foot exclusion zone will be implemented around flagged areas, including special status plants.

More tolerant plant species are not likely to be affected unless they are directly sprayed or subject to substantial drift. Because of the tendency for clopyralid to move into soil rather than to be transported by runoff and because of the greater toxicity of clopyralid by foliar deposition compared to soil contamination, off-site movement of clopyralid by soil runoff does not appear to be substantial risk to non-target plant species. Aquatic plants do not appear to be at any substantial risk from any plausible acute or chronic exposures. In the very extreme case of an accidental spill of a large amount of the herbicide into a relatively small body of water, sensitive aquatic plants (HQ= 159) could be damaged.

Very limited adverse effects are anticipated in terrestrial or aquatic animals from the use of clopyralid in Forest Service programs at the typical application rate of 0.35 lb a.e./acre. Under the exposure scenarios where a small mammal with acute exposure to contaminated short grass produces the HQ of 3. Chronic exposure by a small mammal to contaminated broadleaf foliage (HQ=1.1), contaminated tall grass (HQ=4), and contaminated short grass (HQ=8) also produce hazard quotients above 1. Small birds with chronic exposure to contaminated broadleaf foliage (HQ=12), contaminated tall grass (HQ=10), and contaminated short grass (HQ=21) also produce the HQ of 1.6, exceeding the level of concern. A large bird with chronic exposure to contaminated short grass (HQ=2) slightly exceeds the level of concern.

Clopyralid appears to have a very low potential to cause any direct adverse effects in aquatic animals. All of the upper bounds of the HQs for aquatic animals (e.g., fish and invertebrates) are below the level of concern.

Glyphosate

Glyphosate is a non-selective herbicide designed to disrupt growth in plants. It is highly effective against its target species, and as a result of this can damage other non-target vegetation as well. Direct spraying and drift of up to 300 ft, results in a hazard quotient (HQ) value ranging from 1.4 to 1,538. At direct spray the HQ value is 1,538, indicating adverse effects are very likely. For tolerant species, the highest potential risk is of direct spray, which presents a HQ value of 4. Contaminated irrigation water poses a risk to sensitive species of terrestrial vegetation, with HQ's exceeding the level of concern.

Consumption of contaminated food items such as broadleaf shrubs and short/long grass by insects, presents a mild level of concern with HQ's ranging from 1.1-2. Accidental acute exposures to mammals, such as direct sprays and consumption of contaminated water spills, present low risks, with none exceeding hazard quotients. Non-accidental acute exposures, such as contaminated broadleaf foliage,

tall grass, and short grass of highest residue rate, present a moderate amount of risk with hazard quotients ranging from 1-8 HQ. Contaminated short grass presents the only chronic/longer term exposure risk, with a mild HQ of 1.3.

Fish, amphibians, and most aquatic invertebrates have been shown to be sensitive to the toxicity of the different formulations of glyphosate, both with and without surfactants. Aquatic species are particularly vulnerable to toxicity from glyphosate at the upper level, with exceeding HQ values ranging from 2-908 in accidental and non-accidental acute exposure scenarios. Glyphosate is not proposed for use in aquatic invasive control and due to project design features and RCA restrictions, herbicide will not be used in direct vicinity of stream channels or bodies of water. Therefore, the probability of these scenarios occurring is very low.

For bird species, consumption of various contaminated vegetation presents the only risks, for both long term and acute exposures, with the exceeding HQ's ranging from 1.4-13. These hazard quotients for all species risk assessments discussed in this section represent the upper limit. Toxicity data for glyphosate can be found in Appendix 2 - 5, with further detail in SERA 2007.

Imazapyr

Imazapyr is an effective selective herbicide used in the control of various vegetative plants that works through inhibiting synthase of an enzyme essential to plant growth. Therefore, effects to nontarget vegetation are to be expected. It is more toxic to dicots than to monocots, and especially so when applied post-emergence. Runoff to terrestrial plants and contaminated irrigation water present elevated HQ levels for sensitive and tolerant plants, indicating adverse effects are likely. Drift to terrestrial plants from backpack directed foliar treatment, at direct spray and drift distances up to 900 feet, present high HQ's, indicating adverse effects are also likely.

For mammals and birds, no exposure scenarios exceed HQ's. Aside from terrestrial and aquatic macrophytes, exposure to imazapyr is generally not associated with hazards. The toxicity studies used for assessing the hazards of humans are applicable to risk assessment for mammals. The mechanism through which Imazapyr is toxic to vegetation is well understood, but the mechanism for toxicity to mammals is not well understood. Imazapyr has not been shown to be lethal to mammals or humans.

Macrophytes, in non/accidental acute and chronic exposures, incur some hazardous effects, with HQ values ranging from 1.1-2,776 at the upper level. Insects and honeybees are not shown to exhibit negative effects from exposure to imazapyr.

Indaziflam

Based on acute studies, U.S. EPA classified indaziflam as “practically non-toxic” to mammals, birds, honeybees, and earthworms. However, subacute effects were observed in earthworms and chronic effects were observed in mammals and birds. In aquatic organisms, indaziflam is categorized as “highly toxic” to freshwater and estuarine/marine fish, “moderately toxic to highly toxic” to estuarine invertebrates, and “slightly toxic to moderately toxic” to freshwater invertebrates on an acute exposure basis. The U.S. EPA does not have a classification scheme for effects on plants. Both monocots and dicots in general appear more sensitive to exposures in seedling emergence testing than those from vegetative vigor testing for both formulations. This is consistent with indaziflam’s mode of action as a pre-emergent herbicide.

Exposure scenarios for mammals and birds are a concern (HQ>1) regarding consumption of contaminated vegetation. For small mammals, this includes chronic exposure to contaminated broadleaf foliage (HQ=8), contaminated tall grass (HQ=7), and contaminated short grass (HQ=15). Chronic exposure concerns for large mammals include contaminated short grass (HQ = 3). For small birds, chronic exposure scenarios of concern include exposure to contaminated broadleaf foliage (HQ=6), contaminated tall grass (HQ=5), and contaminated short grass (HQ= 1). For large birds, chronic exposure to contaminated short grass (HQ= 1.2) is a risk.

Indaziflam can be harmful to aquatic plants and animals. Accidental acute exposure for sensitive fish (HQ=4), sensitive invertebrates (HQ=4), tolerant macrophytes (HQ=85845), and sensitive algae (HQ=327) produces hazard quotients of concern. Non-accidental acute exposure of tolerant macrophyte produces a HQ of 657, and non-accidental acute exposure of sensitive algae produces a HQ of 2. Chronic exposure of tolerant macrophyte produces a HQ of 12. Within the North Fork Forest Recovery Project area, design features will help mitigate indaziflam getting into waterways. For example, all streamside wet areas will be buffered-- leaving an untreated strip of land alongside surface waters, wetlands, and riparian areas.

Since indaziflam is an effective herbicide, damage to terrestrial vegetation is to be expected in the event of direct spray, substantial drift, substantial runoff from the application site, and contamination of irrigation water. The application of any effective herbicide is likely to alter vegetation, the secondary effects of which may include changes to food availability and quality of habitat for both terrestrial and aquatic organisms. These secondary effects are likely to vary over time and vary among different species.

Triclopyr acid

Exposure scenarios for mammals and birds are a concern (HQ>1) regarding consumption of contaminated vegetation. For small mammals this includes acute exposure to contaminated short grass (HQ=1.6). Chronic exposure to contaminated fruit (HQ=1.8), contaminated broadleaf foliage (HQ=4), contaminated tall grass (HQ=3), and contaminated short grass (HQ=7) are also a concern for small mammals.

For large mammals, non-accidental acute exposure concerns include contaminated broadleaf foliage (HQ = 6), contaminated tall grass (HQ = 5), and contaminated short grass (HQ = 11). Chronic exposure concerns for large mammals include to contaminated fruit (HQ= 13), contaminated broadleaf foliage (HQ = 3 to 4) depending on the size of the mammal, contaminated tall grass (HQ = 3- 24 depending on animal weight), and contaminated short grass (HQ = 11).

For small birds, non-accidental acute exposure concerns include contaminated fruit (HQ=1), contaminated broadleaf foliage (HQ = 8), contaminated tall grass (HQ = 6), and contaminated short grass (HQ = 14). Chronic exposure scenarios of concern include exposure to contaminated fruit (HQ= 11), contaminated broadleaf foliage (HQ=30), contaminated tall grass (HQ=25), and contaminated short grass (HQ= 54).

For large birds, exposure scenarios of concern include acute exposures to short grass (HQ= 2) and contaminated fruit (HQ=1.3), and chronic exposure to contaminated broadleaf foliage (HQ=3), contaminated tall grass (HQ=3), and contaminated short grass (HQ= 6). Exposure to contaminated insects for small birds produces an HQ of 1.8.

The lack of detailed field studies involving longer-term observations in populations of large mammals following applications of triclopyr adds substantial uncertainty to the risk characterization for mammalian wildlife.

Neither terrestrial nor aquatic applications of triclopyr pose substantial risks (HQ all less than 1) to aquatic animals. However, triclopyr is harmful to aquatic plants, including macrophytes and algae. Accidental exposure to triclopyr in sensitive macrophytes (HQ=36,336), tolerant macrophytes (HQ=3), sensitive algae (HQ=79), and tolerant algae (HQ=5) are above the level of concern. Non-accidental acute exposure of sensitive macrophyte produces a HQ of 480, and chronic exposure to sensitive macrophyte produces a HQ of 120.

Since triclopyr is an effective herbicide, damage to terrestrial vegetation is to be expected in the event of direct spray, substantial drift, and substantial runoff from the application site. The application of any effective herbicide is likely to alter vegetation, the secondary effects of which may include changes to food availability and quality of habitat for both terrestrial and aquatic organisms. These secondary effects are likely to vary over time and vary among different species.

Tank Mixtures

The tank mixes proposed for use have varying degrees of concerning HQs. The largest overall risk category for tank mix use is toxicity in aquatic species in acute scenarios. Due to project design features, the probability of these risk scenarios occurring is very low. Herbicide will not be applied within the RCA buffer (50 ft), and in the event of an invasive species infestation in other riparian areas, such as a wet meadow, aquatic safe formulations of the appropriate herbicide will be used on a case-by-case basis.

Most scenarios for mammals and birds involving consumption of contaminated vegetation (both acute and chronic), are associated with higher hazards quotients. These values range from 2-53, with the latter value associated with consumption of contaminated short grass by a large mammal at a chronic/long term level. The tank mix associated with the most mammal toxicity scenarios exceeding a hazard quotient above 1, is the mix of glyphosate and triclopyr. There are few invasive species that are targeted with this mix, and the foreseeable application of this mix is expected to be low.

As expected with herbicides, the toxicity to varying types of vegetation exceeds hazard quotients. While little effects are observed in honeybees, insects are susceptible to toxicity from tank mixes by the mechanism of consumption of contaminated food items.

References

Culver, B. D., Shen, P. T., Taylor, T. H., Lee-Feldstein, A., Anton-Culver, H., & Strong, P. L. 1994. The relationship of blood- and urine-boron to boron exposure in borax-workers and usefulness of urine-boron as an exposure marker. Environmental Health Perspectives, 102(suppl 7), 133–137. https://doi.org/10.1289/ehp.94102s7133

NRC (National Research Council). 1983. *Risk assessment in the Federal government: managing the process*. Washington, DC: National Academy Press; 176 p. + app.

SERA (Syracuse Environmental Research Associates, Inc.). 2004. *Clopyralid Human Health and Ecological Risk Assessment*. Final report. SERA TR-04-43-17-03c.

SERA (Syracuse Environmental Research Associates, Inc.). 2007. *Aminopyralid Human Health and Ecological Risk Assessment*. Final report. SERA TR-052-04-04a.

SERA (Syracuse Environmental Research Associates, Inc.). 2011a. Glyphosate Human Health and Ecological Risk Assessment. Final report. SERA TR-052-22-03b.

SERA (Syracuse Environmental Research Associates, Inc.). 2011b. Imazapyr Human Health and Ecological Risk Assessment. Final report. SERA TR-052-29-03a.

SERA (Syracuse Environmental Research Associates, Inc.). 2014. *Preparation of Environmental Documentation and Risk Assessments for the USDA/Forest Service*. SERA MD-2014-02b.

SERA (Syracuse Environmental Research Associates, Inc.). 2016a. *Chlorsulfuron Human Health and Ecological Risk Assessment.* Final report. SERA TR-056-17-04b.

SERA (Syracuse Environmental Research Associates, Inc.). 2016b. *Sporax and Cellu-Treat (Selected Borate Salts) Human Health and Ecological Risk Assessment.* Final report. SERA TR-056-15-03c.

SERA (Syracuse Environmental Research Associates, Inc.). 2016c. Triclopyr Human Health and Ecological Risk Assessment. Corrected final report. SERA TR-052-25-03c.

SERA (Syracuse Environmental Research Associates, Inc.). 2016d. WorkSheetMaker Version 6.02 User Guide. Syracuse Environmental Research Associates, Inc. SERA MD-2016-WSM-6.02-01a.

USDA Forest Service. 2013. *Forest Service Manual (FSM) 2100 – Environmental Management,* Chapter 2150 – Pesticide Use Management and Coordination.

USDA Forest Service. 2016. *Forest Service Handbook (FSH) 2109.14 - Pesticide-Use Management and Coordination Handbook*, Chapter 20 – Risk Assessment.

USDA Forest Service. 2020. Human Health and Ecological Risk Assessment (HHERA) for Indaziflam. Final report.

US EPA/OPP/HED. (U.S. Environmental Protection Agency/Office of Programs/Health Effects Division). 2015. Boric Acid/Sodium Salts of Boric Acid. Occupational and Residential Exposure and Risk Assessment for Registration Review. P.9. EPA-HQ-OPP-2009-0306-0025.

US EPA (Environmental Protection Agency). 2020. *Aminopyralid Human Health Risk Assessment*. Draft Report. DP No. D457137.

US EPA (Environmental Protection Agency). 2023. *Reduced Risk and Organophosphate Alternative Decisions for Conventional Pesticides.* Pesticide Registration.

Appendix H-1. Toxicity to Humans (any numbers in bold and highlighted in pink indicates that those hazard quotients are above the level of concern)

Humans		**Aminopyralid**	**Borate Salts**	**Chlorsulfuron**	**Clopyralid**	**Glyphosate**	**Imazapyr**	**Indaziflam**	**Triclopyr acid**
		(.078 lb AE/acre)	(.5 lb AI/Acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Receptor**	**Hazard Quotient**							
Accidental/Incidental Exposures									
Contaminated Gloves, 1 min.	Worker	4E-06	2E-07	4E-06	4E-05	3E-05	1E-04	3E-03	3E-04
Contaminated Gloves, 1 hour	Worker	2E-04	1E-05	2E-04	2E-03	2E-03	6E-03	2E-01	2E-02
Spill on Hands, 1 hour	Worker	2E-03	6E-05	3E-04	8E-03	2E-03	1E-03	3E-03	6E-03
Spill on lower legs, 1 hour	Worker	4E-03	1E-04	6E-04	2E-02	6E-03	3E-03	6E-03	1E-02
General Exposures									
	Worker	1E-02	2E-03	8E-03	2E-01	8E-02	1E-02	**1.09**	**2**
Accidental Acute Exposures	**dose in mg/kg/event**								
Direct Spray of Child, whole body	Child	4E-02	2E-03	9E-03	3E-01	9E-02	0.1	1E-01	0.2
Direct Spray of Woman, feet and lower legs	Adult Female	4E-03	2E-04	1E-03	3E-02	9E-03	5E-03	1E-02	0.5
Water consumption (spill)	Child	4E-01	2E-02	3E-01	**2**	**2**	0.4	5E-01	**2**
Fish consumption (spill)	Adult Male	8E-03	3E-04	5E-03	5E-02	2E-02	4E-03	2E-01	2E-03
Fish consumption (spill)	Subsistence Populations	4E-02	1E-03	2E-02	2E-01	8E-02	2E-02	8E-01	1E-02
Non-Accidental Acute Exposures	**dose in mg/kg/event**								
Vegetation Contact, shorts and T-shirt	Adult Female	4E-04	No data	1E-04	3E-03	3E-03	1E-03	2E-03	0.1
Contaminated Fruit	Adult Female	1E-02	No data	1E-02	9E-02	2E-01	3E-02	3E-02	**4**
Contaminated Vegetation	Adult Female	1E-01	No data	0.1	6E-01	**1.4**	0.2	2E-01	**27**
Swimming, one hour	Adult Female	5E-08	1E-09	9E-08	6E-08	1E-07	1E-06	2E-05	7E-05
Water consumption	Child	5E-03	1E-03	6E-03	4E-03	9E-03	5E-03	3E-03	3E-02
Fish consumption	Adult Male	1E-04	3E-05	1E-04	7E-05	7E-05	5E-05	1E-03	3E-05
Fish consumption	Subsistence Populations	5E-04	1E-04	5E-04	4E-04	3E-04	3E-04	6E-03	2E-04
Chronic/Longer Term Exposures	**dose in mg/kg/day**								
Contaminated Fruit	Adult Female	7E-03	No data	0.1	2E-01	3E-02	2E-02	4E-01	**3**
Contaminated Vegetation	Adult Female	5E-02	No data	0.6	**1.7**	0.2	0.1	**3**	**6**
Water consumption	Adult Male	1E-03	9E-03	1E-02	1E-03	2E-04	7E-04	3E-04	4E-02
Fish consumption	Adult Male	6E-06	4E-05	9E-05	4E-06	3E-07	2E-06	4E-05	1E-05
Fish consumption	Subsistence Populations	5E-05	3E-04	7E-04	4E-05	3E-06	1E-05	4E-04	8E-05

Appendix H-2. Toxicity to Mammals (any numbers in bold and highlighted in pink indicates that those hazard quotients are above the level of concern)

Mammals		**Aminopyralid**	**Chlorsulfuron**	**Clopyralid**	**Glyphosate**	**Imazapyr**	**Indaziflam**	**Triclopyr acid**
		(.078 lb AE/acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Receptor**	**Hazard Quotient**						
Accidental Acute Exposures								
Direct Spray, first-order absorption	Small mammal (20g)	1E-03	4E-04	8E-03	7E-03	1E-03	6E-03	3E-03
Direct Spray, 100% absorption	Small mammal (20g)	4E-02	4E-02	2E-01	6E-01	3E-02	9E-02	1E-01
Contaminated Water, Spill	Small mammal (20g)	5E-03	3E-03	3E-02	3E-02	2E-03	5E-03	6E-03
	Larger mammal (400g)	4E-03	2E-03	2E-02	2E-02	1E-03	4E-03	2E-02
	Canid (5g)	3E-03	2E-03	2E-02	2E-02	3E-03	3E-03	8E-02
	Large mammal (70 kg)	2E-03	1E-03	1E-02	1E-02	7E-04	2E-03	1E-01
Consumption of contaminated fish, spill	Large mammalian carnivore (70 kg)	6E-03	4E-03	4E-02	2E-02	9E-04	3E-01	3E-01
	Canid (5g)	8E-03	5E-03	5E-02	3E-02	4E-03	4E-01	2E-01
Non-Accidental Acute Exposures	**(dose in mg/kg/event)**							
Contaminated Fruit [Lowest Residue Rates]	Small mammal (20g)	4E-02	4E-02	3E-01	7E-01	4E-02	1E-01	0.1
	Larger Mammal (400g)	1E-02	1E-02	6E-02	2E-01	8E-03	2E-02	0.1
	Large Mammal (70 kg)	6E-03	6E-03	4E-02	9E-02	5E-03	1E-02	0.9
Contaminated Broadleaf Foliage	Small mammal (20g)	3E-01	3E-01	**1.8**	**4**	2E-01	7E-01	0.9
	Larger Mammal (400g)	7E-02	7E-02	4E-01	**1**	5E-02	2E-01	0.9
	Large Mammal (70 kg)	4E-02	4E-02	2E-01	0.6	3E-02	9E-02	**6**
Contaminated Tall Grass	Small mammal (20g)	2E-01	2E-01	**1.5**	**4**	2E-01	6E-01	0.7
	Larger Mammal (400g)	5E-02	5E-02	3E-01	0.8	4E-02	1E-01	0.7
	Large Mammal (70 kg)	3E-02	3E-02	2E-01	0.5	3E-02	7E-02	**5**
Contaminated Short Grass [Highest Residue Rate]	Small mammal (20g)	5E-01	5E-01	**3**	**8**	4E-01	**1.3**	**1.6**
	Larger Mammal (400g)	1E-01	1E-01	7E-01	**1.8**	1E-01	0.3	**1.6**
	Large Mammal (70 kg)	7E-02	7E-02	4E-01	**1**	5E-02	0.2	**11**
Contaminated Water	Small mammal (20g)	7E-05	7E-05	5E-05	1E-04	2E-05	4E-05	8E-05
	Larger Mammal (400g)	5E-05	5E-05	4E-05	1E-04	2E-05	3E-05	3E-04
	Canid (5 kg)	4E-05	4E-05	3E-05	8E-05	4E-05	2E-05	1E-03
	Large Mammal (70 kg)	3E-05	3E-05	2E-05	6E-05	1E-05	2E-05	2E-03
Contaminated Insects	Small mammal (20g)	7E-02	7E-02	5E-01	**1.1**	6E-02	2E-01	2E-01
	Larger Mammal (400g)	2E-02	2E-02	1E-01	3E-01	1E-02	4E-02	2E-01

Consumption of small mammal (after direct spray) by predator	Canid (5 kg)	3E-03	3E-03	2E-02	5E-02	8E-03	8E-03	2E-01
Consumption of contaminated Fish	Large Mammalian Carnivore (70 kg)	8E-05	8E-05	5E-05	8E-05	1E-05	2E-03	4E-03
	Canid (5 kg)	1E-04	1E-04	8E-05	1E-04	6E-05	3E-03	2E-03
Chronic/Longer Term Exposures								
Contaminated Fruit [Lowest Residue Rates]	Small mammal (20g)	2E-02	3E-01	7E-01	1E-01	2E-02	**1.2**	**1.8**
	Larger Mammal (400g)	5E-03	6E-02	2E-01	2E-02	4E-03	0.3	**1.8**
	Large Mammal (70 kg)	3E-03	4E-02	9E-02	1E-02	2E-03	0.2	**13**
Contaminated Broadleaf Foliage	Small mammal (20g)	0.2	**1.8**	5E+00	7E-01	1E-01	**8**	**4**
	Larger Mammal (400g)	4E-02	4E-01	**1.1**	2E-01	3E-02	**1.9**	**4**
	Large Mammal (70 kg)	2E-02	2E-01	**0.6**	9E-02	1E-02	**1.1**	**30**
Contaminated Tall Grass	Small mammal (20g)	0.1	**1.5**	**4**	6E-01	9E-02	**7**	**3**
	Larger Mammal (400g)	3E-02	3E-01	0.9	1E-01	2E-02	**1.5**	**3**
	Large Mammal (70 kg)	2E-02	2E-01	0.5	8E-02	1E-02	0.9	**24**
Contaminated Short Grass [Highest Residue Rate]	small mammal (20g)	0.3	**3**	**8**	**1.3**	2E-01	**15**	**7**
	Larger Mammal (400g)	6E-02	7E-01	**1.9**	3E-01	5E-02	**3**	**7**
	Large Mammal (70 kg)	4E-02	4E-01	**1.1**	2E-01	3E-02	**1.9**	**53**
Contaminated Water	Small mammal (20g)	6E-05	6E-04	4E-05	1E-05	1E-05	2E-05	4E-04
	Larger Mammal (400g)	4E-05	5E-04	3E-05	7E-06	8E-06	1E-05	1E-03
	Canid (5 kg)	3E-05	4E-04	3E-05	6E-06	2E-05	1E-05	5E-03
	Large Mammal (70 kg)	3E-05	3E-04	2E-05	4E-06	5E-06	7E-06	1E-02
Consumption of contaminated Fish	Large Mammalian	7E-05	7E-04	5E-05	6E-06	6E-06	9E-04	2E-02
	Canid (5 kg)	1E-04	1E-03	7E-05	8E-06	3E-05	1E-03	1E-02

Appendix H-3. Toxicity to Birds (any numbers in bold and highlighted in pink indicates that those hazard quotients are above the level of concern)

Birds		**Aminopyralid**	**Chlorsulfuron**	**Clopyralid**	**Glyphosate**	**Imazapyr**	**Indaziflam**	**Triclopyr acid**
		(.078 lb AE/acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Receptor**	**Hazard Quotient**						
Accidental Acute Exposures								
Contaminated Water, Spill	Small bird (10g)	7E-02	1E-03	6E-03	2E-02	9E-04	2E-04	4E-02
Contaminated Water, Spill	large bird (4kg)	9E-03	2E-04	9E-04	3E-03	1E-04	3E-05	5E-03
Consumption of contaminated fish, spill	fish eating bird (2.4 kg)	7E-02	2E-03	7E-03	1E-02	5E-04	1E-02	3E-02
Non-Accidental Acute Exposures	**(dose in mg/kg/event)**							
Contaminated Fruit (Low Residue Rates)	Small bird (10g)	0.7	2E-02	7E-02	5E-01	2E-02	6E-03	**1**
	Large Bird (4 kg)	8E-02	3E-03	8E-03	5E-02	3E-03	7E-04	0.1
Contaminated Broadleaf Foliage	Small bird (10g)	**5**	2E-01	5E-01	**4**	2E-01	4E-02	**8**
	Large Bird (4 kg)	6E-01	2E-02	6E-02	0.4	2E-02	5E-03	0.9
Contaminated Tall Grass	Small bird (10g)	**4**	1E-01	0.4	**3**	0.1	4E-02	**6**
	Large Bird (4 kg)	0.5	2E-02	5E-02	0.3	2E-02	4E-03	0.7
Contaminated Short Grass (High Residue Rate)	Small bird (10g)	**10**	3E-01	9E-01	**6**	3E-01	8E-02	**14**
	Large Bird (4 kg)	1.1	4E-02	1E-01	0.7	3E-02	9E-03	**1.5**
Contaminated Water	Small bird (10g)	9E-04	3E-05	1E-05	8E-05	1E-05	2E-06	5E-04
	Large Bird (4 kg)	1E-04	5E-06	1E-06	1E-05	2E-06	2E-07	7E-05
Contaminated Insects	Small bird (10g)	1.2	4E-02	1E-01	8E-01	4E-02	1E-02	**1.8**
Consumption of small mammal (post spray)	Carnivorous bird (640)	3E-02	1E-03	3E-03	2E-02	1E-03	2E-04	4E-02
Consumption of contaminated Fish	Fish-eating bird (2.4 kg)	9E-04	3E-05	1E-05	4E-05	7E-06	8E-05	4E-04
Chronic/Longer Term Exposure								
Contaminated Fruit (Low Residue Rate)	Small bird (10g)	1E-02	1E-01	**1.6**	0.9	5E-02	0.8	**11**
	Large Bird (4 kg)	2E-03	1E-02	0.2	0.1	5E-03	9.00E-02	**1.3**
Contaminated Broadleaf Foliage	Small bird (10g)	1E-01	9E+00	**12**	**7**	3E-01	**6**	**30**
	Large Bird (4 kg)	1E-02	1E+00	**1.3**	0.8	4E-02	0.7	**3**
Contaminated Tall Grass	Small bird (10g)	8E-02	8E+00	**10**	**6**	3E-01	**5**	**25**
	Large Bird (4 kg)	1E-02	9E-02	**1.1**	0.7	3E-02	0.6	**3**

Contaminated Vegetation (Short Grass, High Rate)	Small bird (10g)	2E-01	**1.6**	**21**	**13**	6E-01	**11**	**54**
	Large Bird (4 kg)	2E-02	2E-01	**2**	**1.4**	7E-02	**1.2**	**6**
Contaminated Water	Small bird (10g)	3E-05	2E-04	8E-05	7E-05	2E-05	9E-06	2E-03
	Large Bird (4 kg)	4E-06	3E-05	1E-05	1E-05	3E-06	1E-06	3E-04
Consumption of contaminated Fish	Fish eating bird (2.4kg)	3E-05	2E-04	8E-05	4E-05	1E-05	4E-04	2E-03

Appendix H-4. Toxicity to Aquatic Species (any numbers in bold and highlighted in pink indicates that those hazard quotients are above the level of concern)

Aquatic Species		**Aminopyralid** (.078 lb AE/acre)	**Borate Salts** (.5 lb AI/Acre)	**Chlorsulfuron** (.056 lb AE/Acre)	**Clopyralid** (.35 lb AE/Acre)	**Glyphosate** (2lb AE/Acre)	**Imazapyr** (.45lb AE/Acre)	**Indaziflam** (.091 lb AE/Acre)	**Triclopyr acid** (1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Receptor**	**Hazard Quotient**							
Accidental Acute Exposures									
Fish	Sensitive	7E-02	1E-01	5E-02	2E-01	**757**	8E-01	**4**	9E-01
	Tolerant	4E-02	2E-03	6E-03	1E-02	**73**	No toxicity data	**1.6**	9E-02
Amphibian	Sensitive	No toxicity data	1E-01	No toxicity data	No toxicity data	**908**	No toxicity data	No toxicity data	1E-01
	Tolerant	4E-02	2E-02	No toxicity data	No toxicity data	**14**	No toxicity data	No toxicity data	1E-01
Invertebrate	Sensitive	4E-02	7E-01	8E-02	No toxicity data	**484**	No toxicity data	**4**	7E-01
	Tolerant	4E-02	5E-02	8E-03	7E-01	**16**	0.2	0.3	6E-02
Macrophyte	Sensitive	No toxicity data	1E-01	**6,939**	No toxicity data	**443**	**2,776**	No toxicity data	**36,336**
	Tolerant	8E-02	4E-02	**33**	**159**	0.2	**83**	**85,845**	**3**
Algae	Sensitive	6E-01	3E-01	**177**	**2**	**443**	**1.1**	**327**	**79**
	Tolerant	2E-01	1E-02	2E-01	4E-02	**10**	0.2	0.3	**5**
Non-Accidental Acute Exposures									
Fish	Sensitive	9E-04	1E-02	1E-03	2E-04	**3**	1E-02	3E-02	1E-02
	Tolerant	5E-04	2E-04	1E-04	1E-05	3E-01	No toxicity data	1E-02	1E-03
Amphibian	Sensitive	No toxicity data	9E-03	No toxicity data	No toxicity data	**4**	No toxicity data	No toxicity data	2E-03
	Tolerant	5E-04	2E-03	No toxicity data	No toxicity data	6E-02	No toxicity data	No toxicity data	2E-03
Invertebrate	Sensitive	5E-04	6E-02	2E-03	No toxicity	**2**	No toxicity data	3E-02	1E-02

					data				
	Tolerant	5E-04	5E-03	2E-04	1E-03	7E-02	3E-03	3E-03	8E-04
Macrophyte	Sensitive	No toxicity data	1E-02	**154**	No toxicity data	**2**	**39**	No toxicity data	**480**
	Tolerant	1E-03	4E-03	7E-01	2E-01	1E-03	**12**	**657**	4E-02
Algae	Sensitive	8E-03	3E-02	**4**	4E-03	**2**	2E-02	**2**	**1**
	Tolerant	2E-03	1E-03	4E-03	5E-05	4E-02	2E-03	2E-03	6E-02
Chronic/Longer Term Exposure									
Fish	Sensitive	No toxicity data	2E-02	7E-04	5E-04	2E-01	1E-02	5E-04	8E-03
	Tolerant	1E-02	3E-03	No toxicity data	2E-04	2E-02	5E-03	2E-04	8E-04
Amphibian	Sensitive	No toxicity data	1E-02	No toxicity data	No toxicity data	3E-01	No toxicity data	No toxicity data	No toxicity data
	Tolerant	No toxicity data	1E-03	No toxicity data	No toxicity data	4E-03	No toxicity data	No toxicity data	No toxicity data
Invertebrate	Sensitive	No toxicity data	3E-02	1E-03	No toxicity data	2E-01	No toxicity data	7E-03	2E-03
	Tolerant	2E-04	2E-03	No toxicity data	2E-04	5E-03	5E-03	7E-04	2E-03
Macrophyte	Sensitive	No toxicity data	6E-03	**89**	No toxicity data	1E-01	**18**	No toxicity data	**120**
	Tolerant	5E-04	2E-03	4E-01	5E-02	7E-05	0.5	**12**	1E-02
Algae	Sensitive	3E-03	2E-02	**2**	7E-04	1E-01	7E-03	4E-02	3E-01
	Tolerant	9E-04	5E-04	2E-03	1E-05	3E-03	1E-03	4E-05	2E-02

Appendix H-5. Toxicity to Terrestrial Plants (any numbers in bold and highlighted in pink indicates that those hazard quotients are above the level of concern)

Terrestrial Plants	Aminopyralid	Chlorsulfuron	Clopyralid	Glyphosate	Imazapyr	Indaziflam	Triclopyr acid
	(.078 lb AE/acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Hazard Quotient**						
Sensitive Species: Annual Rainfall Runoff (Clay)							
5	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
10	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
15	**1.9**	N/A	0.6	N/A	N/A	N/A	N/A
20	**3**	N/A	**1.1**	N/A	N/A	N/A	N/A
25		N/A	**1.5**	N/A	N/A	N/A	N/A
50	**4**	N/A	**3**	N/A	N/A	N/A	N/A
100	**5**	N/A	**5**	N/A	N/A	N/A	N/A
150	**6**	N/A	**6**	N/A	N/A	N/A	N/A
200	**7**	N/A	**7**	N/A	N/A	N/A	N/A
250	**8**	N/A	**8**	N/A	N/A	N/A	N/A
Sensitive Species: Annual Rainfall Runoff (Loam)							
5	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
10	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
15	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
20	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
25	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
50	8E-04	N/A	6E-04	N/A	N/A	N/A	N/A
100	1E-03	N/A	8E-03	N/A	N/A	N/A	N/A
150	2E-04	N/A	4E-03	N/A	N/A	N/A	N/A
200	3E-05	N/A	2E-03	N/A	N/A	N/A	N/A
250	8E-06	N/A	1E-03	N/A	N/A	N/A	N/A
Sensitive Species: Annual Rainfall Runoff (Sand)							
5-250	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
Runoff to Terrestrial Plants (Acute)							
Terrestrial vegetation (Sensitive)	N/A	**412**	N/A	5E-02	**601**	**587**	**4**
Terrestrial vegetation (Tolerant)	N/A	**17**	N/A	4E-02	**7**	**249**	5E-02
Tolerant Species: Annual Rainfall Runoff (Clay)							
5	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
10	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
15	8E-03	N/A	3E-02	N/A	N/A	N/A	N/A
20	1E-02	N/A	5E-02	N/A	N/A	N/A	N/A

25	1E-02	N/A	7E-02	N/A	N/A	N/A	N/A
50	2E-02	N/A	2E-01	N/A	N/A	N/A	N/A
100	2E-02	N/A	3E-01	N/A	N/A	N/A	N/A
150	3E-02	N/A	0.3	N/A	N/A	N/A	N/A
200	3E-02	N/A	0.4	N/A	N/A	N/A	N/A
250	4E-02	N/A	0.4	N/A	N/A	N/A	N/A
Tolerant Species: Annual Rainfall Runoff (Loam)							
5	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
10	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
15	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
20	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
25	0E00	N/A	0E+00	N/A	N/A	N/A	N/A
50	4E-06	N/A	3E-05	N/A	N/A	N/A	N/A
100	7E-06	N/A	4E-04	N/A	N/A	N/A	N/A
150	8E-07	N/A	2E-04	N/A	N/A	N/A	N/A
200	1E-07	N/A	9E-05	N/A	N/A	N/A	N/A
250	3E-08	N/A	5E-05	N/A	N/A	N/A	N/A
Tolerant Species: Annual Rainfall Runoff (Sand)							
5-250	0E00	N/A	0E+00	N/A	N/A	N/A	N/A

Terrestrial Plants		**Aminopyralid**	**Chlorsulfuron**	**Clopyralid**	**Glyphosate**	**Imazapyr**	**Indaziflam**	**Triclopyr acid**
		(.078 lb AE/acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Exposure Scenario (Upper Limit)	**Receptor Type**	**Hazard Quotient**						
Drift to Terrestrial Plants, after Backpack Directed Foliar Treatment	Terrestrial Veg, Acute							
Proportion of Drift at distances downwind (ft)	Sensitive Species							
0		**390**	**70,000**	**700**	**1,538**	**7,031**	**243**	**357**
25		**3**	**582**	**6**	**13**	**59**	**2**	**3**
50		1.7	**303**	**3**	**7**	**30**	**1.1**	**1.5**
100		0.9	**169**	**1.7**	**4**	**17**	0.6	0.9
300		0.4	**66**	0.7	**1.4**	**7**	0.2	0.3
500		0.2	**41**	0.4	0.9	**4**	0.1	0.2

900		0.1	**22**	0.2	0.5	**2**	8E-02	0.1
Proportion of Drift at distances downwind (ft)	Tolerant Species							
0		7E-01	**50**	0.7	**4**	**1.1**	**40**	0.5
25		6E-03	4E-01	6E-03	4E-02	9E-03	3E-01	4E-03
50		3E-03	0.2	3E-.3	2E-02	5E-03	2E-01	2E-03
100		2E-03	1E-01	2E-03	1E-02	3E-03	1E-01	1E-03
300		7E-04	5E-02	7E-04	4E-03	1E-03	4E-02	5E-04
500		4E-04	0.0	4E-04	3E-03	7E-04	2E-02	3E-04
900		2E-04	2E-02	2E-04	1E-03	4E-04	1E-02	2E-04
Contaminated Irrigation Water	Terrestrial Veg							
	Sensitive Species	**106**	**20,934**	**22**	**58**	**828**	**15**	**39**
	Tolerant Species	2E-01	**15**	2E-02	0.2	1E-01	**3**	5E-02
Acute exposure by Wind Erosion		Terrestrial Veg						
	Sensitive Species	5E-02	**10**	1E-01	2E-01	1E+00	3E-02	5E-02
	Tolerant Species	1E-04	7E-03	1E-04	6E-04	2E-04	5E-03	7E-05

Appendix H-6. Toxicity to Insects and Honeybees

Herbivorous or Predatory Insects		**Aminopyralid**	**Chlorsulfuron**	**Clopyralid**	**Glyphosate**	**Imazapyr**	**Indaziflam**	**Triclopyr acid**
		(.078 lb AE/acre)	(.056 lb AE/Acre)	(.35 lb AE/Acre)	(2lb AE/Acre)	(.45lb AE/Acre)	(.091 lb AE/Acre)	(1lb AE/Acre)
Acute Exposure	Receptor							
Food Item: Fruit/Large Insects	Insect	No toxicity data	No toxicity data	No toxicity data	0.2	2E-02	3E-03	5E-02
Food Item: Broadleaf shrubs	Insect	No toxicity data	No toxicity data	No toxicity data	**1.4**	2E-01	3E-02	5E-01
Food Item: Short Grass	Insect	No toxicity data	No toxicity data	No toxicity data	**2**	3E-01	5E-02	9E-01
Food Item: Long Grass	Insect	No toxicity data	No toxicity data	No toxicity data	**1.1**	1E-01	2E-02	4E-01

Appendix H-7. Toxicity to Honeybees

Toxicity to Honeybees	
Borate Salts (.5 lb a.i./acre)	No Toxicity Data
Aminopyralid (Milestone VM) 0.078 lbs AE/acre	No Toxicity Data
Clopyralid (Transline) .35 lb AE/Acre	No Toxicity Data

Imazapyr (Chopper), .45lb AE/Acre			
	Foliar Interception		
Distance Downwind	None	50%	90%
Direct Spray	4E-02	2E-02	4E-03
25	3E-04	1E-04	3E-05
50	2E-04	8E-05	2E-05
100	9E-05	4E-05	9E-06
300	3E-05	2E-05	3E-06
500	2E-05	1E-05	2E-06
900	1E-05	6E-06	1E-06

Glyphosate (Roundup Original), 2lb AE/Acre			
	Foliar Interception		
Distance Downwind	None	50%	90%
Direct Spray	5E-01	3E-01	5E-02
25	4E-03	2E-03	4E-04
50	2E-03	1E-03	2E-04
100	1E-03	6E-04	1E-04
300	5E-04	2E-04	5E-04
500	3E-04	2E-04	3E-05
900	2E-04	8E-05	2E-05

Indaziflam (Esplanade 200SC) .091 lb AE/acre			
	Foliar Interception		
Distance Downwind	None	50%	90%
Direct Spray	7E-03	4E-03	7E-04
25	6E-05	3E-05	6E-06
50	3E-05	2E-05	3E-06
100	2E-05	9E-06	2E-06
300	7E-06	3E-06	7E-07
500	4E-06	2E-06	4E-07
900	2E-06	1E-06	2E-07

Chlorsulfuron (Telar XP), 0.056 lbs AE/Acre			
	Foliar Interception		
Distance Downwind	None	50%	90%
Direct Spray	2E-02	9E-03	2E-03
25	1E-04	7E-05	1E-05
50	8E-05	4E-05	8E-06
100	4E-05	2E-05	4E-06
300	2E-05	8E-06	2E-06
500	1E-05	5E-06	1E-06
900	6E-06	3E-06	6E-07

Triclopyr acid (Garlon 3A), 1lb AE/acre			
	Foliar Interception		
Distance Downwind	None	50%	90%
Direct Spray	1E-01	6E-02	1E-02
25	9E-04	5E-04	9E-05
50	5E-04	2E-04	5E-05
100	3E-04	1E-04	3E-05
300	1E-04	5E-05	1E-05
500	6E-05	3E-05	6E-06
900	3E-05	2E-05	3E-06

Appendix H-8. Borate Salts Toxicity

Borate Salts (.5 lb a.i./acre)		
Exposure Scenario (Upper Limit)	**Receptor**	**Hazard Quotient (Upper)**
Accidental Acute Exposures (mg/kg/event)		
Direct consumption from stump	large mammal (70 kg)	2E-02
	large bird (4 kg)	6E-02
	small mammal (20 g)	2E-02
	small bird (10 g)	6E-02
Contaminated Water		
Accidental spill	small mammal (20 g)	2E-04
Expected peak concentration		2E-05
longer-term concentration		4E-04
Accidental spill	small bird (10 g)	1E-03
Expected peak concentration		1E-04
longer-term concentration		2E-03
Consumption of contaminated fish		
Accidental spill	carnivorous mammal (4 kg)	3E-04
Expected peak concentration		3E-05
longer-term concentration		7E-04
Accidental spill	fish eating bird (2.4 g)	1E-03
Expected peak concentration		1E-04
longer-term concentration		2E-03
Direct spray		
first order absorption	small mammal (20 g)	3E-05
100% absorption	small mammal (20 g)	1E-02

Appendix I Past, Ongoing, and Reasonably Foreseeable Future Activities (PORFFA) in and near the proposed Tributaries Forest Recovery Project

Cumulative Effects General

According to NEPA and CEQ regulations, “cumulative impacts” are the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR §1508.7). Similarly, CEQA Guidelines (Section 15355(b)) defines cumulative impacts as the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects.

The CEQA Guidelines and NEPA regulations require that the cumulative impacts of a proposed action be addressed in an environmental document when the cumulative impacts are expected to be significant (40 CFR 1508.25[a][2]; 14 California Code of Regulations [CCR] 15130[a]). When a lead agency is examining a project with an incremental effect that is not “cumulatively considerable,” the lead agency need not consider that effect significant, but should briefly describe its basis for concluding that the incremental effect is not cumulatively considerable.

This analysis relies on existing environmental conditions as a proxy for the impacts of past actions because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to the cumulative effects of the proposed action and alternative.

The cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Existing conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternative. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at existing conditions, the analysis is sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the CEQ 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.”

The cumulative effects analysis in this EA/IS is also consistent with Forest Service NEPA Regulations (36 CFR §220.4(f)) (July 24, 2008), which state, in part:

> *"CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonably foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR §1508.7)."*

For these reasons, the analysis of past actions in the Tributaries Forest Recovery Project and specialists' reports is based on current environmental conditions which were most significantly affected by the 2021 Dixie/Sugar and 2019 Walker Fires within and around the Project Area.

Past Activities

- 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.
- Beckwourth Roadside Reforestation Project: Treat fuels and reforestation on 400 acres of the Beckwourth Ranger District after 2021 Dixie and Sugar Fires. Treatment areas include roadsides, Conklin area, and Frenchman Recreation Area Day Use Facilities.
- Though much of the land where these activities occurred subsequently burned (or reburned) in the Dixie (2021) and Walker (2019) fires, activities for the past 30 years in and around the Tributaries Project Area as reported in the Forest Service FACTs database include:
    - Forest thinning: Commercial and precommercial thinning, thinning for hazardous fuel reduction, encroachment control, group and single-tree selection cuts, shelterwood removal, and thinning for wildlife habitat improvements;
    - Salvage: Salvage and sanitation cuts;
    - Reforestation: Site preparation for planting and for natural regeneration, tree planting, control of understory vegetation (manual and chemical) for seedling survival, establishment, and release;
    - Fuels reduction: underburning (broadcast burn) and pile burns; chipping and mastication;
    - Range: Livestock grazing, fencing construction and removal, and allotment plans;
    - Noxious weeds: Manual, mechanical, and chemical control of noxious weeds;
    - Road and Trail Maintenance
    - Recreational Uses and Maintenance
    - Mining: Mining operations and reclamation
    - Special Uses and Recreation: Fuelwood use, Christmas Tree harvests, Posts/Poles

Present and Ongoing Activities

- Moonlight Fire Area Restoration Project: Harvest dead and/or dying conifers, construct and decommission temporary roads, and perform reforestation. Project area is northeast of Greenville and north of Taylorsville in the Lights Creek and surrounding drainages.
- 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.
- North Quincy Wildfire Resilience Project: Implement fuels reduction and forest restoration treatments on approximately 8,800 acres across the norther portion of American Valley. The intent is to protect values at risk near the community of Quincy.
- Region 5 Post-Disturbance Hazardous Tree Management Project: Hazard tree felling and removal to reduce public safety hazards along portions of roads, trails and facilities in 9 national forests.
- Beckwourth Roadside Reforestation Project: Treat fuels and reforestation on 400 acres of the Beckwourth Ranger District after 2021 Dixie and Sugar Fires. Treatment areas include roadsides, Conklin area, and Frenchman Recreation Area Day Use Facilities.
- Community Protection – Central and West Slope Project (Emergency Authority portion): Treat 69,925 acres in the LaPorte/Greater Mohawk area via mechanical thinning and/or prescribed fire to reduce the risk of catastrophic fire to communities in the area and improve forest resiliency on the landscape.
- Argentine Non-Motorized Trail Project: Construct up to 2 miles of non-motorized trail in the area surrounding the Argentine Rock Lookout.
- Livestock Grazing: seasonal livestock use of Forest Service designated grazing allotments
- Recreational Uses and Maintenance (dispersed camping, hunting, fishing, OHV use, mountain biking): Recreation use by the public is common throughout the year. Maintenance includes hazard tree removal, fire rings removed, signs installed, and sites closed to use within 100' of water sources. Installation of sign posts, new fire rings, tables, and barrier posts. Road/trail repair and heavy maintenance.
- Road and Trail Maintenance: Annual road maintenance, grading of roads and ditches, culvert cleanout, hazard tree removal. Trail work typically includes, logging out of the trail tread, brushing, constructing, reconstructing, maintaining waterbars or other erosion control devices, installing and maintaining signs. This work would be accomplished by a combination of force account crews, volunteers, and contractors from May 15 through September 30 annually.
- Special Uses: Administration of existing Special Use authorizations. Annually actions may include- maintaining access, hazard tree removal to protect improvements, authorizations for repairs/replacements, fire safety inspections and follow-up requirements for clearing limits (removal of vegetation). Permit types include, waterlines, above ground/buried power lines, road use, weather stations, recreation events (winter/summer), organizational camps and outfitter/guide operations. New proposals may be received at any time for consideration.
- Mining Operations: New proposals may be received at any time for consideration.
- Invasive Plant Treatments: Manual and chemical treatments to reduce quantities and prevent spread of invasive plant species.
- Fuelwood Use, Christmas Trees, Posts/Poles: Use is common in analysis area.

Reasonably Foreseeable Future Activities

- Beckwourth Roadside Reforestation Project: Treat fuels and reforestation on 400 acres of the Beckwourth Ranger District after 2021 Dixie and Sugar Fires. Treatment areas include roadsides, Conklin area, and Frenchman Recreation Area Day Use Facilities.
- Community Protection – Central and West Slope Project (non-Emergency Authority portion): Reduce risk of wildfire impacts to communities and critical infrastructure across 147,796 acres, within Greater American Valley and West Slope communities.
- Community Protection – Eastside Project: Reduce risk of wildfire impacts to communities and critical infrastructure, within Eastside communities with moderate-, high-, or very high-risk wildfire hazard potential.
- North Fork Forest Recovery Project: Perform fuels reduction and recovery activities from the PNF boundary with Lassen National Forest, up the North Fork Feather River Canyon, to the Southern tip of Lake Almanor, down to Indian and Genesee Valleys.
- Volcano and Hough Trails Reforestation Project: Remove fuel loading, reforestation, herbicide preparation along the Mt. Hough Trail System.
- Claremont Trails Project: Evaluate existing OHV trails on Claremont Peak and surrounding area in order to add approximately 40 miles of Forest system OHV trails to the area.

Appendix J Glossary

Silvicultural Treatments

Reforestation Methods

Site Preparation is done to improve planting conditions, encourage germination of seed or growth of seedlings, and promote survival of the planted species. The method, intensity and timing of site preparation would vary according to site conditions, species, weight of seed crop, ground cover and soils. The first step is generally the removal of existing live and dead vegetation and debris. Ground herbicide application may be applied to prevent shrubs from outcompeting seedlings prior to the initial planting, generally where 1-2 growing seasons of brush has occurred. Appropriate spray buffers will apply. No aerial spraying is proposed in this project.

Low intensity site prep would occur in high burn intensity stands that are composed of open ground and dead trees generally less than 12" diameter breast height (DBH). Dead and down trees would be treated utilizing mastication, hand cut and lop, or pile and burn, machine felling/piling/burning, prescribed burn, cultural burn, and/or prescribed grazing (*see definitions in Fuel Reduction Methods below*).

High intensity site prep would occur in high burn intensity stands composed of trees generally greater than 12" DBH. Dead trees greater than 10" DBH would be mechanically or hand felled, and mechanically piled or skidded to a landing deck for burning or biomass utilization. Dead and down trees less than 10" DBH would be treated utilizing mastication, hand cut and lop, or pile and burn, machine felling/piling/chipping or burning, prescribed burn, cultural burn, and/or prescribed grazing (*see definitions in Fuel Reduction Methods below*).

Tree Planting would occur in identified reforestation treatment areas following site preparation. Reforestation would focus on large, high-severity burn patches with high basal area mortality and low probability of natural regeneration. Site appropriate tree species would be planted, avoiding single species plantings where feasible. Burned areas with persistent live conifer stands or areas likely to recover naturally would not be targeted for reforestation.

Microsite Cluster Planting is a planting design in which three to four seedlings are planted at least 6 ft apart in a cluster (within 10-15 ft of a central point) based on the following microsite conditions: in open canopy; at edge of shrub canopy; in shade of perennial herbaceous, stump, rock, or other shade structure; and at edge of a second shrub or herbaceous species, if present. This approach is recommended for areas predicted to have high climatic water deficit and stress (*see Appendix C*).

Release and Maintenance is an intermediate treatment designed to free young trees from undesirable, usually overtopping, competing vegetation. This may include manual, mechanical, and/or herbicide treatments, including hand grubbing, chainsaw release on brush greater than two feet in height, or mastication. Additional interplanting and/or pre-commercial thinning may occur after the initial planting to reach or maintain desired stocking and/or species preference.

Herbicide use involves ground application either broadcast sprayed, or spot sprayed at a select radius around each conifer seedling or on target noxious weed species. Appropriate spray buffers will apply. No aerial spraying is proposed in this project.

Fuel Reduction Methods

Fuel reduction is the treatment of vegetation to reduce surface and ladder fuels. All mechanical thin and hand thin fuel reduction treatment methods described below would meet the standards and guidelines outlined in the 2004 SNFPA ROD, p. 50-51 and/or as amended by this project.

Chipping is the mechanical treatment of woody debris resulting from fuel reduction treatments (whole tree logging, mastication, hand thinning). Utilizing a woodchipper, woody debris is processed into relatively uniform small pieces. Chipped material could be removed or left on-site when appropriate in place of piling/burning. Chipping and spreading of materials across the treatment area would not exceed a depth of three inches. Chips would be spread away from the base of trees.

Hand Thinning and Piling involves using hand tools and mechanical hand-operated tools, such as chainsaws, to cut trees and brush to reduce stand densities. Hand thinning includes cutting down entire trees, as well as limbing and pruning. The resulting slash (coarse and fine woody debris created from the thinning) would be placed in piles for future burning (*see Pile Burning*). Crews would compress slash tightly in piles to ensure full consumption when burned. Piles would be placed outside the boundaries of sensitive resource areas including, but not limited to, historical or archeological sites, sensitive plant populations, perennial streams or drainages, roadside gutters and culverts, and any other known avoidance areas. It also allows treatment in topographic areas where equipment use is not feasible, such as steep slopes or rocky areas.

Invasive Species Management is a term used to describe actions taken to reduce the populations of or prevent the introduction or spread of non-native organism(s) that cause or are likely to cause economic or environmental harm, or harm to human, animal, or plant health. Invasive species management can include containment, suppression, and reduction of populations of invasive species, or eradication, the removal or destruction of an entire population.

Machine Piling utilizes heavy equipment to move woody debris/slash into piles. Pile construction and placement parameters are the same as hand piling described above.

Mastication is a mechanical process that changes the shape, size and distribution of fuels. Whole trees and large brush are broken down in-situ into small chunks and left on the forest floor. Mastication is effective for clearing trees along roadsides, ravines and places that could be difficult to reach with other equipment or on foot. Masticated slash may be scattered within the treatment area.

Pile Burning involves igniting piles of woody debris/slash resulting from thinning and fuel reduction actions. Pile location and size would be determined by site conditions, and account for minimizing damage to other timber or residual trees when burned, as well as risk of fire escaping. Sensitive areas and resources would be avoided. Piles would be burned during periods of low fire danger, typically in the late fall and winter months.

Prescribed Burn and **Cultural Burn** are the utilization of controlled ignitions to reduce surface and ladder fuels, as well as to open the canopy to allow light to reach the understory. Cultural burns are lower intensity-controlled fires much like prescribed burns with the major difference being that cultural fire was and is still used by Tribes as an essential part of culture, to cultivate materials and food and to enhance habitat essential to centuries-long traditions. Burn methods include broadcast, understory, or jackpot burning. Broadcast is a burning method used in areas with little to no forest canopy present, such as grasslands, shrub fields, or oak woodlands, and is also used to enhance and/or restore wildlife habitat. Understory burning is a fuel reduction treatment where ignition under the forest canopy is focused on surface and ladder fuel consumption, leaving canopy fuels (i.e. larger trees) intact. Understory burning is often used as a follow-up treatment to thinning and pile burning to further reduce surface fuels. This type of burning mimics the role of frequent fire in an active fire regime to maintain the desired landscape condition of a healthy and resilient forested stand. Post mechanical and hand thin fuel reduction treatments, understory burning would be used to promote snag development and shade-intolerant species, such as ponderosa and Jeffrey pine, while reducing less fire resilient species, such as white fir and lodgepole. Activities associated with understory burning include fire control line construction along treatment boundaries following topography favorable to controlling the burn; large-tree protection raking; reinforcement of control lines through the removal of live or dead trees and brush, limbing, bucking, and/or rearranging fuels to assist with safety and containment. Post-burn or mop up activities would include the use of hand tools to extinguish all heat to a minimum of 25 feet from the control line. Jackpot burning is similar to understory or broadcast burning, but instead of treating the entire forest floor, targets areas with high fuel concentrations (i.e. "jackpots"). Jackpot burns result in mosaic burn patterns with limited burning in adjacent low-fuel concentration areas. Jackpot burning may be an initial or follow-up treatment to other fuel reduction treatment methods.

Prescribed Grazing is the controlled removal of vegetation, with grazing or browsing animals, to maintain a stable and desired plant community and/or reduce fuel loads, while protecting water quality and watershed function, reducing accelerated soil erosion, and maintaining or improving soil conditions.

Shaded Fuelbreak is a strategically placed break in vegetation continuity created for wildfire control and fire suppression safety. Fuelbreaks would be built along select ridgelines and roadways within the project area with an average stand density of no more than 50-100 trees per acre, or overstory cover of 100 square feet of basal area per acre, averaging 40% canopy cover over the thinned unit.

Whole Tree Logging (includes Commercial Thinning) is the practice of mechanically cutting the entire above-ground portion of a tree (via cut-to-length, hotsaws, feller bunchers, yarders, or tethered logging) and removing it from the forest for fuel reduction purposes. The different parts of the tree are used for different purposes. Depending on the size of the tree, the trunk can be sawn into specified lengths for transport to a sawmill to be processed into dimensional lumber for commercial sale. Tree tops and limbs, as well as whole small trees, can be chipped (*see Chipping*) and sold as biomass for energy, piled and burned, or spread for soil cover within the treatment area.

Watershed Treatments

Meadows, Stream Channels and Riparian Areas, and Springs and Fens

Stream and meadow treatments are a means to improve water quality, restore sediment metering functions, reduce erosion, restore the floodplain function of meadows and riparian areas, and improve aquatic habitat. All mechanical and hand implemented treatment methods described below would meet standards and guidelines outlined in the 2004 SNFPA ROD, p. 62-66 and Plumas National Forest 1988 LRMP, 4-41 – 4-45.

Grade Control Structures are used to transition a new meadow gradient to the existing channel downstream and are often used at the downstream end of a degraded meadow channel that has been restored utilizing partial or complete fill. Structures are made of large rock, fill, and vegetation.

Instream Structures, such as beaver dam analogs (BDA) and post-assisted log structures (PALS), are process-based restoration techniques that mimic the function of a natural beaver dam or accumulation of large woody debris in a stream channel. Process-based techniques are a low-tech restoration tool used to reconnect stream channels to their floodplain, reduce channel erosion, restore sediment metering, and enhance riparian and meadow habitat. Structures are typically built by hand and are made of native materials, generally sourced from on-site, with the exception of purchased wooden posts used in PALS. Structures are temporary and require ongoing maintenance before they become self-sustaining, requiring follow-up treatments to maintain their structural integrity and effectiveness. Maintenance activities may include adding more wood or posts to existing structures, building new structures where existing ones have washed out, and building existing structures further into the floodplain.

Large Wood, known as large woody debris (LWD), is present in streams and floodplains within forested areas and plays a significant role in the physical transport processes that streams support (Wohl et al. 2019), including sediment metering functions. Recent wildfires have removed or substantially reduced LWD from streams within the project area. “The main mechanisms for large wood recruitment to stream channels include recruitment from tree fall from mature riparian and upland forests, recruitment from transport of downed wood through ephemeral channels during floods, and landslides and debris flows that deliver large slugs of large wood to stream corridors for transport downstream” (Yochum & Reynolds, 2020). “For streams to maintain large wood recruitment, they must have adequate nearby riparian and upland forests” (Ibid). Due to the loss of recruitment sources in the project area, channels exhibiting mass sediment movement and first and second order channels with slopes greater than 2% will be evaluated for large wood restoration. Wood structure types may include self-stabilizing large wood pieces dropped into stream channels, windthrow emulation, or single-piece log structures and small wood complexes. Focus areas for restoring sediment metering functions would be channel reaches upstream of road crossings. Where applicable, large wood channel structure restoration would be utilized to reduce stream channel erosion. Management of riparian zones for wood production would be prioritized to provide sustainable wood recruitment to the stream system.

Meadow, Springs, Fens and Riparian Vegetation methods used to restore the hydrologic and ecological functions of meadows will include conifer removal, transplanting of meadow sod and riparian shrubs, willow propagation, native seeding, and installation of temporary and/or permanent fencing.

Partial or Complete Fill is a restoration technique where a deeply incised meadow channel is filled with soil material. Partial fill, also known as “pond-and-plug”, utilizes on-site or off-site material to fill stream segments leaving incised channel voids between segments unfilled. On-site material use often involves excavating areas within and adjacent to the degraded channel larger and deeper to fill the adjoining stream segment with the excavated fill. These borrow areas frequently become ponds sustained by restored groundwater. On-site material may also be sourced from the edges of the meadow or upland, if soil characteristics are considered suitable. Complete fill leaves no voids in the treated channel and fill is either sourced on-site from meadow margins and/or uplands, or is transported in from off-site. Streamflow is then allowed to re-occupy a stable remnant channel or a newly constructed channel, to restore floodplain function, elevate the water table to within the root zone, and support reestablishment of wet meadow vegetation.

Riffle Augmentation involves adding rock, gravel, or vegetation to the channel to raise the streambed elevation at specified locations within a stream channel reach. Riffles may be used to reconnect a moderately incised channel to its floodplain, create/enhance aquatic habitat, or transition a new meadow gradient to the existing channel downstream, similar to a grade control structure.

Stream-Road Crossings

Stream-Road Crossings will be evaluated for road crossing stability, risk of failure, and barriers to aquatic organism passage (AOP). Road-related sources of sediment and flow delivery to stream channels will also be identified.

Aquatic organism passage (AOP) refers to the ability of fish and other aquatic organisms (amphibians and invertebrates) to migrate and swim freely upstream and downstream through or beneath human infrastructure such as culverts, bridges, diversion, dams, etc.; functional AOPs facilitate habitat connectivity for aquatic organisms.

Approach is the length of the road surface which may direct runoff from the road to the stream crossing.

Dips refer to dips or humps on road surfaces which intercept surface runoff and redirect water flow off the road surface; helps reduce erosion.

Critical Dip is used adjacent to road crossings to redirect water that overflows from a culvert.

Rolling Dip is used along approaches to reduce the length of connected surface for stream crossings.

Ditch relief culverts, also known as cross drains, culverts placed in ditches to prevent erosion in the ditch and help water cross the road.

Lead-off ditches are ditches used to transmit water from a drainage structure or drainage dip outlet to the natural drainage area.

Outsloping refers to angling the road so that it is lower on the outside or downhill side of the road than it is on the inside or bankside. Outsloping lets water sheet across and off the road instead of trapping it on the road surface or directing it to an inside ditch.

Fire Suppression Repairs

Fire suppression activity repairs and rehabilitation would occur along fire suppression lines, roads, and other areas used by suppression resources where suppression damage occurred.

Boulder/Berm blockades may need to be placed/created to prevent motorized access to fire suppression lines mitigating their use as unauthorized roads.

Recontouring would occur on suppression lines that were bladed into the soil resulting in berms tall enough on the sides of the suppression line to catch or alter water runoff fit this category. Berms will be pull back to restore the natural contour into the natural gradient of the hillside so that water does not channel down the dozer line unnaturally and potentially causing severe soil erosion within the suppression line and downslope from it.

Spillway ditch repair where spillway ditches—specially designed drainage channels that allow excess rainwater to flow away from road surface—have been dozed and filled in with soil and debris preventing the water from properly draining. This repair type requires a unique expertise different than ground disturbance repair and will be treated based upon the need.

Spreading woody debris throughout a fire suppression line can help slow water runoff and mitigate the use of suppression lines as unauthorized roads.

Soil surface scarification breaks up and loosens the top layer of soil to improve water infiltration.

Subsoiling breaks up compacted soil and loosens the subsoil with minimal disruption to the surface to improve water infiltration.

Waterbarring is the creation of a ridge or berm to divert runoff to prevent erosion. Waterbars need to be established in increments appropriate for the steepness of the slope the suppression line bisects. Water should be directed primarily to resistant surfaces with high vegetation cover when possible. Waterbars should discharge into undisturbed areas and preferably rocky ground, or filter areas well protected with ground and vegetative cover, whether rocks or organic materials. Waterbar spacing based upon gradient should be considered and installation construction should follow appropriate angle (between 30 to 45 degrees relative to fire line) and outlet. Waterbars should never direct water into stream channels.

Trail Improvements

Trail improvements refer to completing needed trail repairs, removing hazard trees and snags, and removing encroaching brush to bring trails up to current Forest Service Standard Trail Plans and Specifications.

Dips: dips or humps on trail surfaces which intercept surface runoff and redirect water flow off the trail; helps reduce erosion**.**

Hazard Tree Removal is the removal of trees capable of striking roads, trails, and structures, and removing felled trees from past fire suppression or rehabilitation activities along high-use roads, within and adjacent to developed facilities on National Forest System (NFS) lands; and felling certain trees along NFS trails and on NFS land adjacent to private property boundaries that pose a safety risk. Identified hazard trees would be felled by hand (i.e. chainsaw) or mechanically with heavy equipment, such as a feller-buncher. Felled trees would be chipped, lopped and scattered, piled and burned; removed for wood products such as lumber, biomass or personal and/or commercial firewood; or other similar means of processing or removal. The resulting woody debris slash would be piled, lopped and scattered, masticated, chipped, and/or burned. Lopped and scattered slash would be shorter than eight feet and distributed no greater than 18 inches deep. Hazard tree removal specifications will tier to the Region 5 Hazard Tree Guidelines (USDA 2022c).

Re-benching is the cutting of trail tread to address erosion, control the grade, and/or to smooth out the trail to improve user experience.

Tread is the actual travel surface of the trail; constructed and maintained to support the designed use of the trail.

Wildlife and Botanical Habitat Enhancement Methods

All wildlife and botanical habitat enhancements would entail utilizing some combination of fuel reduction and reforestation methods noted above for terrestrial species, and a combination of stream and meadow methods for aquatic species. Native vegetation establishment for wildlife species habitat, maintaining rare and/or sensitive plant populations, and creating habitat connectivity would be accomplished through collection of local native seed to be grown out at a local nursery for reliable seed and plant stock, as well as the purchase of commercially produced native seed, as needed. Identified areas would be seeded/planted by hand, with protections such as fencing or caging utilized, as needed, for vegetative establishment. All mechanical and hand implemented treatment methods described above would meet standards and guidelines applicable to species and habitat protections, as outlined in the 2004 SNFPA ROD p. 49-66, and Plumas National Forest 1988 LRMP, 4-29 - 4-35; FSM 2620-2630, 2670; FSH 2090.24, 2609.13, 2609.26).

Invasive Species Management

Invasive Species Management is a term used to describe actions taken to reduce the populations of or prevent the introduction or spread of non-native organism(s) that cause or are likely to cause economic or environmental harm, or harm to human, animal, or plant health. Invasive species management can include containment, suppression, and reduction of populations of invasive species, or eradication, the removal or destruction of an entire population (Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species, December 5, 2016). All invasive species control methods would adhere to federal and State standards and guidelines to protect air, water, and soil quality.

Biological control refers to the use of animals or insects, such as goats or other livestock, to reduce and control invasive species populations (*see also Prescribed Grazing in Fuel Reduction Methods above*).

Chemical control is the use of herbicides to control invasive species. Herbicides application would be ground-based spot spraying of targeted invasive species. Herbicide selection would be dependent on the species targeted for control, severity of infestation, presence of sensitive resources and native habitats, proximity to surface water, site access, and budget. Selected herbicides would meet forest standards and regulations, and treatment applications would adhere to all relevant regulations and best management practices.

Manual control refers to hand grubbing, pulling, or digging with hand tools.

Mechanical control utilizes mechanical equipment such as a mower, weed whacker, chainsaw, or masticator to remove invasive plant species.