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Almanor Ranger District

Plumas, Shasta, and Tehama Counties, California

West Lassen Headwaters Landscape Restoration Project

Purpose and Need and Proposed Action

Photograph of the northern West Lassen Headwaters Project taken by Sophie Castleton from the Big Rock Overlook on July 5th, 2022. Battle Creek Meadows Ranch is in the foreground, surrounded by Lassen National Forest timberland and peaks in the Lassen Volcanic National Park.

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Table of Abbreviations

Table 1. Table of Abbreviations

Abbreviation	Definition
AG	American goshawk (previously called northern goshawk)
ARD	Almanor Ranger District
BA	Basal area
BDA	Beaver dam analogue
CSO	California spotted owl
CWHR	California Wildlife Habitat Relationship
DBH	Diameter at breast height: diameter of a tree measured at 4.5 feet above the ground on the high side of the tree.
EDRR	Early Detection Rapid Response (invasive plant species)
FRI	Fire return interval
FS	Forest Service
GIS	Geographic Information System(s)
IDF	Integrated design feature
IPM	Integrated Pest Management
LNF	Lassen National Forest
LRMP	Land and Resource Management Plan
NFS	National Forest System
NRV	Natural range of variation
PAC	Protected Activity Center
PALS	Post-assisted log structure
PAPN	Proposed Action, Purpose and Need
POD	Potential Operational Delineation
PSW	Pacific Southwest [Region]; i.e., Region 5 of the FS
PSW-GTR	Pacific Southwest [Region] General Technical Report
R5	Region 5 [of the Forest Service]: i.e., California, Hawaii, and the Pacific Islands
ROD	Record of Decision

Abbreviation	Definition
rSDI	Relative stand density index
SI	Sierra Institute, or Special Interest (plant species)
SNFPA	Sierra Nevada Forest Plan Amendment
TES	Threatened, endangered, or sensitive (species)
USDA	United States Department of Agriculture (parent agency of FS)
WLHP	West Lassen Headwaters Project
WUI	Wildland urban interface [or intermix]

Introduction

The Almanor Ranger District of the Lassen National Forest (LNF) is proposing management activities on approximately 101,471 acres of National Forest System (NFS) lands as part of the West Lassen Headwaters Landscape Restoration Project (WLHP), a landscape-scale, cross-boundary restoration initiative to improve forest resilience, watershed health, and vital community protection across 172,765 acres southwest of Lassen Peak. At this time, activities to occur on Lassen Volcanic National Park (LAVO) are covered under their Fire Management Action Plan and will not be included in the WLHP Proposed Action and project analyses.

The WLHP forms a vital, largely undeveloped corridor linking ecological communities from 3,400 feet in the Deer Creek drainage to over 8,000 feet in Lassen Volcanic National Park. The project encompasses the headwaters of Antelope, Deer, Battle, and Mill Creek – four anadromous watersheds at the nexus of the Cascades and Sierra Nevada that provide irreplaceable water resources for anadromous fish and wildlife and the upper North Fork Feather River headwaters which provides clean drinking water for millions of Californians via the State Water Project. Approximately 31 percent of the project (all lands) is located within the wildland-urban interface (WUI), and the terrain and dominant weather patterns create the potential for fast-moving wildfires that would threaten the communities of Mineral, Mill Creek, Childs Meadow, and other more dispersed communities.

The 2021 Dixie Fire, the largest single wildfire in California history, burned almost a million acres and displaced thousands of residents, underscoring the urgent need for the landscape-scale restoration proposed in the WLHP. Approximately 30 percent (52,722 acres) of the WLHP is located within the Dixie Fire perimeter, including 29,697 acres of National Forest System land. The 2024 Park Fire burned into the southwestern portion of the Project, impacting another 14,377 acres of National Forest System land. Suppression efforts were successful at holding the Park Fire to the south and east of Mineral, and the areas around Mineral and Mill Creek remain highly susceptible to risk from wildfire. About 49 percent of the land in the project area burned at high severity in these two recent wildfires. Prior to the Dixie Fire, these watersheds were among the most severely fire-departed landscapes in California, with no record of significant fire in these watersheds for more than 100 years (Safford et al. 2014). Landscape-scale treatments are needed to reduce the likelihood of high-severity wildfire moving across the landscape, enhance the resilience of forest stands, and manage fuels within the Dixie Fire perimeter. This project includes actions to restore burned forest within the Dixie Fire and Park Fire perimeters, reducing the risk of reburn in a future high-intensity fire. The proposed project complements previous and ongoing restoration work in the region, such as the Upper Butte Creek Forest Health Project, the North Fork Feather River Headwaters Forest Restoration Project, the Plumas North Fork Forest Recovery Project, and meadow restoration in Child's Meadow and Deer Creek Meadows.

Approximately 71,774 acres of NFS land within the WLHP is outside the Dixie Fire and Park Fire perimeters and includes large patches of green forest on the Almanor Ranger District not impacted by recent wildfires. The WLHP would improve ecosystem resilience to stand-replacing wildfire by reducing woody fuel densities and restoring fire as a beneficial disturbance process in diverse habitats ranging from oak woodland to high-elevation conifer forest. Restoration actions would be designed to protect communities, strengthen strategic fire management features (e.g. defensible roads, dozer lines and trails), and restore landscape resilience to stand-replacing disturbances.

Location of the Proposed Project Area

The project is in Plumas, Shasta, and Tehama Counties and includes the communities of Mineral, Mill Creek, Childs Meadow, and Saint Bernard. The northern boundary of the project area is in the Lassen Volcanic National Park, and the southwestern terminus of the project is the Lassen National Forest Boundary. The western extent of the project is delineated by the Lassen National Forest boundary, as well as Potential Operational Delineation (POD) boundaries, which run along roads that will serve as holding features for prescribed fire and management of unplanned ignitions; the project is bounded to the east by the Pacific Crest Trail. State Highway 89 bisects the project, from the northern extent of the project within Lassen Volcanic National Park, running south to the junction with State Highway 36, which extends west to the community of Mineral, and southeast to the junction with State Highway 32. State Highway 32 parallels Deer Creek, which flows down the prominent Deer Creek Canyon, to the southwestern terminus of the project.

The project encompasses the Cub Creek Research Natural Area (RNA), which was designated to protect an example of mixed-conifer forest for scientific study and education and for the maintenance of biological diversity. It also includes the Wild Cattle Mountain proposed wilderness and portions of the Heart Lake and Mill Creek proposed wildernesses. The WLHP also includes portions of the Butt Mountain, Cub Creek, Mill Creek, and Wild Cattle Mountain inventoried roadless areas (IRA).

The project is located approximately six miles west of Lake Almanor and includes Lassen National Forest System lands located within the following Management Areas (MA) on the Almanor Ranger District: Mineral (MA 26), Upper Mill Creek (MA 27), Feather River (MA 28), Turner (MA 35), Upper Deer Creek (36), Butt Creek (MA 37), Lower Mill Creek (MA 40), Middle Deer Creek (MA 41), Lower Deer Creek (MA42), and Jonesville (MA44) and on the Hat Creek Ranger District: Red (MA16). The project also includes the southwestern corner of Lassen Volcanic National Park, including the prominent peaks of Brokeoff Mountain, Mount Conard, and Sifford Mountain.

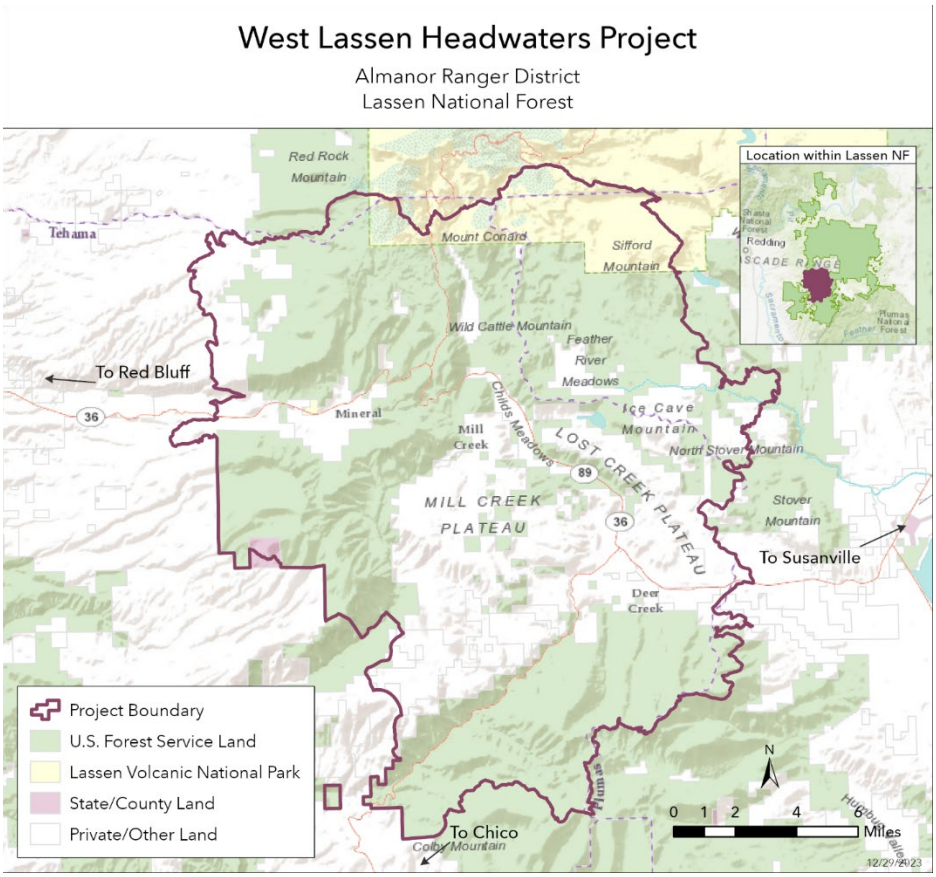


Figure 1. Vicinity Map

Collaboration

The Almanor Ranger District of the LNF and LAVO have developed the proposed project through a collaborative process with the South Lassen Watersheds Group (SLWG), a local forest collaborative focused on advancing forest and meadow restoration and community protection across an approximately million-acre footprint. The SLWG functions through active engagement and support from more than 25 member groups encompassing diverse stakeholders, including non-profit organizations (Mountain Meadows Conservancy, Point Blue Conservation Science, The Nature Conservancy, Feather River Trout Unlimited), Tribal entities (Maidu Summit Consortium), local government (Plumas County Board of Supervisors), and other groups such as the Butte County Resource Conservation District. Planning and implementation of the WLHP is a top priority for the SLWG and is directly aligned with the Group's commitment to increase the pace, scale, and efficacy of forest and watershed restoration in the region.

The SLWG seeks to accelerate the pace and scale of restoration in response to the high degree to which forests in the northern Sierra Nevada are departed from their historical and desired conditions. In doing so, SLWG recognizes the importance of enabling adaptive management in response to change conditions (e.g., drought-related tree mortality, wildfire, climate change, etc.). To accomplish these objectives, the project planning team is utilizing a condition-based management approach that would result in a single decision authorizing actions across the WLHP area, contingent on the execution of post-decision steps defined in a collaboratively developed implementation plan. This approach would increase the pace and scale of restoration, while retaining transparency and accountability for resource

protection. A critical shift compared to "business as usual" is the re-alignment of some resource surveys to immediately precede implementation, allowing resource specialists to identify and respond to realities on the ground at a finer level of detail, and with greater temporal alignment with implementation. Future phases of project planning would include the collaborative development of an adaptive management framework and implementation plan; two planning tools that would serve as an accountability mechanism to ensure resource protection objectives are met while accelerating the pace of implementation.

In addition to a traditional federal interdisciplinary team made up of staff from the Forest Service, National Park Service, and Sierra Institute for Community and Environment, the planning process for WLHP includes collaborative resource-specific planning groups and a landowner engagement subcommittee born out of the SLWG. Designed based on lessons from past projects, this collaborative engagement serves as a mechanism to allow early identification and resolution of conflict, advance shared understanding and ownership of the project, and facilitate the incorporation of expert and local knowledge to support restoration planning. This Proposed Action, Purpose and Need document was informed by a series of collaborative workshops, in which participants collectively described current landscape conditions, aligned on desired conditions for public lands, and discussed potential proposed actions to restore the ecological integrity of the landscape and achieve project goals.

Finally, as part of the SLWG Memorandum of Understanding, the collaborative is committed to incorporating the Mountain Maidu cultural and philosophic perspectives into project planning and implementation efforts. During planning and implementation of the WLHP, the collaborative will work with local Tribes to ensure that Tribal values and priorities are incorporated into project prioritization processes, and that Tribal community members have ample opportunities to use indigenous traditional ecological knowledge and stewardship practices to manage lands within the project area.

Purpose and Need

Most of the public lands in the project area were considered high-quality wildlife habitat during the Herger-Feinstein Quincy Library Group era and were excluded from active management (USDA-FS 2005). This deferral of active management now puts these habitats at risk from threats including drought, wildfire, insects, and disease. This highlights a needed paradigm shift in conservation strategy: in the coming decades, remaining dry mature forest habitat in California is susceptible to complete loss without a rapid transition from a conservation strategy that attempts to maintain static conditions to one that manages for sustainable disturbance dynamics (Steele et al. 2022). In alignment with management recommendations in *Pacific Southwest Research Station General Technical Reports* (PSW GTRs) 220, 237, 256, and 263 to improve resilience for stands within mixed conifer and red fir forest types, this proposal aims to create the conditions that would support functioning ecological processes and natural disturbance regimes across the landscape. With this overarching need in mind, this project has three purposes:

1. **Forest Resilience**: Improve the health and resiliency of upland conifer forest, pine, hardwoods, and aspen communities in fire-departed forest stands, as well as in post-fire stands within recent wildfire footprints.
2. **Watershed Health**: Restore watershed health, function, and resilience in a changing climate.
3. **Fire Management**: Prepare the landscape and community wildland-urban interface for planned and unplanned fires. Treat overstocked vegetation with prescribed fire and mechanical treatments to reduce the frequency and intensity of catastrophic wildfires while returning the landscape to its historical average fuel composition.

The Lassen National Forest Land and Resource Management Plan (LRMP 1992) and Record of Decision (ROD 1993), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) Final Environmental Impact Statement and ROD (2004) and the Management Indicator Species Amendment (2007), provide the foundation for the three purposes of the project. Project objectives are also aligned with the goals set forth in the Region 5 Ecological Restoration Leadership Intent (USDA 2011).

Additionally, the need to address vital habitat for anadromous fish is outlined in the 1992 LNF Land and Resource Management Plan, as amended by the 2004 Sierra Nevada Forest Plan Amendment (USDA FS 2004a), which continues the long-term strategy for anadromous fish-producing watersheds for the Lassen National Forest as set forth in Appendix I of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement 2001 (USDA-FS 2001). Regional plans that address anadromous watersheds also are used to inform the project including the Battle Creek Watershed Based Plan (Battle Creek Conservancy 2019), which has identified long-term monitoring sites to assess anadromous fish habitat; and the Recovery Plan for Central Valley Salmon and Steelhead, which provides recommendations for watershed adaptive management and monitoring (NMFS 2014).

The project's three purposes are further supported by the South Lassen Watershed Group's mission, which is to collaboratively identify, advance, support, and enable projects in the North Fork Feather River, Upper Deer Creek, and Upper Mill Creek watersheds to reduce the risk of catastrophic wildfire, and improve ecological resilience, watershed condition and function, and local community health and socioeconomic conditions. The project also advances goals outlined in the SLWG's Memorandum of Understanding for forests, fuels, fire, hydrology, and water resources. The collaborative group is further committed to ensuring that local Tribes help to achieve the three outlined purposes and accomplish project goals using indigenous traditional ecological and traditional land management practices.

The project's first purpose (Forest Resilience) is to improve the health and resiliency of upland conifer forest, pine, hardwood, and aspen communities across the landscape. This purpose applies to both green forest and areas of burned forest within the project and aligns with Forest Plan direction to protect the habitat of forest-dependent species (SNFPA ROD pp.6, 8-9); manage stand density levels to reduce the susceptibility of forests to wildfire and other disturbance (SNFPA ROD pp. 48-49); and restore forest species composition and structure following large-scale, stand-replacing disturbances (SNFPA ROD pp. 31-32).

The project's second purpose (Watershed Health) is to restore watershed health, function, and resilience in a changing climate. This purpose aligns with Forest Plan direction to maintain, restore, and enhance aquatic, riparian, and meadow ecosystems (SNFPA ROD, pp. 32-34, 42-43, and 62-66).

The third purpose of the project (Fire Management) is to prepare the landscape and wildland urban interface communities for planned and unplanned fires. This purpose is directly in line with Forest Plan direction to reduce threats to communities and wildlife habitat from large, severe wildfires (SNFPA ROD, pp. 8, 34, and 44-48); and reduce the risk of wildfire to communities in the urban wildland interface while realigning the broader landscape with its historical fire regime and forest composition (SNFPA ROD, pp. 3, 34, and 45-46).

Needs for actions outlined in this proposal are further detailed in the following description of existing landscape conditions and the identification of those conditions that are out of alignment with desired conditions for the landscape.

Forest Plan Amendments

The WLHP proposes project-specific Forest plan amendments to the Lassen National Forest Land and Resource Management Plan (LRMP 1993) as amended by the Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD 2004). The SNFPA ROD specifies basal area and canopy cover requirements in mechanical thinning treatments in mature forest habitats (California Wildlife Habitat Relationship size and density classes 4M, 4D, 5M, 5D, 6) outside of WUI defense zones. These basal area and canopy cover requirements limit the ability to meet updated forest resiliency objectives that account for climate change and an increase in large, high-severity fires (Safford and Stevens 2017, North et al. 2022) and do not always reflect the best available science about the habitat needs of California spotted owls (USDA FS 2019). Thus, the need to amend the Forest Plan (36 CFR 219.13 (b)(1)) is driven by the three purposes of this project.

The proposed project-specific plan amendments are based on PSW-GTR-256 by Safford and Stevens (2017), PSW-GTR-263 by Meyer and North, the California Spotted Owl Conservation Strategy (USDA FS 2019), and the best available science related to American goshawk habitat conservation. The Conservation Strategy and the best available science related to American goshawks provide updated management recommendations that focus on maintaining high-quality spotted owl and goshawk habitat while increasing habitat resiliency across landscapes.

Proposed changes include modifying, removing, and adding specific forest plan components to:

1. Improve forest resiliency in general forest stands.
2. Protect California spotted owl (CSO) and American goshawk protected activity centers (PACs) by enhancing their resilience to severe disturbances, thereby providing for their long-term sustainability on the landscape.
3. Address needs for enhancing habitat resiliency in CSO territories.

4. Balance the need to protect habitat for late-successional wildlife species with needs for protecting life and property and reducing fire hazards near communities.

The proposed forest plan amendments would apply only to the West Lassen Headwaters Project. The proposed project-specific amendments would be evaluated during environmental analysis to assess their efficacy in meeting project objectives.

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 219.11 are directly related to the plan direction being added, modified, or removed by the proposed amendments (Appendix B and Table 25):

- **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 **(1)** Ecosystem integrity and **(2)** Ecosystem diversity, **(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 on the plan area to adapt to change (§ 219.8(a)(1)).
- **36 CFR 219.11:** Timber requirements based on the NFMA, **(c)** Timber harvest for purposes other than timber production, **(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 West Lassen Headwaters Project) is consistent with the purpose of the substantive requirement.

Purpose 1. Forest Resilience:

Improve health and resiliency across the landscape within upland conifer forest, pine, hardwoods, and aspen communities in fire-departed forest stands, as well as in post-fire stands within recent wildfire footprints.

Need for Action: Actions are needed to improve heterogeneity at the stand and landscape level to restore a forested landscape resilient to severe impacts from wildfire, insect and disease infestation, drought, and anticipated future conditions resulting from climate change. Actions are needed to improve habitat resilience and connectivity for key wildlife species across the wide elevational gradient within the project.

Stands not Affected by Disturbance

Existing Condition:

Approximately 59 percent of the National Forest System lands (59,800 acres) in the project area are outside the Dixie Fire and Park Fire perimeters. These lands are approximately 85 percent conifer forest, 3 percent hardwood or mixed hardwood-conifer forests, and 12 percent non-forested shrub, herbaceous, meadow, barren, or water. Most of the conifer forest is mid-aged, a seral stage between early stand initiation and late seral old forest, with moderate to high canopy cover and are most at risk from wildfire, insect and disease infestation, and drought.

Much of the project area historically receives high precipitation, promoting productive sites for tree growth. Steel et al. 2022 found that increasing fire size and frequency is causing rapid and dramatic shifts in composition and distribution of conifer forests of the Sierra Nevada. To put these changes in context within long-term ecological trends, managers use the concept of Natural Range of Variation (NRV) to compare current ecological conditions and trends to the natural state of the landscape to guide management activities and desired outcomes. When assessing NRV, researchers look across the breadth of knowledge pertaining to the site's climate, geology, and ecology. They summarize literature and current conditions in each ecosystem to gauge changes in composition, structure, and function. Understanding how an ecosystem has changed over time can inform managers of how its unique ecological communities may respond to current and projected conditions and any management decisions made for the area.

The NRV for both primary forest types found in the WLHP are described in General Technical Reports developed by the Pacific Southwest Research Station. PSW-GTR 256 describes NRV for yellow pine/dry mixed conifer forest (Safford and Stevens 2017) and PSW-GTR 263 describes NRV for red fir/moist mixed conifer forest (Meyer and North 2019). It is important to note that the terms "natural range of variation" and "natural fire regime" used throughout this document include deliberate use of fire by Native Americans to manage the landscape and maintain the primary forest types for thousands of years.

Fire exclusion from the project area has substantially increased tree density and reduced the structural heterogeneity of forested stands across the landscape[1]. Dense stands create a high degree of competition between trees for nutrients, water, growing space, and sunlight and reduce understory vegetation and plant diversity. In addition to increased density, many stands in the project area have a larger proportion of small trees and fewer canopy gaps than would have been historically expected. The

1 Structural complexity is the distribution of trees and understory vegetation in three-dimensional space. Stand heterogeneity refers to the diversity and distribution of stands with varying structural attributes on the landscape.

current homogenous, highly complex, and dense stand structure is not resilient to disturbances such as fire, disease, insects, or drought. Species composition has shifted to favor shade-tolerant species, such as true fir and incense-cedar, while decreasing the prevalence of shade-intolerant species that are well-adapted to an active fire regime, such as pine and oak. Stands that are composed of higher proportions of shade-tolerant species at higher densities are at increased risk of mortality from disturbances.

Forests in the WLHP provide important habitat to many sensitive wildlife species including California spotted owl, American goshawk (previously called northern goshawk), Sierra Nevada red fox, Pacific marten, and fisher. Departure from the natural range of variation across the WLHP has resulted in denser stands and a shift in tree species composition, leading to an abundance of younger, smaller trees, and a reduction in the structural characteristics important for these species of wildlife, (e.g., large mature trees, large snags, and large coarse woody debris). This departure also threatens the approximately 10,000 acres of old growth forest in the project area, characterized by the abundance of large trees, snags, and down woody material.

From the 1990's to 2013, there was a 44 percent decline in California spotted owls on the LNF (USDA-FS 2019) and recent scientific studies indicate current population declines in various study areas on the National Forest System lands are likely a delayed result from historic logging of large trees and a century of fire suppression (Jones et al. 2017). Continued fire suppression and other activities that lead to the persistence of homogeneous forest conditions are perpetuating these declines, due to negative impacts on CSO prey species abundance (USDA-FS 2019).

The combined impacts of forest stand departure and climate change have resulted in wildlife habitat that is at risk of loss from stressors including pests, drought, and wildfire. Wildlife habitat connectivity, or the connectedness of patches of wildlife habitat or areas occupied by a species, is a critical landscape component that allows individuals to move through the landscape with minimal resistance. The WLHP represents a largely undeveloped corridor providing for connectivity of wildlife habitat and movement and dispersal routes through the WLHP. However, due to changing forest conditions as described above, this expansive corridor is at risk of large, fast-moving, high-severity wildfire that could compromise habitat connectivity within and outside of the WLHP.

Within the WLHP many plantations were windrowed before planting trees in the 1960s and 1970s. Windrows are a type of site preparation where topsoil was bladed into long piles together with the root crowns of shrubs prior to tree planting. The practice was largely effective in reducing shrub competition with newly planted trees, but it is now known that windrowing is detrimental to soils and long-term productivity. Windrows can also disrupt water flow paths and cause erosion downslope.

Desired Condition:

Desired conditions for upland forests in the WLHP outside the Dixie Fire and Park Fire perimeters are based on expected vegetation community structure and composition under a more frequent fire regime, exhibiting both stand and landscape heterogeneity. The goal is to restore resilient forested landscape conditions that consist of structurally diverse vegetation communities across elevational gradients, with different age classes and stands composed of large, tall trees where appropriate on the landscape to support late-successional forest-dependent wildlife species. These characteristics increase the forest's ecological integrity, which is defined as the likelihood of forest stands to be able to withstand and recover from most disturbances imposed by natural environmental dynamics or human influence (36 CFR 219.19).

At the landscape scale, the desired condition is a fire-regime maintained forest structure characterized by low stand densities with large, fire resilient tree species intermixed with pockets of tree regeneration and shrubs in canopy openings. There is a need to reduce tree densities across the landscape to restore historic forest stand structure and composition and aid in development of old forest habitat. Table 2 shows the desired stand conditions in mature conifer forests as compared to existing conditions. When a stand approaches 60 percent of the stand's maximum stand density index (SDI)[2], the inter-tree competition for resources increases to the level that trees begin to die from competitive stress, also called "self-thinning." The range of desired relative stand density reflects the range of forested stand conditions from young, forested stands and mature forest stands resilient to disturbances to denser mature forested stands required for wildlife habitat.

Table 2. Existing and desired stand conditions in mature forest by forest type

Forest Type	Existing Average Percent of Maximum SDI	Desired Percent of Maximum SDI	Existing Average Basal Area (square feet per acre	Desired Range of Basal Area (square feet per acre)	Existing Average Trees per Acre	Desired Range of Trees per Acre
Ponderosa/Jeffrey Pine	57	25-50	180	60-100	205	30-65
Sierra mixed conifer	62	25-50	215	120-160	760	25-135
White fir	64	25-50	288	140-180	410	25-135
Red fir	56	25-50	305	180-220	520	50-85

Data from common stand exams collected in the project area and processed using the Forest Vegetation Simulator program.

Without action, stands are expected to experience density-related tree mortality, resulting in increased fuel loading and undesired changes in tree species composition and increasingly homogenous forest structure characterized by smaller, more dense trees and excessive fuel loading across the landscape. These conditions increase the potential of severe fire behavior and risk of loss of forested stands to high-severity fire.

Desired forest conditions for forest-dependent wildlife include the resilient stand components outlined above, and structural heterogeneity across the landscape, with a diversity of tree sizes, understory vegetation, snags, and coarse woody debris. New science indicates threats to spotted owls, for example, are shifting as the climate changes and management action is needed to enhance the resilience of habitat to multiple disturbances (USDA-FS 2019). The loss of known CSO and American goshawk habitat in the Dixie Fire underscores the urgent need to improve the resilience of important nesting, roosting, and foraging habitat. Similarly, the scale of high-severity patches within the Dixie Fire demonstrates the

[2] Stand density index (SDI) is one measure of stand density. It is computed based on the number of trees per unit area and diameter at breast height (dbh) of the tree of average basal area. SDI is typically used as a measure of relative density by comparing existing SDI to a stand's biological limit, or maximum SDI ("SDImax"). As stands exceed 60 percent of maximum SDI, tree growth and vigor are severely impacted by inter-tree competition and stands are prone to large-scale insect and disease outbreaks and stand replacing fire.

need to actively maintain and enhance habitat connectivity across a large landscape to allow for wildlife movement, dispersal, and responses to disturbance-induced habitat loss. There is a need to sustain and improve habitat for sensitive forest species and to improve the continuity and distribution of mature forests across the landscape (SNFPA 2004 ROD, pp 6, 8-9, 31). Desired conditions for the old growth forest type include complex stand structures that support many wildlife species. There is a need to retain large tree components throughout old growth communities while focusing implementation actions on improving growing conditions to maintain high-quality habitat for species dependent on large, old trees.

In proximity to communities, the desired condition is an open stand structure dominated by large, fire tolerant trees with a sparse mid-story and understory component. Generally, the desired condition for these stands would include few larger trees, little to no ladder fuels, and low levels of surface fuels to the extent necessary to reduce the likelihood of wildfire moving into communities. There is a need to reduce tree density, reduce understory vegetation, and maintain low surface fuel loads in these community-adjacent stands to protect life and property from wildfire.

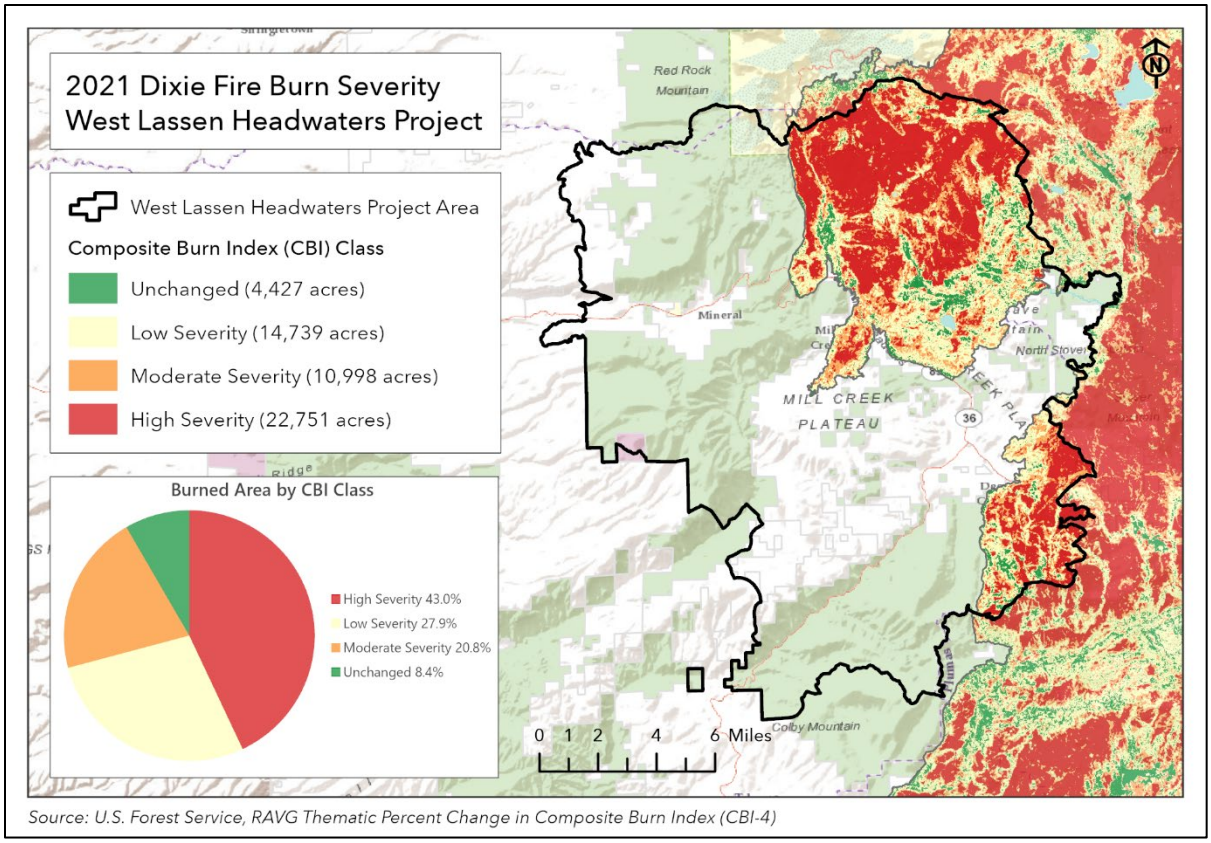
The LNF seeks to restore soil in windrowed plantations where feasible. Spreading windrowed material would redistribute nutrients and topsoil across the forest floor and improve growing conditions for trees and vegetation.

Stands Affected by Disturbance

Existing Condition:

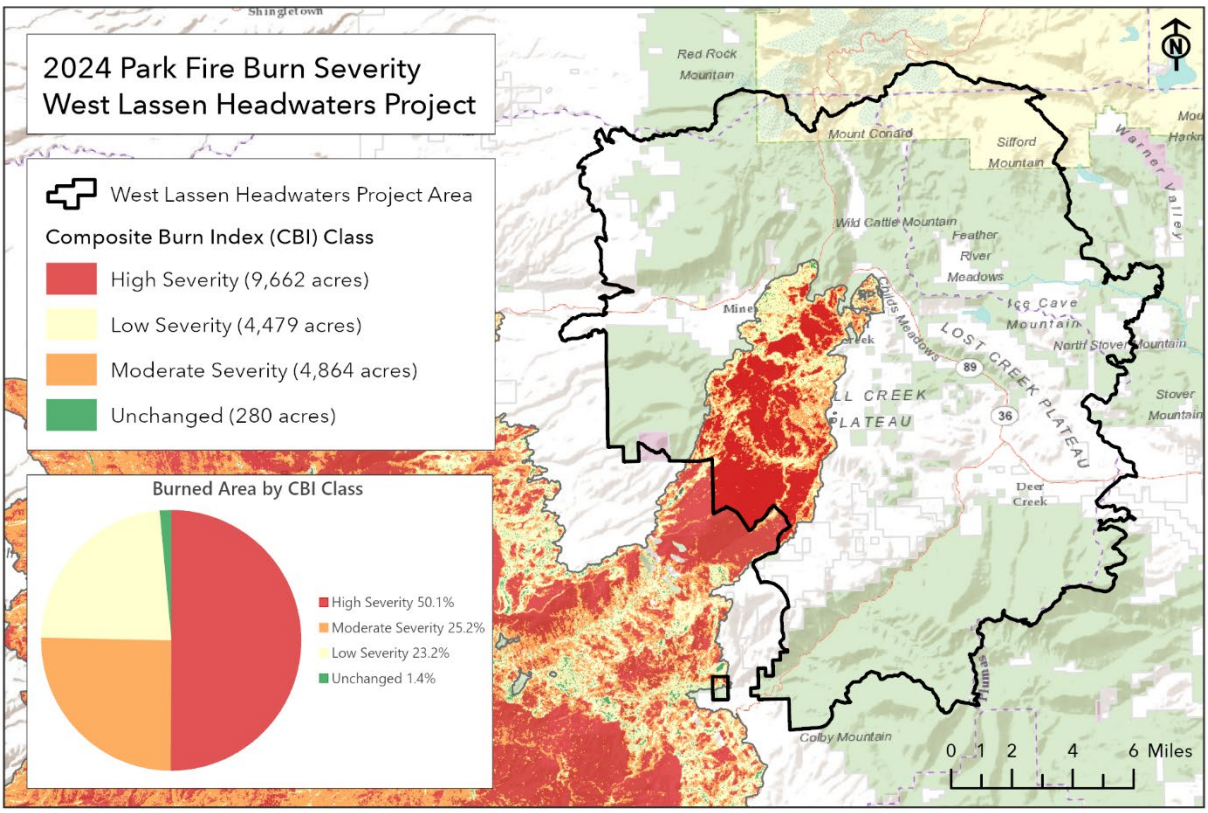
Patches of forest where most or all trees have died from a disturbance event comprise an important early seral habitat stage and a key component of NRV. Disturbances include wildfire, insect activity, disease infestation, and drought-related mortality and are a natural part of the landscape variability. However, excessively large patches of disturbance represent a departure from NRV.

Following nearly a century of fire exclusion, the 2021 Dixie Fire and 2024 Park Fire burned almost half of the Project. Effects from these disturbances varies, with high-severity fire effects across 43 percent of the Dixie Fire footprint within the project area and low to moderate effects across the remaining 57 percent. Fifty percent of the Park Fire burned at high severity within the West Lassen Headwaters Project area. Some stands that burned at low severity are closer to a resilient state that is within their respective natural ranges of variation than they were pre-fire, other stands contain heavy fuel loads and are still in a condition that is departed from the natural range of variation. High-severity patches that were previously forested now represent early seral vegetation conditions, consisting of open habitats with early pioneer plant species, including shrubs. Contiguous high-severity patches larger than 100 acres of previously forested land are the least likely to support live trees in the near-term and are outside the natural range of variation (Coppoletta et al. 2022). Where forest burned at stand-replacing severity, significant fuel loading will persist for decades if unmanaged. There are approximately 6,609 acres of National Forest System lands in the West Lassen Headwaters Project with a low to moderate chance of natural conifer regeneration based on using the USFS Region 5 Ecology Program's Assessment of post-fire restoration opportunities following the 2021 Dixie Fire (Coppoletta et al. 2022). Preliminary remote-sensing data suggests the Park Fire footprint will follow a similar trajectory given the presence of large, contiguous patches of high severity fire.



Source: U.S. Forest Service, RAVG Thematic Percent Change in Composite Burn Index (CBI-4)

Figure 2. 2021 Dixie Fire burn severity in the West Lassen Headwaters Project map



Source: U.S. Forest Service, RAVG Thematic Percent Change in Composite Burn Index (CBI-4)

Figure 3: 2024 Park Fire burn severity in the West Lassen Headwaters Project map

Desired Condition:

The desired conditions after a disturbance event are to promote resilience to future disturbances. The desired condition for most of the forest stands that experienced high-severity disturbance is an open, early seral forest structure with conditions that promote tree growth to maturity (where site conditions remain conducive to the re-establishment of coniferous forest). These conditions include the early establishment of conifer seedlings, planted or natural, in areas with the highest likelihood of survival (based on site conditions and projected climate) and management of competing vegetation. Across the landscape, fuel loading levels would be low enough to not contribute to patches of future high-severity wildfire greater than 100 to 250 acres or perpetuate repeated large patches of high-severity fire. The desired condition also includes retention of patches of snags where they provide the greatest benefit to snag-dependent or burned forest associated species such as the black-backed woodpecker, without significantly increasing future risk to firefighter safety, infrastructure, and the public. Stands that experienced low-severity and mixed-severity fire may currently represent a desired condition with low levels of surface fuel loading and fire-resilient mature trees.

In forested stands that burned or were affected by other disturbance events, there is a need to reduce fuels and snags to prepare the landscape for future fire. This includes maintaining desired conditions where they exist and improving the resilience of forest unaffected or low-severity patches to a future wildfire or insect/disease outbreaks. When large patches of mortality do occur, there is a need to limit excessive fuel accumulation, especially within and adjacent to communities, and increase the resilience of remnant green stands.

In alignment with the Post-Fire Restoration Framework for National Forests in California (PSW GTR-270), post-fire restoration would be prioritized through a structured decision-making process that recognizes resource and capacity limitations, considers desired conditions for individual stands within the overall landscape, and acknowledges the effects of a changing climate when defining desired conditions for previously forested landscapes. Alternate desired conditions may be defined for burned forest stands that are unlikely to re-establish naturally or with reforestation. Alternate desired conditions may include a transition to oak-dominated stands, riparian hardwood, or montane chaparral.

Purpose 2. Watershed Health:

Restore watershed health, function, and resilience in a changing climate.

Need for Action: Reduce sedimentation from existing roads and other diversions, address fish passage and post-fire sedimentation issues, protect and enhance anadromous fish habitat, and restore the hydrologic function of soils. There is also a need to restore montane meadows, fens, and riparian communities to maintain the ecological functioning of the system and improve carbon sequestration.

Existing Condition:

The WLHP encompasses the headwaters of Antelope, Deer, Battle, and Mill Creek: four anadromous watersheds at the nexus of the Cascades and Sierra Nevada that provide irreplaceable water resources for anadromous fish and wildlife. The project also includes the upper North Fork Feather River headwaters which provides clean drinking water for millions of Californians via the State Water Project. Located on the southwestern slope of Lassen Peak, the WLHP spans a wide elevational gradient from 3,400 feet in the Deer Creek drainage to over 8,000 feet in Lassen Volcanic National Park. Mean annual precipitation within the project footprint ranges from 45 inches a year in the lower elevations to over 100 inches on the highest peaks. The WLHP is underlain by young, highly fractured volcanic rocks, and deep, well-drained soils. This combination of topography and climate results in an environment with an abundance of water. There are over 175 miles of perennial streams in the greater cross-boundary project area (172,765 acres), 211 miles of intermittent streams, and over 3,700 acres of meadow systems. This surface expression of water is highly influenced by groundwater and the related subsurface conditions. The WLHP includes plentiful seeps and springs as well as fen-dominated systems which are unique wetland features that exist in this geography. The lakes and fens in the WLHP support diverse riparian communities and wetland-associated wildlife populations and offer a window into the dynamics of lake-to-meadow succession.

The most extensive meadow systems in the greater 172,765 cross-boundary footprint of the WLHP are privately owned, consistent with the pattern of early homesteading in the Sierra. However, smaller wetland systems including fens abound on the 101,471 acres of NFS lands within the project. They maintain well-connected aquatic and riparian habitat that supports the southernmost populations of cascades frogs in California, willow flycatcher populations (a state endangered and FS sensitive species), and fawning ground for the Tehama deer herd. Meadows in the project exhibit a range of conifer encroachment and degraded hydrologic function, including stream channel incision, diversion, and ditching, and dryer climatic conditions leading to upland habitat conversion. The resulting wet-dry cycles on the floodplains cause soil organic matter to volatilize, reducing the beneficial “sponge-like” function of meadows and releasing carbon into the atmosphere. Actions proposed in this project would complement past and ongoing work in the region to restore anadromous fish habitat and meadows, including restoration projects on private lands in Deer Creek Meadows, Childs Meadow, Battle Creek Meadows Ranch, and Highlands Ranch.

The absence of fire on the landscape, particularly during the last century, has impacted wetlands within the WLHP and has led to encroachment of lodgepole pine and an accumulation of fuels. Aspen, cottonwood, and other hardwoods provide rich riparian habitat in WLHP meadows, but the majority of the 115 aspen stands in the project area are in poor health because of conifer encroachment and excessive grazing (Burnett and Fogg 2011). Initial observations following the recent fires found hardwood regeneration in fire scars, however opportunities remain in unburned areas of the project to enhance riparian hardwood communities.

The lack of major dams and other fish passage barriers in these streams has led to the persistence of the only anadromous fish populations on USFS land in the Sierra Nevada (USDA FS 2004a); occupied anadromous habitat stretches all the way to the LAVO boundary in upper Mill Creek (Armentrout et al, 1998). The watersheds within the WLHP have been classified as the highest priority for protection and restoration due to their ability to support anadromous fish populations during periods of unfavorable climatic conditions and instability (NMFS 2014). Due to their proximity, a single wildfire could simultaneously burn the headwaters of Deer, Mill, Antelope, and Battle Creek, which would severely degrade water and habitat quality in this critical refugia for Spring Run Chinook Salmon and Central Valley Steelhead. The Park Fire (2024) burned 19,290 acres in the project area, primarily in the Mill Creek drainage.

The upper watersheds of the WLHP have a high near-stream road density that contributes to both chronic and episodic sedimentation. Road crossings also contribute to habitat fragmentation and act as barriers to the movement of fish and other aquatic species The USFS road system was developed during a land management era that assumed a high level of road use, generally for timber harvest, and corresponding frequent maintenance. Analysis of 58 road crossings in the project area found 39 to be undersized and at risk of failure (Abramson et al. 2023). Road crossings also contribute to habitat fragmentation and act as barriers to the movement of fish and other aquatic species. Over 70 percent of crossings surveyed in the project area by Abramson et al. (2023) were found to be impassable for adult anadromous, adult non-anadromous, and juvenile salmonids. Post-fire effects exacerbated naturally high sedimentation in the anadromous occupied reaches of Mill Creek making it a high priority for restoration, and post-fire effects are likely to compound problematic roads and road-stream intersections, resulting in additional sedimentation and aquatic organism passage issues.

Recreation infrastructure (e.g., campgrounds and trails) in the WLHP also present sedimentation issues in its current condition. This includes campgrounds along the Deer Creek corridor and the Mill Creek and Pacific Crest Trails, which are important recreation assets for local communities and the public.

Desired Condition:

In collaborative workshops, project partners aligned on a vision for watersheds in the WLHP, including desired conditions for meadows, streams, riparian areas, anadromous fish habitat, and forest roads. Desired conditions for meadows include carbon sequestration in meadow soils, water tables near the surface through the dry season, and floodplain-connected streams that inundate approximately every 1-2 years. Under desired conditions, meadows will support rich populations of native species including diverse *Botrychium* spp. and dense thickets of mature willows where site conditions allow. Sierra meadows are biodiversity hotspots (Kattlemann and Embury 1996) that provide habitat for diverse fish and wildlife species, including several of conservation concern. The presence of key meadow bird species is a desired condition for meadows in the WLHP, as they are an indicator of meadow function and can be used as a measure of restoration success (Burnett and Fogg 2011). In the WLHP, restoring hydrologic function in meadows would provide benefits that would extend beyond the project area to

millions of downstream beneficiaries (Reed et al. 2020). There is a need to address the existing and ongoing hydrologic changes to meadows which, if left unmanaged, will result in further degradation and reduction in habitat complexity.

Desired conditions for headwater forests include a natural fire regime in which forests burn within their natural fire return interval, stand densities and species composition that are resilient to drought and fire disturbances, an abundance of appropriate riparian vegetation, and significant reductions in conifer encroachment in riparian corridors. Under desired conditions, streambanks would support abundant stands of riparian hardwood (e.g., willow, alder, black cottonwood, and aspen) that require sufficient sunlight and a lack of overtopping or encroachment by conifers. The project's integrated approach would improve the function of hydrological and ecological processes across the landscape through a combination of upland, riverine, and wetland restoration. Restoring the ecological function of aquatic environments in the project area in concert with forest restoration would significantly increase carbon sequestration capacity, improve regional climate change resilience, and decrease fuel continuity across the landscape.

A properly functioning watershed slows water and allows for greater infiltration and more substantial groundwater recharge. Desired conditions for the watersheds in the WLHP include the presence of habitats necessary for all fish life cycles within shaded streams providing cold, clean water, low sedimentation and runoff, and uninhibited fish passage. There is a desire for perennial stream habitat with unimpeded habitat connectivity, with beavers present and reproducing where possible, and reduced invasive aquatic species impacts (e.g., bullfrog, brook trout). Restoring water regulation capabilities and ecological function to degraded stream and meadow ecosystems, as well as road and culvert improvements to reduce sediment delivery to streams, would be key components of comprehensive landscape restoration benefitting anadromous species in these vital watersheds.

To protect anadromous habitat, the desired condition for forest roads includes reduced road-stream hydrologic connectivity, reduced stream diversion potential, unimpeded aquatic organism passage, and road crossings designed to accommodate 100-year flood flows. Needed watershed infrastructure improvements include implementing repair efforts to accelerate restoration in areas that were highly impacted by the Dixie Fire (focusing on safe access and facilities for the public), minimizing chronic-road related erosion on public lands, and addressing priority road crossings at risk of failure. Across the project area, there is a need to address the extensive existing NFS road network in the WLHP, portions of which are threatening watershed function and aquatic habitat due to lack of maintenance and improper road construction, alignment, or drainage. Similarly, there is a need to reduce the potential for sedimentation from recreation infrastructure, particularly in anadromous watersheds.

Purpose 3. Fire Management:

Prepare the landscape and wildland urban interface communities for planned and unplanned fires.

Need for Action: Wildfires are increasingly large and complex incidents in the western United States. To respond to the change in fire size and behavior we must plan projects to include fire management strategies. There is a need to define management actions and locations preemptively. Fuel breaks, access, and safety routes, as well as operational containment features need to be planned and completed to aid fire suppression and fuels management.

There is a need to reduce surface, ladder, and tree canopy fuels available to sustain high-intensity fires. Restoring fire as a beneficial disturbance across the landscape would promote conditions like those found under historic fire return intervals.

Existing Condition:

The diverse suite of ecosystems present in the West Lassen Headwaters has been molded by the interactions between fire and long-term climate trends, short-term weather patterns, existing vegetation, and topography. In this landscape of the northern Sierra Nevada, deep south-west facing gorges rise to peaks up to 9,000 feet. Prior to Euro-American settlement in the Sierra Nevada, fire was primarily ignited by lightning and indigenous peoples' burning practices. In lower elevations, fires were frequently started by indigenous peoples, such as the Mountain Maidu of the Feather River region, to actively manage the landscape. They used fire to improve forage for game species, clear areas for travel, and promote the regeneration of many useful plant species common to their homelands. Widespread and significant cultural relationships with fire were used to create forest structures carefully curated by indigenous communities across the Sierra Nevada (Klimaszewski-Patterson et al. 2018).

Through fire history studies and the knowledge of the trees and shrubs in the area, land managers can tell how the landscape likely burned prior to fire suppression. The pre-settlement fire regime in the WLHP was primarily frequent (0-35 years) low-mixed severity fire. Exceptions to that include pockets of montane chaparral, which didn't burn as frequently (0-100+ years), but burned at a higher, stand-replacing severity. Other pockets of lodgepole pine stands did not burn as frequently (35-100 years), but also burned in stand-replacing events. The higher elevation true fir stands (white fir, red fir) in the very northern project area and within LAVO had a 35–100-year average fire return interval and burned at mixed severity (LANDFIRE 2021).

Fire regimes were significantly altered following Euro-American settlement, first by the rampant burning by early settlers to encourage forage growth and then by the active exclusion of fire. The absence of fire resulted in an increase in forest fuel loadings and continuity across all fuel profiles (surface, ladder, canopy). In addition, conifer dominance has shifted to fire-intolerant trees. Exacerbated by the effects of climate change, this shift has increased the probability of large-scale, high-severity fire. Dry mixed-conifer forests in the northern Sierra Nevada now exhibit some of the most departed fire regimes in the range and burn much less frequently than they would have under a pre-settlement fire regime (Safford et al. 2017).

The lack of fire in the West Lassen Headwaters over the last 100 years contributes to an increased likelihood of high-severity and high-intensity fire effects when fire does occur in the project area. The 2021 Dixie Fire demonstrated this change in fire effects, with roughly half of the fire footprint within the project area burning at high severity. In addition to overall increases in acreage burned at high severity, the Dixie Fire exhibited larger patches of high-severity fire than would be expected in a pre-settlement fuels landscape – the largest of which exceeded 33,000 acres. There is a need for a cohesive fire management strategy to both restore the landscape following recent wildfires and prepare for when wildfire inevitably returns to the project area.

Overstocked forests and high tree mortality are of particular concern in drainages and around communities where the interaction between weather (southwesterly and northerly wind events) and topography result in vulnerability to high-severity fire. Following recent fires, much of the remaining fire hazard in the project includes steep slopes and drainages, as well as the western boundary of the project, which is experiencing increasing fire recurrence and changes in vegetation types.

Desired Condition:

Desired conditions for strategic fire management include the construction and maintenance of a network of strategically placed control features (e.g., fuelbreaks, prepared roadsides) on the landscape

to reduce the likelihood of fire moving from the ground into the overhead tree canopy and provide emergency escape routes, safety zones, and efficient movement of fire management resources within the treatment area. The placement and treatment of fire management features would depend on competing resource values around fire management routes. Collaborative members and fire managers desire to develop a comprehensive fire management strategy that spans watersheds and jurisdictions to provide significant decision space for fire managers to implement prescribed fire and protect values at risk during a wildfire.

In the wildland-urban interface, desired conditions are areas that are open and dominated by larger, more fire tolerant trees. Desired conditions for surface fuel loading are no more than 15 tons per acre outside the WUI and 10 tons per acre inside the WUI. There is a desire for crown separation in forested landscapes and a need to reduce hazardous fuels across the landscape and adjacent to potential control locations for future planned and unplanned ignitions. Additionally, desired conditions include those that allow for safe firefighter response (e.g., effective fuel breaks, fewer snags). To reduce risks to human communities, resources, and infrastructure, there is a need to modify existing vegetation in strategic locations through active management to support wildfire management operations and reduce the risk of fire to communities and other landscape values.

Across the landscape, the desired condition would support the reintroduction of prescribed fire at a spatiotemporal scale that mimics the NRV for fire frequencies and severities. There is a need to restore fire regimes to resemble pre-European settlement conditions, create a cohesive strategy for fire management, and reduce risks to human communities, resources, and infrastructure. Actions are needed to restore a resilient, heterogeneous ecosystem structure, prepare the landscape for the use of prescribed fire, and reestablish fire processes through landscape-scale efforts that support the natural range of fire severity and frequency.

The SNFPA outlines additional desired conditions for WUI, which is defined as an area where human habitation is mixed with areas of flammable wildland vegetation, and divides WUI into two distinct areas with different desired conditions. The WUI defense zone represents the areas near communities, higher densities of residences, facilities, safety routes, and recreation areas. Defense zones are determined based on historical fire spread and intensity, historical weather patterns, topography, and access; typically considered to extend ¼ mile from capital improvements (USDA 2004a, pg. 40). The WUI threat zone buffers the defense zone and generally extends 1 ¼ miles from the outer edge of the defense zone. The SNFPA describes desired conditions within the Defense and Threat zones (2004 SNFPA ROD pp. 40 and 41) as follows:

Defense Zone

- Stands in defense zones are open and dominated primarily by larger, fire tolerant trees.
- Surface and ladder fuel conditions are such that crown fire initiation is highly unlikely.
- The openness and discontinuity of crown fuels, both horizontally and vertically, result in very low probability of sustained crown fire.

Threat Zone

Under high fire weather conditions (97th percentile fire weather for this project) fire behavior in treated areas should exhibit:

- Flame lengths at the head of the fire are less than 4 feet.
- Rates of spread reduced to at least 50 percent of pre-treatment levels.

- Hazards to firefighters are reduced by managing snag levels in locations likely to be used for control of prescribed fire and fire suppression consistent with safe practices guidelines.
- Treatments are designed to enhance fire suppression tactics.
- Tree density has been reduced to a level consistent with the site's ability to sustain forest health during drought conditions.

Proposed Action

The proposed action includes a suite of treatments designed to meet one or more of the project needs. The proposed action also includes project level plan amendments to achieve desired landscape conditions (Appendix B) and integrated design features (IDFs) designed to minimize the potential for adverse resource effects (Appendix C).

The proposed action is described in the following sections, divided by the three purposes for the WLHP: (1) Forest Resilience, (2) Watershed Health, and (3) Fire Management. For each purpose, treatment types and methods are listed (with more detail in Appendix D), followed by a description of the conditions under which treatments would be utilized, and a summary of common conditions that would trigger a need for treatment. Treatments may be implemented in isolation, in combination with other treatments, following other treatments, or may be repeated to meet project objectives and maintain desired conditions.

Proposed Actions for Forest Resilience

The following proposed vegetation management actions would improve stand structure and species diversity of mixed conifer forests to reflect a more fire adapted and resilient ecosystem. Treatment would include a combination of the treatment types and methods including thinning (mechanical and hand), surface fuels reduction (machine and hand), and prescribed fire under the landscape conditions described below. Table 3 outlines the general proposed treatments across the project area with estimated acres. Treatments are based on existing conditions and subject to change with landscape conditions. Acre values in Table 3 do not include maintenance re-entries to sustain desired conditions. Maintenance would be included for all treatments listed in the table.

Mechanical treatment acres would be further refined for feasibility and to maintain sensitive areas and wildlife habitat (e.g., carnivore connectivity, riparian areas). Mechanical treatments may include follow-up surface fuel machine pile or chip and haul, tree and shrub hand or mechanical thinning, mastication or chip and haul, pile burn, or underburning. Mechanical treatment includes ground-based systems up to 35 percent slope (mechanical thinning, grapple piling, and mastication) or up to 50 percent with the approval of a hydrologist or soil specialist; and skyline/cable logging on slopes above 45 percent (see Appendix B for more information on this project-level plan amendment). Acres planned for mechanical thinning may be converted to hand thinning during implementation to protect resources on the ground.

Hand thinning would be used in areas inaccessible or off-limits to mechanical thinning or where hand-thinning is the most ecologically beneficial option. These areas include wet meadows, riparian areas excluded from mechanical treatments, steep areas with highly erosive soils, and wildlife land allocations excluded from mechanical treatments.

Prescribed fire is proposed throughout the entire project area in conjunction with other proposed actions but would be used alone (with targeted hand thinning treatments) in proposed wilderness, Cub

Creek Research Natural area and inventoried roadless areas, also called designated lands. Description of prescribed fire is included in the Proposed Actions for Strategic Fire Management section.

Table 4 lists acres of treatment proposed in various focus areas. Wildlife land allocation in the table represent goshawk and owl protected activity centers, owl territories, and fisher den buffer. Many focus areas overlap. For example, there are protected activity centers and owl territories within the wildland-urban interface. For this reason, the sum of these acres is greater than the total proposed treatment acres.

Table 3. Summary of proposed actions and acres for forest resilience

Proposed Action	Estimated Treatment Acres
Mechanical treatments (variable density thinning, fuels reduction, piling)	66,852
Hand treatments (variable density thinning, fuels reduction, piling)	7,422
Prescribed fire only with targeted hand thinning	27,197
TOTAL	101,471
Reforestation post mechanical treatment (including herbicide application)	4,404 (Dixie) 5,658 (Park)

Table 4. Treatment Focus Areas for Forest Resilience

Treatment Focus Area	Acres
Wildland-Urban Interface*	32,532
Designated Lands	27,197
Wildlife Land Allocations	39,298
Post-Fire Forest	44,001
Recreation and Infrastructure	260
General Forest	17,496

* Description of proposed actions in the Wildland Urban Interface are included in the Proposed Actions for Strategic Fire Management section.

Variable Density Thinning (VDT)

Stands identified to be outside of the range of natural variation and generally highly departed from a natural fire regime would be treated to increase forest resiliency to stand-replacing events, improve wildlife habitat, promote fire resilient tree species, improve growing conditions to favor larger diameter trees, and create more open forest conditions while retaining pockets of younger, healthy conifer trees.

Relative stand density index (rSDI) would be used to inform the type, application, and prioritization of treatments. rSDI measures relative inter-tree competition, or how crowded a stand is, and can be used to determine if a particular area would benefit from thinning. Stand density index (SDI) is based on a

combination of the size and number of trees in a stand and is typically used as a measure of relative density by comparing the existing SDI to the maximum SDI the stand could support based on forest types. Traditionally, a general forestry practice is to maintain stand stocking above 35 percent of maximum SDI to sustain stand growth, and schedule thinning harvests as a stand SDI approaches 60 percent of the maximum SDI to maximize harvest and avoid density-dependent mortality (Drew and Flewelling 1979). However, recent studies, such as North et al. (2022), suggest that historical mixed conifer stands that experienced frequent-fire disturbance regimes in the Sierra had relative SDI values that ranged from 23-28 percent of maximum SDI, suggesting low competition in historical stands. Based on the best available scientific information, the general target rSDI within the project area would be 25 to 35 percent, and rSDI above these levels would **trigger a need for treatment**.

Relative stand density values would vary depending on the resource values present in a stand. For example, denser forests would be retained within spotted owl and American goshawk protected activity centers and fisher and marten denning habitats. Landscape factors such as slope, slope position, elevation, and aspect would further inform tree density objectives. Treatments in the WLHP would be designed to create stands with higher rSDI on sites with greater soil moisture availability (such as drainages and north and east facing slopes), and promote lower rSDI values on drier, steeper slopes that are more drought-prone and have an elevated risk of experiencing large-scale, high-intensity fire effects (North et al. 2022).

Variable density thinning (VDT) prescriptions would be used to thin stands and maintain or create stand-level structural heterogeneity, promote development of diverse tree species, and enhance overall stand resilience to severe disturbances. Through individual tree removal, VDT restores or creates openings or gaps in the forest canopy, retains and promotes clumps of trees, and restores a variable-density "matrix" condition to the landscape. VDT would retain the oldest trees and some of the other large trees and snags with cavities, deformities, broken tops, or other habitat features of value to wildlife species. VDT would also accelerate growth of mid-seral forests toward late seral conditions (particularly in previously planted stands). Conifer trees less than 30-inches DBH would be thinned, though shade-tolerant conifer trees greater than or equal to 30 inches and less than 40 inches DBH may be removed to reach forest health density targets, see Appendix B. for more information.

Elements of variable density thinning include:

- Openings or gaps that are generally 0.1 to 3 acres in size created by thinning conifer trees. Gaps may make up approximately 10 to 20 percent of the project area.
- Clumps are dense pockets of trees where thinning is light or avoided to retain multi-tiered canopy with interlocking crowns. Clumps would include dense pockets of tree 0.1 to 0.25 acres in size and comprise up to 15 percent of the project area.
- The area between gaps and clumps is the matrix. Spacing between trees would vary within the stand based on forest type to mimic historic conditions and promote conditions favorable to low severity wildfire.

VDT treatments would be informed by concepts detailed in Pacific Southwest Research Station General Technical Reports (PSW GTRs) 220, 237, and 256 to improve resilience for stands within mixed conifer forest type and PSW-GTR 263 for stands in the red fir forest type. Most stands would be thinned mechanically, but hand thinning would be utilized to protect sensitive areas such as protected wildlife habitats or riparian areas and to avoid soil disturbance on steep slopes.

Mechanical thinning treatments that results in product removal would most likely occur in stands that are classified from 3M to 6 using the California wildlife habitat relationship (CWHR) classification system (see Table 5 and Table 6 for CWHR class descriptions). Mechanical and mastication thinning in more open stands (CWHR canopy classes S and P) and smaller tree size classes 1 and 2 would be used to reduce ladder fuels and tree densities as needed.

Table 5. CWHR tree canopy closure classes

Tree Canopy Class	Canopy closure (percent)
S	10 to 24
P	25 to 39
M	40 to 59
D	60 to 100
X	Not determined

Table 6. CWHR tree size classes

Tree Size Class	Tree Description	Diameter at Breast Height
1	Seedling	Less than 1 inch
2	Sapling	1 to less than 6 inches
3	Pole	6 to less than 11 inches
4	Small	11 to less than 24 inches
5	Medium to large	24 inches and larger
6	Multi layered	Size class 5 over size class 4 or 3; total tree canopy closure 60 percent or greater

Fuel Reduction

The goal of fuel reduction treatments is to remove excessive fuels from the landscape to modify potential fire behavior, to reduce the intensity and threat of severe wildfire, especially around communities, and to create a more resilient forest. Fuels reduction treatments would remove or modify canopy, ladder, and surface fuels. Canopy and ladder fuels would be treated using hand and mechanical thinning and mastication. Surface fuels would be piled by hand and machine and piles burned or masticated. Where feasible, biomass would be removed from the site. Prescribed underburning would also reduce surface fuels and kill, although not necessarily consume, live ladder tree and shrub fuels. See Appendix D for more details on fuels reduction methods.

Trigger for Surface Fuels: Inside the WUI (threat and defense zones), when surface fuels exceed 10 tons per acre (of which no more than 5 tons can be under 3 inches in diameter), managers would take action to reduce surface fuels to at or below 10 tons per acre.

Outside the WUI, when surface fuels exceed an average of 15 tons per acre (of which no more than 5 tons can be under 3 inches in diameter), managers would take action to reduce surface fuels to at or below 10 tons per acre. Higher values of down, woody material with a minimal diameter of 12 inches would be retained in PACs and marten or fisher den buffers to meet these species' needs for understory complexity.

Material 12 inches diameter and greater would be prioritized for retention in both zones. A log approximately 20 feet in length and 26 inches diameter is approximately 1 ton.

Wildlife Habitat

Wildlife land allocations proposed for treatment include California spotted owl (CSO) protected activity centers (PACs) and territories, American goshawk PACs, fisher and marten den buffers, and forest carnivore habitat. Thinning treatments in wildlife habitat would utilize mechanical VDT described above with some key differences described in this section. Within some wildlife areas, such as PACs, mechanical treatments are permitted under certain conditions, whereas mechanical equipment is excluded from other, more sensitive wildlife areas like CSO and goshawk nest buffers and fisher den site buffers.

Table 7 lists acres of wildlife habitat designated prior to the Park Fire. PACs and owl territories will be evaluated and redrawn as needed based on post-Park Fire conditions. Due to similar habitat requirements, owl and goshawk PACs, owl territories, and fisher den buffers areas overlap in many places. Acres listed in the table are greater than the actual total.

Table 7. Wildlife habitat within the project area

Habitat Area	Acres
California Spotted Owl PAC	11,301
American Goshawk PAC	5,020
California Spotted Owl Territory*	37,797
Fisher Den Buffer	705

***The CSO territory encompasses the 300-acre CSO PAC and 10-acre nest core area.**

California Spotted Owl and American Goshawk

Protected Activity Centers

California spotted owl (CSO) and American goshawk habitat is managed through the establishment of land allocations known as protected activity centers (PAC). PACs are delineated to protect and maintain high-quality CSO and American goshawk nesting and roosting habitat around active nest sites. PACs may be modified based on biophysical conditions, disturbance events, or a lack of occupancy following surveys (USDA-FS 2019).

CSO PACs are delineated to include known and suspected nest stands and encompass the best available 300 acres of habitat in as compact a unit as possible. American goshawk PACs are delineated to include known and suspected nest stands and encompass the best available 200 acres of forested habitat in the largest contiguous patches possible.

In accordance with USDA – FS 2019 (*Conservation Strategy for the California Spotted Owl in the Sierra Nevada*), all treatments in CSO PACs would be designed to minimize near-term impacts to CSOs while increasing the probability that PACs would maintain suitable habitat following a wildfire. Specifically, these treatments would reduce fuels and small tree density to manage for low- to moderate-intensity fires (flame lengths less than 4 feet and 6 feet, respectively) and promote the retention, growth, and recruitment of larger trees and snags (at least 24 inches and at least 36 inches DBH, respectively). As such, treatments are proposed in CSO PACs provided that certain forest structural conditions critical to CSO reproduction and occupancy are maintained.

The justification supporting treatments in American goshawk PACs is very similar to that of treatments in CSO PACs. The management strategy of treating within American goshawk PACs follows the best available science indicating that goshawk nesting and reproduction is most closely associated with habitat conditions at a small (30 acres) spatial scale (Bruggeman et al. 2023) and that when dense, mature forest associated with goshawk nesting is overabundant, nesting habitat, as well as suitable goshawk habitat across the landscape, is at significant risk of being lost to high-severity wildfire (Blakey et al. 2020). Further, goshawks have been shown to utilize a broad range of forest structure and seral stages outside of nest stands (Reynolds et al. 2006). Together, this information strongly suggests that the proposed treatments within goshawk PACs would provide increased fire resilience while maintaining sufficient suitable or high-quality nesting habitat to support goshawk reproduction and population viability.

CSO and American goshawk habitat conservation would include actions to retain stands with late seral habitat attributes (e.g., large standing trees, snags, and down logs, high canopy cover, etc.) that compose the highest quality nesting and roosting habitat while increasing the resiliency of habitat to climate change and severe, stand-replacing disturbances. For PACs within the WUI, this objective would be balanced with the need to reduce the risk of high-severity wildfire to surrounding communities. PACs in the WLHP would be managed to increase long-term, sustainable CSO and American goshawk habitat development in a dynamic landscape.

Treatments within PACs would include mechanical treatment, hand treatment, prescribed fire, fire management features, or a combination of these activities. Specific treatment areas would be laid out by the Forest Wildlife Biologist and Fuels Specialist based on fuel loading and the risk of losing historical nest trees and key ecosystem characteristics (e.g., greater than 24 inches DBH trees, and snags and logs greater than 15 inches diameter) to wildfire or other stand-replacing disturbances. Treatments within the 10 acres surrounding the three most recently used nests in a California spotted owl or American goshawk PAC would be limited to hand thinning and prescribed fire. Within PACs, a VDT prescription would focus on developing late seral habitat features outside of late seral closed canopy habitat (CWHR 5D and 6) while promoting fire resilient conifers and encouraging their regeneration. Where necessary to increase long-term resilience, vegetation treatments that reduce habitat quality would be permitted in a maximum of 1/3 of a PAC (up to 100 acres for CSO PACs and up to 66.6 acres for American goshawk PACs) and would only be implemented outside of the highest quality nesting and roosting habitat, CWHR size and density classes 6, 5D, and 5M. Prescriptions and design elements for VDT in PACs would be developed to:

- Retain connected areas of moderate (at least 40 percent) and high (at least 60 percent) canopy cover between the known nest sites (if current nest site is not known, the most recent known nest site will be used) and other areas of moderate and high canopy cover in the rest of the PAC.

- Retain an adequate amount and distribution of mid-story, fire-resilient conifers during thinning treatments to provide for long-term recruitment of large overstory trees that are important habitat elements for CSO and American goshawk nesting.
- Avoid mechanical treatments in the 10-acre nest core area surrounding the most recent known nest sites at the discretion of the wildlife biologist; Hand thinning and prescribed fire could be used in the 10-acre area surrounding the nest.
- Include clumps and matrix thinning, with creation of openings or gaps not to exceed 0.25 acres in size; avoid creating new landings or new temporary roads.
- Increase the quadratic mean diameter (QMD) of trees at the PAC scale.
- Maintain the average canopy cover of the PAC above 50 percent in the general forest, and above 40 percent in the WUI, including large clumps of more than 70 percent canopy cover (e.g., nest core areas) as per the project level plan amendment (Appendix B). In PACs, canopy cover and tree density would tend toward the upper end of the range the site can support.

When practicable, fire would be used as the primary tool for achieving restoration goals within PACs. Prescribed fire treatments would include pile burning and underburning. Underburning would be designed to minimize effects to existing habitat features such as down logs, large trees and snags, and clumps of trees, while promoting new habitat features where they do not currently exist. Piles would be made mechanically or by hand. Pile location and size would be based on existing conditions, with piles placed outside of nest core areas. See Appendix D for a description of the methods listed above.

PAC treatments would vary depending on the existing condition and geophysical location of the PAC and would be designed to maximize, restore, and protect the habitat value that exists. Following guidance in USDA (2019) and the best available science related to American goshawk reproduction as it relates to silvicultural treatments, **triggers for treatmen**t in PACs would be based on an assessment of risk level of the PAC to high-severity wildfire or severe tree mortality and the likelihood of reproductive success of the PAC, which relates directly to the viability of American goshawk and CSO populations. **Triggers** that would indicate a high level of risk to severe disturbance include: (1) projected flame lengths greater than 4 feet under 90th percentile weather conditions, (2) high potential for crown fire initiation and spread, and (3) high density of smaller diameter trees. PAC treatments will be prioritized following USDA (2019) such that the least productive PACs, often characterized by marginal CSO or American goshawk habitat, would be treated first and most intensively to foster the regeneration of high-quality nesting and roosting habitat while productive PACs would either be avoided or treated later in time and least intensively to avoid detrimental effects on species reproduction and viability (see Appendix B for more detail).

Within nest core areas, the objective is to bring fuel loads to a level that would allow these sensitive areas to burn at low severity, thus minimizing the potential loss of overstory trees and reducing the likelihood of crown fire ignition. Where necessary, hand thinning, piling, and pile burning would be used to reduce surface and ladder fuel density to reduce the likelihood of crown fire. Activities could also include raking around key habitat structures and pruning tree limbs to reduce ladder fuels.

In PACs, all conifer trees 30 inches DBH and larger would be retained except where removal is necessary for safety and operability. Snags 15-inches DBH and larger would be retained within the limits of operability and safety. Down logs 12-inches in diameter and larger would be retained at no more than 10 tons per acre in the WUI and 15 tons per acre outside the WUI. With VDT, clumps may be placed in areas with higher densities of larger snags (greater than 15-inch DBH) and down logs (greater than 12-

inch DBH) to protect them during operations. To promote snag recruitment, defective trees greater than 24 inches DBH would be retained in mechanically treated areas at about two per acre. New openings or landings larger than 0.25 acre would not be created in PACs.

California Spotted Owl Territories

A spotted owl territory is the area defended by a resident pair of owls from other owls of the same species (USDA-FS 2019). It consists of nesting, roosting, and foraging habitat and is approximately 1,000 acres in size, which includes the 300-acre PAC, for owls in the north and central Sierra Nevada national forests (USDA-FS 2019). Territories are generally mapped as a circular area around an activity center but "may be adjusted to be noncircular, as needed, to include the most sustainable areas of high-quality habitat and exclude areas less likely to support suitable habitat" (USDA FS 2019 p. 28). This land allocation is specific to CSO and no similar land allocation exists for the American goshawk on the LNF.

The primary objectives in treating owl territories are to reduce stand density to improve resiliency to large, severe wildfires and other disturbances and to increase heterogeneity through clumps and gaps while providing enough nesting, roosting, and foraging habitat in a well-connected network to provide for sustainable long-term territory productivity. The largest trees available would be kept in the mid and upper canopy. Enough fire-resilient mid-story conifer trees would be retained to provide for continued recruitment of overstory trees that are critical to CSO nesting and reproduction. Relative stand density index would be brought down to 35 to 50 percent of maximum, with the higher end of that range selected for stands that contribute to nesting, roosting, and foraging habitat availability and connectivity. Treatments would include the following.

- 40 to 60 percent of a territory, depending on site conditions, would be maintained and promoted in mature tree size classes with moderate and high canopy cover for nesting, roosting, and foraging. This corresponds to roughly the following CWHR size/density classes in descending order of priority: 6, 5D, 5M, 4D, and 4M. Growing conditions in the project area are wetter and more capable of naturally supporting a greater amount of dense, mature forest relative to other areas within Sierra Nevada national forests supporting CSO populations. As such, 60 percent of a territory would be maintained in suitable CSO habitat where it exists. Where territories do not contain 60 percent suitable habitat, all habitat would be retained. The remainder of the territory would represent a diversity of many different structure and canopy cover classes. Where territories are within the WUI defense zones, 40 percent of the territory would be maintained in suitable habitat where it exists. Small openings consistent with the natural range of variation (0.1-0.74 acres; from Safford and Stevens 2017) to increase heterogeneity for foraging owls and other wildlife would be created. These openings would generally not exceed 0.5 acres and would be larger towards the periphery of the territory.

- Temporary roads within territories would not exceed 1 mile in length.

Following guidance in the 2019 CSO strategy, adaptive management would guide actions in the WLHP. The strategy outlined above may need to be changed to adapt to new scientific findings or monitoring outcomes. **A list of triggers** that would likely warrant a change in management include but are not limited to: CSO occupancy declining significantly over space or time, the risk of high-intensity fire or extensive tree mortality increasing significantly in occupied CSO territories (USDA-FS 2019).

California Spotted Owl Habitat Connectivity

The connectedness of areas containing suitable CSO habitat is critical to providing habitat conditions that support a viable CSO population. This connectivity should occur within PACs, territories, and in the greater landscape to provide for species movement and dispersal. In accordance with the Conservation Strategy for the California Spotted Owl in the Sierra Nevada, treatments would be designed to facilitate movement between patches of suitable habitat at multiple spatial scales, particularly outside of CSO PACs and territories where CSO habitat retention is not explicitly guided by specific Forest Service standards and guidelines.

Carnivore Habitat

Sensitive habitat documented to support the reproduction of late-successional carnivore species, specifically Pacific marten and fisher, would be maintained through the protection of den buffers. For marten and fisher dens, 100 and 700 acres around known den sites, respectively, will be managed according to guidelines established in the 2004 SNFPA ROD and reiterated in the carnivore specific IDFs (Appendix C).

Pacific marten and fisher habitat outside of protected den buffers would be maintained within the WLHP area through the identification and protection of a network of estimated carnivore habitat cores and corridors between habitat cores (referred to hereafter as the carnivore habitat network) that was developed using available animal location data, empirical habitat quality and connectivity models specific to both species, and stand-level data. This exercise was conducted at a landscape scale to ensure connectivity between high quality denning habitat areas inside and outside of the project boundary.

Den Buffers

Treatment within marten and fisher den buffers would only occur when den buffers overlap WUI defense or threat zones. The objective of treating den buffers within WUI is to reduce the risk of stand-replacing disturbance without compromising the ecological function of the area as a denning site to either species. This would entail retaining high-quality denning habitat where it exists and treating overly dense stands of suitable denning habitat at high risk of stand-replacing disturbance. Treatments within den buffers would be done in consultation with a wildlife specialist and would be implemented outside of limited operating periods for these species.

Treatments within marten and fisher den buffers would involve hand thinning and, in limited instances, underburning and pile burning to reduce surface and ladder fuels. Large trees, snags, and large down logs would be retained. Treatments would not remove marten or fisher habitat from suitability, as defined by CWHR types 4D, 4M, 5D, and 5M for marten and 4D, 5M, and 5D for fisher.

Triggers for treatment within marten and fisher den buffers would include surface and ladder fuel loads resulting in an unacceptably high probability of stand-replacing disturbance and complete habitat loss for these species.

Carnivore Habitat Network

The primary objective of treatments within the carnivore habitat network is to maintain a well-connected network of suitable and high-quality denning and foraging habitat for marten and fisher while reducing the likelihood of stand-replacing wildfire, disease, or insect outbreaks. Treatments within the carnivore habitat network would be more extensive than within den buffers but would retain adequate

forest structural complexity in a specific spatial arrangement to provide for efficient animal movement and dispersal both within and through the WLHP area.

Treatment types within the carnivore habitat network would include mechanical thinning, hand thinning, machine and hand piling and burning, and mastication. A minimum of 40 percent canopy cover would be retained in suitable habitat except where carnivore cores overlap fuelbreak treatments. In such cases, all vegetation greater than 2 feet tall would be removed within 50 feet of the fuelbreak feature (e.g., road) and 40 percent canopy cover would be retained within 50-200 feet of the fuelbreak feature. Salvage harvest of standing burned trees may not be permitted in specific areas as needed for habitat connectivity. Large trees, snags, and large down logs would be retained within harvest units to provide Pacific marten and fisher with resting and denning sites in thinned stands. Additionally, in treatment units within the carnivore habitat network with post-treatment canopy cover less than 60 percent where fuel piling would occur, one pile of logs and large coarse woody debris per acre would be retained. Piles would not be retained within fuelbreak treatment units.

Triggers for treatment within the carnivore habitat network include high tree densities and surface and ladder fuel loads resulting in a high likelihood of crown fire spread and marten and fisher habitat loss. Treatments within the carnivore habitat network would be triggered at a lower threshold and would be more extensive than treatments within den buffers.

Hardwood Release

Thinning treatments would also be used to enhance growing conditions and increase sunlight for oak, aspen and riparian hardwood trees (e.g., cottonwood, willow). Actions would improve wildlife habitat for hardwood and riparian-associated species and restore naturally functioning ecological processes of hardwood communities. Field reconnaissance and riparian assessments would be implemented to identify and assess the conditions of hardwood stands throughout the WLHP.

Overtopping and encroaching conifer trees would be removed from under oak trees and 30 feet from the dripline of oak trees or clumps of oak trees. The largest available, healthy conifer trees, preferably without dwarf mistletoe infection, would be kept beyond the 30 feet to meet stand density targets. Conifer trees would be retained closer to oak trees where there are so many oak trees that all conifers would be removed under the 30-foot prescription. Retaining conifers closer to oak trees would ensure that the mixed hardwood-conifer forest habitat remains.

Field reconnaissance of the WLHP identified 125 stands of aspen for a total of about 167 acres. Conifer trees would be mechanically removed in and around aspen trees and stands of aspen for up to 200 feet from the most distal aspen stem depending on topography for a total of approximately 1,000 acres of potential aspen enhancement. The largest, healthy conifer trees would be kept at approximately 20 square feet per acre of basal area where they do not directly compromise sunlight availability to aspen trees. White fir and lodgepole pine trees would not be retained.

Conifers that cannot be removed by mechanical means from hardwood stands would be removed by hand-thinning. The fuels generated from hand treatment would be mechanically piled or hand-piled and piles burned or lopped and scattered. Fuels piled for burning would be piled more than 25 feet from the outermost aspen tree or shoot. After mechanical and hand thinning treatments have been completed, prescribed fire would be allowed during prescribed burning operations in adjacent uplands. After aspen treatment, temporary fencing may be placed to protect new shoots from browsing as needed. Any fences installed prior to underburning activities would be protected.

Overtopping and encroaching conifer trees would be removed from under riparian hardwood trees and 30 feet from the drip line of hardwood trees.

Triggers for treatment of oak, aspen and riparian hardwood trees are stands with an excess of encroaching conifers overtopping hardwood trees and excessive fuel loading indicative of high wildfire susceptibility.

Hazard Tree Removal

Hazard trees are trees that have a risk of falling, in whole or in part, and injuring people or damaging property. Removing hazard trees within the project would improve public safety and facilitate forest restoration and fire management by providing safe conditions for forest workers.

Hazard tree removal involves identifying, felling, and removing hazard trees capable of striking Forest Service system roads, trails, or structures and removing felled trees from past fire suppression or rehabilitation activities along high-use roads (operational maintenance level 2, 3, 4, and 5 NFS roads and county roads), within and adjacent to developed facilities on NFS lands, along NFS trails where standing or down trees pose a safety risk, and along private property boundaries where dead and dying trees present a threat to life or property. Where the transportation of material off-site is infeasible or impractical, hazard tree removal may also involve felling only, on-site chipping, hand or mechanical piling, and pile burning.

Hazard trees would be identified and removed by following the hazard tree rating guidelines outlined in Forest Health Protection Report RO-22-01 'Hazard Tree Identification and Mitigation' (USDA – FS 2022b) and "Marking Guidelines for Fire Injured Trees in California" (Smith and Cluck 2011).

Steep Ground

Management activities conducted on steep (greater than 35 percent) slopes would be designed to shift forest conditions toward NRV and reduce wildfire risk while avoiding soil disturbance on steep slopes. The WLHP is composed of many steep slopes leading down into major perennial streams and effective landscape-scale restoration of NRV conditions and wildfire risk reduction necessitates treatments in these areas.

Treatment on steep slopes would be focused on excessive fuel loading and tree density that is greater than what the site can support. Slopes greater than 50 percent would be treated with hand thinning and piling, with the option for cable logging with the approval of soils and silviculture specialists. Steep ground between 35 to 50 percent slope would be considered for ground-based mechanical thinning or cable logging pending an analysis of the effects of a steep-slopes logging pilot program as described in Appendix C.

In the WLHP, mechanical equipment will not operate on slopes greater than 35 percent with rhyolitic soils, as specified in the LNF LRMP (USDA – FS 1992). The restriction was put in place due to the inherent nature of high silica volcanic rock, rhyolite, to form soils that lack cohesion and have an elevated tendency to displace easily and erode. The rock itself is often porous, low density, and easily transported as gravel-sized fragments, or can occur as loose unconsolidated material. An extensive erosion study conducted in the Battle Creek Watershed, the headwaters of which is included in the WLHP, found that rhyolitic soils were as much as twice as erodible as soils that formed on other parent materials (Terraqua 2018). See the *Rhyolitic Soils* map in Appendix A for more information.

Table 8 summarizes treatments on slopes greater than 35 percent with approximate acres across the project area and all treatment types.

Table 8. Summary of proposed treatments on slopes greater than 35 percent

Category	Treatment Type	Acres
Steep Ground (35%-50% Slope)	Hand VDT and Piling	6,124
Steep Ground (35%-50% Slope)	Mechanical VDT and Piling	11,192
Steep Ground (35%-50% Slope)	Prescribed fire only with targeted hand thinning	1,326
Steep Ground (>50% Slope)	Hand VDT and Piling	7,959
Steep Ground (>50% Slope)	Mechanical VDT and Piling	0
Steep Ground (>50% Slope)	Prescribed fire only with targeted hand thinning	906

Designated Lands

In the WLHP, the *Designated Lands* treatment focus area includes Inventory Roadless Areas (IRA), Proposed Wilderness, and a Research Natural Area (RNA). These are designated NFS lands with special management protections, which in some cases alter the treatment types or methods that can be applied to achieve desired conditions. Additional sideboards and triggers for treatment in these areas are described in the sections below. All designated lands in the project area would receive the same general treatment of prescribed fire and targeted hand thinning, except for additional fire management treatments proposed in the RNA (described below). Table 9 lists the number of acres of designated lands in the WLHP.

Table 9. Designated land acres within the project area

Designated Land Type	Acres*
Inventoried Roadless Area*	12,244
Proposed Wilderness	11,013
Research Natural Area	3,939
Total Designated Lands	27,197

***Acres outside Proposed Wilderness and Research Natural Area**

Inventoried Roadless Areas

The WLHP includes portions of the Butt Mountain, Cub Creek, Mill Creek, and Wild Cattle Mountain IRAs. The portions of these IRAs in the project area total 25,509 acres (portions of the IRA also overlap the Proposed Wilderness and RNA). Wild Cattle Mountain IRA is north of highway 36, and Mill Creek, Cub Creek, and Butt Mountain IRAs are all located south of highway 36. The topography of these areas is characterized by mountainous terrain and steep river canyons and the dominant forest type is mixed conifer with red fir at the higher elevations. IRAs are managed according to the 2001 Roadless Area

Conservation Rule (36 CFR 294) that generally limits timber harvesting and road building. However, "generally small diameter timber"[3] may be cut, sold, or removed in IRAs when needed to restore ecosystem structure and function, such as reducing the likelihood of uncharacteristic wildfire effects or if the treatment would maintain or improve roadless area characteristics defined in the 2001 Rule (Riddle and Vann 2020).

The management objective in IRAs is to provide protection for roadless area characteristics consistent with the 2001 Roadless Area Conservation Rule (36 CFR 294), by maintaining or restoring ecosystem composition, structure, and function. Proposed actions in the WLHP IRA will focus on restoring the ecological role of fire and minimizing impacts of severe disturbances on roadless area characteristics, including high quality soil, water, and air, sources of public drinking water; diversity of plant and animal communities, habitat for threatened, endangered, proposed, candidate, and sensitive species, and natural appearing landscapes with high scenic quality (36 CFR 294).

A primary objective in IRAs is to safely re-introduce fire to reduce surface and ladder fuels, reduce the risk of severe wildfire impacts, and reduce competitive stress on trees to make stands more resilient to severe disturbances. Treatments in IRAs will maximize application of prescribed fire where conditions allow for acceptable fire-caused tree mortality and manageable rates of fire spread. No mechanical thinning would occur in IRAs in the WLHP. Additionally, no new permanent or new temporary roads would be constructed in IRAs.

Proposed Wilderness Areas

Proposed Wilderness Areas in the WLHP include Wild Cattle Mountain and portions of the Heart Lake and Mill Creek Proposed Wilderness, totaling 10,998 acres. These areas were designated as "Further Planning Areas" in the 1972 Roadless Area Review and Evaluation (RARE II) and were recommended to Congress to be designated as wilderness areas. The management direction for these areas is to protect wilderness qualities until a final decision is made by Congress. This means that management activities in Proposed Wilderness Areas must be conducted according to the Wilderness Act of 1964 and the wilderness prescription in the LRMP, which prohibits mechanized equipment and timber harvesting (LRMP 4-76). The primary objective in Proposed Wilderness Areas is to preserve wilderness character (i.e. undeveloped and untrammeled areas) while allowing for the return of natural fire regimes and the re-establishment of a fire-adapted forest. In the WLHP, Proposed Wilderness Areas would receive the same types of treatments as IRAs. There is spatial overlap between Inventoried Roadless Areas and Proposed Wilderness Areas. Underburning and hand thinning for control line construction and trail maintenance are proposed in the wilderness areas for the WLHP.

Research Natural Area

The project encompasses the 3,939-acre Cub Creek Research Natural Area (RNA), which was designated to protect an example of mixed-conifer forest for scientific study and education, and for maintenance of biological diversity (Taylor and Randall 1978). The Cub Creek RNA is characterized by moderately steep topography and cliffs formed from weathering resistant volcanic rocks.

The USFS RNA system protects sensitive ecological features and preserves relatively undisturbed ecosystems on selected NFS lands. These preserved areas provide a reference condition, and the RNA

[3] "Generally small diameter timber" is referred to in 2001 Rule, Section 294.13. The FS specified in 2001 Rule, p. 3257, that a description of what constitutes generally small diameter timber is not specified.

designation requires that the focal features are treated with minimally invasive management practices, and only if approved by the regional RNA committee. The legacy of fire exclusion on NFS lands means that RNAs are burning less frequently than they would have with natural disturbance regimes (Coppoletta et al. 2019). In the Cub Creek RNA, known recorded wildfires include a 1926 fire that burned about 500 acres of the RNA and the 2008 Cub fire that burned through the entire RNA at mixed fire severity. The 2021 Dixie Fire burned less than a mile from the eastern edge of the Cub Creek RNA.

Treatments in the RNA would employ minimally invasive techniques to reduce an unnatural accumulation of fuels and facilitate the site's realignment with a state that is resilient to future disturbances. Specific activities in the Cub Creek RNA would include underburning, use of the Pacific Crest Trail (PCT) and connector trail 511 as control lines, and the development of a prescribed fire plan.

To support the application of prescribed fire in the Cub Creek RNA, improvements would be made to the PCT, which runs along the eastern edge of the RNA, and constitutes the eastern boundary of the project, and trail 511 along the southern boundary of the RNA and project. Actions would include cutting shrubs greater than 2 feet tall and conifer trees less than 12 inches DBH within 30 feet from the centerline of the trails and cutting hazardous snags and live trees within 200 feet from the centerline of trails so that they could be used as control lines (except where the project boundary is less than 200 feet from trail 511, then hazardous snags would be cut up to that boundary). Material from thinning treatments would either be scattered or piled, and piles burned. Areas of heavily concentrated fuels along the trails may be mechanically piled, following IDFs listed in Appendix C. The length of this treatment would be approximately 3 miles long.

In addition to construction of a control line within the RNA, fireline preparation work would include designation and maintenance of fire management routes that are located outside, but adjacent to the RNA to improve them as control features (described in the *Fire Management* section). These fire management features would support the application of prescribed fire, as well as improve opportunities for management of unplanned ignitions in proximity to the RNA.

Herbicide

In the WLHP, herbicide application would be considered under two conditions: (1) as site-preparation and post-planting release treatments in reforestation units to improve seedling success by controlling competing vegetation, and (2) to control invasive plant species at the discretion of the Forest Botanist.

Herbicide would be applied using a backpack sprayer for broadcast treatments for site preparation. Direct application using backpacks would be utilized for release treatments. No aerial herbicide application is proposed. Herbicides would be applied in accordance with product label directions, California Department of Pesticide Regulations requirements, U.S. Environmental Protection Agency requirements, and Forest Service best management practices for water quality. Descriptions of proposed herbicide application methods, such as foliar application and spot spraying, are listed in Appendix D. Herbicide application would be constrained by integrated design features such as buffers from streams, sensitive and special interest plant species, private property boundaries, and other restrictions (Appendix B). The Forest would take measures to minimize human exposure, including the use of personal protective equipment, controlled access to treatment areas, wind and precipitation application restrictions, droplet size specifications, and signage at public access points. Buffers to streams could be greater than the minimum dictated by law; they would be determined based on what is best for the site. Examples of site-specific factors that can influence buffer size are the species of amphibians that have suitable habitat in the area, soil type (some soil types are more mobile or well-

drained than others), and recent severity of burn or other disturbance (burn severity affects soil mobility and infiltration). Specific restrictions are outlined in IDFs (Appendix C).

The proposed types of herbicide and application rates are outlined below in Table 10 and Table 29. Herbicide Characteristics and Application Considerations. Additional details for herbicide use as a tool for invasive species management and reforestation can be found in Appendix D. Treatment Methods. Location and timing of herbicide application would be made available to the South Lassen Watersheds Group and to the broader public. Future invasives treatments could potentially use any herbicide analyzed with this project.

Table 10. Proposed herbicides, application rates, and application types

Herbicide Active Ingredient **(measured as active ingredient (a.i.) or acid equivalent (a.e.)**	**Proposed Use**	**Expected Application Rate** **(pounds a.i. or a.e. per acre)**	**Maximum Application Rate** **(pounds a.i. or a.e. per acre)**	**Application Method**
Aminopyralid (a.e.)	Invasives	0.078	0.11	Directed, Select
Chlorsulfuron (a.i.)	Invasives	0.065	0.25	Directed, Select
Glyphosate (a.i.) aquatic and non-aquatic formulation	Invasives	2.00	8.00	Directed, Select
Glyphosate (a.i.) aquatic and non-aquatic formulation	Reforestation site preparation	2.00	8.00	Broadcast in tank mix with Imazapyr or Indaziflam
Glyphosate (a.i.) aquatic and non-aquatic formulation	Reforestation release	2.00	8.00	Directed
Imazapyr (a.e.) oil soluble	Reforestation site preparation	0.45	1.25	Broadcast in tank mix with Glyphosate
Indaziflam (a.i.)	Reforestation site preparation	1.33	1.905	Broadcast in tank mix with Glyphosate
Triclopyr (a.e.)	Invasives	1.00	6.00	Directed, Select
Triclopyr (a.e.)	Reforestation release	1.00	6.00	Directed

Types of herbicide application outlined in Table 10 includes directed, select, and broadcast. See Appendix D. for definitions of these application methods.

Application rate ranges are those analyzed in SERA risk assessments, which considers likely USFS application methods and label recommended rates. Surfactants and marker dyes may be added to any herbicide application, unless limited by specific project design features. Surfactants are adjuvant compounds that enhance absorbing, spreading, sticking, and other properties of herbicides, allowing for use of lower application rates (SERA 1997, USDA FS 2021b). Marker dyes are used to visually confirm the location of the herbicide application. This assists applicators in limiting application to target plants and reduces the risk of application to non-target organisms and areas.

Post-Disturbance Forest

Ecological disturbances such as fire, drought, insect outbreaks, and disease are natural phenomena that drive successional dynamics in Sierran forests. However, warming temperatures, drought, and the dense vegetative conditions in the Sierra Nevada are expected to result in compounding disturbances that synergistically increase threats to ecosystem function. The water contained in the snowpack has declined by 50 percent in much of the Sierra Nevada landscape (USDA-FS 2022a). Increasing temperatures contribute to increasing drought conditions. These climatic trends are expected to continue to produce a hotter climate in the future. Current trends of increasing fire activity and severity are predicted to continue (ibid).

Actions are often needed to move post-disturbance landscapes to a state in which there is a high likelihood of stands regenerating to conditions resilient to stand-replacing disturbances and anticipated climate change. For example, post-fire stands are often characterized by excessive fuel loads conducive to high-severity fire. Similarly, residual trees in stands that have undergone a major insect or disease outbreak may continue to harbor pathogens, increasing the likelihood of future outbreaks within the stand. Post-disturbance treatments would be based on the natural range of variation, incorporating climate change scenarios. An example of this is the post-Dixie fire treatments described in the next section.

Post-Fire Burned Forest

Historically, small patches of high-severity fire were relatively common in Sierran mixed conifer forests, playing an important ecological role in regeneration, especially for shade-intolerant species like pine (Coppoletta et al. 2022). In the WLHP, high-severity patches that are greater than 250 acres are considered highly departed from NRV (Coppoletta et al. 2022, Meyer et al. 2021). High-severity patches 100 to 250 acres in size are moderately departed, based on this size being at the upper end of the NRV for these forest types (Safford and Stevens 2017, Coppoletta et al. 2022).

In the 44,043 acres of NFS lands in the WLHP that burned in the Dixie Fire and Park Fires, actions would be taken where they are needed to realign the forest within the natural range of variation (NRV). Proposed actions in burned forest would be guided by recommendations outlined in the Region 5 Ecology Program's *Postfire Restoration Opportunities for Conifer Forest in the Dixie and Sugar Fires* (Coppoletta et al. 2022), the 2021 *Post-Fire Restoration Framework for National Forests in California* (PSW-GTR-270; Meyer et al. 2021), and PSW-GTR-256 (Safford and Stevens 2017).

In alignment with Coppoletta et al. (2022) this project considers two criteria to identify areas where fire effects are outside of NRV: (1) high-severity patch size, and (2) predicted conifer regeneration. In some areas within a fire perimeter, management actions are needed to facilitate forest recovery. To identify opportunities for reforestation within the Dixie Fire, Coppoletta et al. (2022) overlaid large high-severity patches (>100 acres) with areas that had low-moderate potential for natural regeneration (<60 percent probability) or high potential for natural regeneration (>60 percent probability). Approximately 4,404

acres within the WLHP that are outside of designated lands and fall on slopes less than 50 percent have been identified for potential reforestation using Coppoletta et al. 2022. A similar process for the Park Fire considered: (1) high-severity patch size, and (2) operability based on slope. Approximately 5,658 acres were preliminarily identified for potential reforestation within the Park Fire footprint. Reforestation actions would be further refined based on conditions on-the-ground.

Within recent fire footprints, there are also acres that are either unburned or burned at low to moderate severity or are patches of high severity that are less than 100 acres in size. Proposed treatments in these areas include reduction of surface and ladder fuels, removal of live and dead trees, and prescribed fire. **Treatment triggers** in such areas include high relative stand density, the presence of disease or pathogen-infested trees, excessive snags, high surface fuel loading (especially within WUI defense and threat zones), and tree species composition still influenced by fire suppression such as in meadows and aspen stands. Restoration treatments would follow guidance in Coppoletta et al. (2022) and incorporate actions described for forest resilience and wildland urban interface.

In alignment with NRV, up to 15 percent of the landscape can remain in high tree mortality patches (i.e., standing snags), with most patches less than 100 acres. When high mortality exceeds 15 percent of the landscape, managers would take action to restore forested landscapes by cutting snags (salvage, biomass removal, piling), reducing fuels (piling, pile burning, underburning), and promoting growth of native tree species suitable for the location (planting trees, care of natural regeneration). The 15 percent of high mortality patches that would not be treated would be identified based on the retention of high-quality foraging and nesting habitat patches for burned forest associated woodpecker species, most notably the black-backed woodpecker.

In areas where dead trees pose a significant threat to roads, infrastructure, or public/firefighter safety and areas within WUI threat and defense zones that present a significant threat of reburning and future high-severity wildfire, treatments would include hand and mechanical methods of hazard tree removal, hand or mechanical thinning and piling, and mastication.

Table 11 outlines proposed treatments within the Dixie Fire perimeter. Similar treatments are proposed in the Park Fire perimeter.

Table 11. Post-Dixie fire forest treatment acres

Category	Treatment Type	Acres
Post-Disturbance Forest Outside NRV	Reforestation (including mechanical site preparation, herbicide application, and planting trees), prescribed fire	4,404
Post-Disturbance Forest Outside NRV	Prescribed fire on steep slopes and in designated lands, no reforestation	4,827
Post-Disturbance Forest Within NRV, departed from desired conditions	Prescribed fire in designated lands, Prescribed fire, fuel reduction, thinning, culture of natural regeneration outside of designated lands	14,890
Post-Disturbance Forest Within NRV, close to desired conditions	Prescribed fire, fuels reduction	2,212

Reforestation

Strategic reforestation activities would consider future climate scenarios and employ diverse native tree planting, site preparation, and maintenance strategies to restore a resilient landscape. Regional policy directs projects to use an integrated approach that identifies appropriate methods of treatment to ensure successful reforestation efforts with the intended goal of forest stand establishment and long-term development.

Strategic reforestation would focus on the establishment of shade-intolerant pine species (e.g., Jeffrey, ponderosa, sugar), hardwoods when suitable (aspen, cottonwood, oak), and white and red fir at higher elevations in areas identified for reforestation within the Dixie Fire and Park Fire footprints of the WLHP (see the *Burned Area Treatments* maps in Appendix A). In accordance with PSW-GTR-270, potential areas for reforestation would be evaluated to determine the likelihood of natural regeneration (using the geospatial prediction described in Coppoletta et al. 2022 as well as field reconnaissance). Further refinement and prioritization would consider factors such as additional post-fire tree mortality, slope and accessibility, future climate scenarios, and local community interests. Reforestation would include the use of climate-adapted seedlings that have increased resilience to future warmer and drought conditions.

Reforestation treatments would include site preparation, tree planting, and maintenance/release to improve the chances of reforestation success. For planting units, herbicide is proposed for site preparation and follow-up release treatments as needed. Reforestation strategies would create desired forest structure and promote horizontal and vertical heterogeneity and would be combined with monitoring and adaptive management following planting to track survival and stocking levels. Additional research and monitoring in the Park Fire would be conducted by the Pacific Northwest Research Station to study the effects of large, high-severity wildland fires and post-fire restoration treatments on seed dispersal, tree recruitment, and fuel accumulation.

Site Preparation

Site preparation refers to the actions necessary to prepare an area for successful reforestation. Site preparation includes removal of dead standing trees, surface fuels, and competing vegetation through cutting and piling, herbicide application, mastication, pulling shrubs, and hand work. Non-chemical forms of site preparation would be used for areas left for natural regeneration. Herbicide would be applied in planting units to reduce the number of shrubs, forbs, and grasses that may outcompete seedlings prior to the initial planting. Mastication may occur prior to herbicide treatment, where shrub development has progressed to the point that chemical application is impractical.

Before planting trees, pre-emergent herbicide treatment of shrubs would occur in spring to early summer and pre-emergent herbicide treatment of herbaceous plants would occur in the fall. Shrubs damaged from mechanical site preparation treatment will not take up herbicides well, and chemical treatments may need to be delayed for a year to allow shrubs to recover and grow to about 12 to 18 inches tall.

- First, in the spring to early summer, broadcast spray planting units with a tank mix of glyphosate and oil soluble imazapyr using a backpack sprayer (refer to Table 10 above). Imazapyr targets deciduous and evergreen woody brush. It has very strong soil and foliar activity and provides brush control for about 5 years. Glyphosate targets existing vegetation and provides up to six months of vegetation control. Imazapr may stunt tree growth if planting occurs shortly after herbicide treatment, so planting would be done at least a year later.

- Second, in the fall, broadcast spray planting units with a tank mix of indaziflam and glyphosate using a backpack sprayer (refer to Table 10 above). Indaziflam has soil activity only and is effective as a preemergent for the control of grasses and forbs for about 2 years though it doesn't provide significant control of perennial grasses. Glyphosate targets existing herbaceous plants. Treatment would occur in October and November to maximize the amount of soil moisture. Indaziflam has moderate mobility in the soil, and rainfall helps with uptake. It is important to use a preemergent for grass and forb control after treating shrubs with imazapyr. When shrub competition is reduced or eliminated, grasses and forbs will occupy the site and compete with planted seedlings.

Effective chemical site preparation would reduce or possibly eliminate the need for chemical tree release. Vegetation control will be considered successful when units have planted trees free to grow within five years after planting. At that point, understory vegetation would be allowed to grow to the point that shrubs become a ladder fuels issue and may require mastication or other means of control.

Plant Trees

Following site preparation, trees would be planted to meet desired conditions. Burned areas where live conifer forests persist or are likely to naturally recover would not be planted but would be treated for fuels reduction. At the time trees are planted, sprouting shrubs and vegetation would be removed through manual methods to prepare an area for planting. Planting densities would vary depending on slope position, aspect, and elevation and to reduce future cultural needs. Trees would be planted at about 120 to 300 trees per acre.

Conifer trees would not be planted in meadows, wet areas, and aquatic features or within 200 feet of aspen trees. Trees would not be planted within 100 feet of roads, trails, and dozer lines proposed as strategic fire management features. Conifer trees would not be planted within 12 feet of oak seedling and saplings and within 30 feet of oak trees 3 inches DBH and larger, depending on the number of oak trees. To retain mixed conifer-hardwood forest types, shade-intolerant pine trees may be planted at low densities within 12 to 30 feet of oak trees.

Planted and Natural Regeneration Tree Release

Survival and stocking examinations would be done after the first and third year of growth to assess needs for treating competing vegetation. Stocking exams would be done in areas left for natural regeneration to determine treatment needs. Release treatments after planting would include chemical applications, hand grubbing or mechanical brush cutting. Treatments for natural regeneration areas would include hand grubbing or mechanical brush cutting or mastication. Chemical release treatments would be directed application of glyphosate or triclopyr to treat shrubs and herbaceous plants using a backpack sprayer (refer to Table 10 above). Glyphosate would be used to treat deciduous shrubs in late summer, evergreen shrubs in early summer before shrubs go dormant, and herbaceous vegetation in the spring. Triclopyr would be used to control evergreen shrubs, as needed. Triclopyr would not be combined with glyphosate or imazapyr as it will inhibit the two other herbicides from working on many plant species. See Appendix E. Herbicide Characteristics and Application Considerations for more information.

Based on survival and stocking examinations, additional planting, also called interplanting, may be needed to reach desired stocking levels or species composition. Maintenance activities in planted areas would include mastication, shrub cutting, or fuel piling. Prescribed fire underburns could occur as soon as nine years after planting where there is adequate fuel reduction and growth of planted trees.

Effective control of competing vegetation would result in planted trees that grow fast, developing thicker bark and heights that can withstand underburns.

Invasive Plant Species Management

Integrated Pest Management

The LNF proposes to use an integrated pest management (IPM) approach to control currently known non-native invasive plant species and new infestations located in the future that pose a threat to ecological diversity. IPM incorporates various manual (hand pulling, clipping, digging, mulching, or tarping), cultural (thermal, prescribed fire, seeding), and chemical (selector directed spray of herbicide) control methods; see Appendix D for a description of these methods. Treatments are developed based on the target species' biology, environmental settings, potential impacts on other resources, and the size and density of infestations. The IPM approach would determine which of these methods, used alone or in combination, would be the most effective to achieve management goals. Best management practices would be also included in the design and implementation of other treatments to minimize the potential introduction and spread of non-native invasive species.

There are three phases in the plant invasion process: introduction, colonization, and naturalization. Introduction occurs when plant propagules are moved from one infestation (i.e. the seed source) to a new un-infested habitat. In general, any activity that moves soil or plant parts, especially seeds, from one location to another has the potential to facilitate nonnative invasive plant species introduction. The most critical action is early detection and rapid response (EDRR) which involves eradicating infestations during the initial colonization phase (USDA – FS 2004). Once a nonnative invasive plant species is established and is entering the phase of naturalization, control measures become both difficult and expensive.

The most vulnerable parts of the WLHP to invasion are those areas that burned in the Dixie Fire, areas directly impacted by suppression activities (e.g., dozerlines, staging areas, handlines), roads and trails, and areas that endure repeat disturbances such as dispersed recreation sites. EDRR would be coupled with integrated activities to rapidly assess and respond with quick and immediate actions to eradicate, control, or contain the spread of invasives.

To meet the LNF Invasive Plant Management Objectives in the WLHP, the LNF would:

1) Treat currently identified invasive plant infestations at known locations.
2) Establish a prioritization and treatment protocol that would allow for adaptive management of known infestations and evaluation of expanding and newly arising invasive plant occurrences for treatment; and
3) Treat future (currently unknown) invasive plant infestations.
4) Establish a site-specific survey and management protocol for EDRR and IPM.

Generally, chemical treatment is considered after other methods are deemed ineffective or infeasible. Chemical treatment is proposed as an option for treatment for all invasive species within the project area; however, many of these species would be treated only using manual and cultural or mechanical methods. Proposed herbicide treatments would be implemented during the time of the year when application would be most effective for each species. The method used for herbicide treatment would depend on a variety of factors including time of year, severity of infestation, presence of sensitive resources (e.g. native plant and wildlife species, including protected species), degree of intermixing of invasive species with sensitive native habitats, access, proximity to surface water, and budget. No aerial

application is proposed (see Table 10). If new or resurgent target plants emerge, then the infestation may be promptly treated again to ensure effective control depending on the species and herbicide used (see Appendix E. Herbicide Characteristics and Application Considerations).

The annual treatment area for invasive species management would be developed during the project analysis phase based on the proposed treatment of known infestations plus additional acreage for expanding known infestations and new (currently nonexistent or undocumented) infestations. Any species currently included on the LNF Invasive Plant List (USDA – FS 2023), as well as any species that may be added in the future, may be considered for treatment. Treatment methods for new infestations would be limited to those analyzed in the proposed action. Project operations would continue annually until weed management goals are met or until such time as new information warrants additional environmental analysis.

Initial Treatment of Known Occurrences

For most invasive plant species encountered in the WLHP, infestations are both small and isolated, so eradication would be the management goal. See Table 12 for a list of invasive plant species, management goals, and treatment methods. However, for species with large or widespread infestations, the management goal would depend upon the threat and spread risk. A few species (e.g., bull thistle) are so widespread that eradication is not a feasible goal currently. Attempts would be made to contain spread through prevention measures; however, treatment would only be considered when infestations of these species threaten high value resources or are located along vector corridors.

Table 12. Invasive plant species known to occur in the West Lassen Headwaters Project

Invasive Plant Species (common name)	Management Goal	Manual Methods	Herbicide and Application Method
Bromus tectorum (cheatgrass)	Control	Hand pulling	Glyphosate: directed
Cirsium arvense (Canada thistle)	Eradicate	Digging	Aminopyralid: directed or spot spray
Cynoglossum officinale (houndstongue)	Control	Digging	Glyphosate or Chlorosulfurom: directed or spot spray
Holcus lanatus (common velvet grass)	Eradicate	Hand pulling Digging	Glyphosate: directed
Hypericum perforatum (Klamathweed)	Control	Digging	Aminopyralid or Glyphosate: directed or spot spray
Leucanthemum vulgare (Oxeye daisy)	Control	Digging	Aminopyralid: directed or spot spray
Rubus armeniacus (Himalayan blackberry)	Eradicate	Digging	Triclopyr: directed or spot treatment of stems
Elymus caput-medusae (medusahead)	Control	Hand pulling	Aminopyralid or Glyphosate: directed

Adaptive Management Process for New Occurrences or Retreatments

Monitoring would occur throughout the life of the project to ensure treatment methods for individual infestations are appropriate and effective. An adaptive management process would allow for the evaluation of treatment of newly discovered occurrences or adjustments to the re-treatments of existing occurrences.

Each year, prior to implementation, an annual Implementation Plan would be developed and reviewed by the appropriate resource specialists to ensure that the proposed treatment is within the scope of the decision document. Adjustments to methodology and timing, as well as the addition of new occurrences or new species would be recommended during this review process.

Changes to the implementation plan would be prompted by new detections of species previously known to the project area or Forest, the addition of new species to the LNF weed list, or an assessment of the success or shortcomings of prior treatments that would prompt a need to re-evaluate subsequent treatments. This process would include a prioritization of any new occurrences for treatment using the EDRR approach followed by an evaluation of treatment methods using IPM.

Recreation and Infrastructure

Recreation and infrastructure include developed recreation sites, dispersed recreation sites and trails, and powerlines. Vegetation treatments within campgrounds and recreation facilities and along electrical distribution lines throughout the WLHP would include actions to cut and remove hazard trees as well as mechanical thinning to reduce stand densities and improve forest health. Hazard trees would be evaluated and identified using Angwin et al. 2022 *Hazard Tree Identification and Mitigation* Forest Health Protection Report # RO-22-01 and Smith and Cluck 2011 *Marking Guidelines for Fire-Injured Trees in California* at a 0.5 probability of mortality. Table 13 lists the recreation and infrastructure treatments.

Table 13. Recreation and Infrastructure Treatments

Category	Treatment Type	Acres/Miles
Developed and Dispersed Recreation Areas	Mechanical or hand VDT	224 acres
Trails	Mechanical or hand VDT	91.34 miles
Powerlines	Mechanical or hand VDT	7.93 miles

Developed Recreation Sites

Actions in developed recreation sites would improve outdoor recreation opportunities for the public, reduce sedimentation issues in anadromous watersheds, and increase forest health and public safety. Vegetation treatments in developed recreation site would achieve the same objectives as vegetation treatments in the WUI defense zone.

Mechanical treatment and pile burning at all developed recreation sites would reduce hazardous fuels and improve forest health. Vegetation would be mechanically cut, masticated, or cut by hand. Cut material would be removed, piled and burned, or chipped and scattered to an average depth of 4 to 6 inches. No hardwood trees would be cut unless they pose a hazard in the recreation site. Conifer trees would be favored for retention in this order: sugar/western white pine, ponderosa/Jeffrey pine, Douglas-fir, incense-cedar, white/red fir, lodgepole pine.

Some actions in developed recreation sites are more site-specific than other activities described in this document. In addition to vegetation management at all recreation sites, additional actions include replacing existing restrooms at Battle Creek, Gurnsey Creek, Elam, Hole in The Ground and Alder Campgrounds, removing a restroom at Elam Picnic Area, and improving the Gurnsey Creek campground. Improvements would also include repaving and pavement repairs at Elam, Battle Creek, Gurnsey Creek, and Potato Patch Campgrounds as well as roadway repair and installation of a drainage feature at Hole in the Ground. Entrance gates would be installed at Morgan Summit Snowpark and Hole in the Ground.

Developed recreation sites in the WLHP would be assessed to determine if current condition present sedimentation issues to the watershed. Bank armoring and stabilization in recreation sites (particularly along Deer Creek) would be considered as a treatment option, especially under conditions described in the Long-Term Strategy for Anadromous Fish Producing Watersheds on the Lassen National Forest (USDA – FS 2001).

Dispersed Recreation Sites and Trails

Actions in dispersed recreation sites and along trails would improve visitor access to recreation activities, repair and improve trail tread, increase forest health and public safety, and reduce sedimentation impacts in anadromous watersheds.

Signage and/or kiosk installation and parking improvements or expansion would occur at all trailheads in the WLHP. These include trailheads at Deer Creek, Carter Meadows, Mill Creek, Spencer Meadows, Heart Lake, and McGowan Winter trailheads (see the Recreation map in Appendix A). Mechanical thinning and pile burning would occur in known dispersed camping areas such as Upper Deer Creek, Willow Springs, and Upper Rice Creek. Additional actions include installing a restroom at Upper Deer Creek dispersed site and improving access to the Upper Mill Creek Trailhead. Additional trail improvements may occur in the WLHP, where trails are causing sedimentation in anadromous watersheds. Along all trails within the WLHP, vegetation treatment would be the same as the adjacent or encompassing treatment unit where it occurs. Additionally, or as a stand-alone treatment, brush greater than 2 feet tall within 30 feet of the centerline of the trail may be removed, and snags and hazard trees would be cut within 200 feet of the centerline of the trail. Brushing, snagging, and pile burning along trails would follow IDFs to prevent damage to infrastructure or natural resources (Appendix C). Treatments would be completed by hand inside proposed wilderness, inventoried roadless areas, and the Cub Creek RNA.

Powerlines

In the WLHP, treatments along powerlines would reduce hazardous fuels and trees and reduce the risk of unplanned ignitions to provide for human safety and reliable transmission of critical electrical energy. Treatments along powerlines would total 7.9 miles. Actions specific for the treatment along powerlines include:

- Within 40 feet of the centerline of the powerline, all vegetation would be removed that may pose a hazard to the lines from grow-in or fall-in, whether identified as a hazard or not. Vegetation would be mechanically cut, masticated, or cut by hand. Cut material would be removed, piled and burned, chipped and scattered to an average depth of 4 to 6 inches, or lopped and scattered to a depth no greater than 18 inches.
- Woody shrubs and small trees up to 10 inches DBH would be cleared adjacent to power poles and towers.
- Slash and older debris from previous trimming and removal work would be chipped, masticated, piled and burned, or removed.
- Within the area 40 to 200 feet from the centerline of the powerline, trees would be thinned to a target basal area of 60 to 100 square feet per acre. The lower basal area would be implemented in the pine-dominated stands and the higher basal area in the mixed-conifer stands. Trees would be thinned from below, leaving the healthiest, largest trees available. No hardwood trees would be cut unless they pose a hazard to the powerline. Conifer trees would be favored for retention

in this order: sugar/western white pine, ponderosa/Jeffrey pine, Douglas-fir, incense-cedar, white/red fir, lodgepole pine. Vegetation would be mechanically cut, masticated, or cut by hand. Cut material would be removed, piled and burned, chipped and scattered to an average depth of 4 to 6 inches, or lopped and scattered to a depth no greater than 18 inches.

- Within the area 40 to 200 feet from the centerline of the powerline, shrubs would be cut, chipped, or masticated where shrub cover is greater than 20 percent or under the canopy of trees, creating ladder fuels. Surface fuels would be piled, removed, chipped, or masticated where existing surface fuel loading is greater than 10 tons per acre.

Soil Restoration

The WLHP includes a proposal to restore soils in windrowed plantations when feasible. Spreading windrowed material would redistribute nutrients and topsoil across the forest floor and improve growing conditions for trees and other vegetation. Spreading of windrowed material has been shown to result in higher soil nitrogen and other nutrients in topsoil, which can increase productivity (Zhang et al. 2015). The soil scientist or other qualified specialist would visit windrowed plantations to assess their suitability for spreading. Where deemed feasible windrows would be spread to redistribute the piled topsoil. Shrubs would be masticated before windrow spreading to make it easier to spread the windrows effectively. Approximately 10 percent of the shrub cover would not be masticated to retain a component of older shrub species. Windrows containing topsoil and root wads would be pushed out amid the plantation trees to a nearly level condition using a wheeled or tracked machine. Bare soil resulting from windrow spreading would be seeded with native grass species.

Forest Resilience: Conditions that Trigger a Need for Treatment

Although existing conditions in much of the project area are departed from historical ranges of variability, the degree of that departure is what would trigger a management action. Common existing stand-level conditions triggering a need for vegetation and fuels treatments are described below. In some cases, the land allocation (e.g. proposed wilderness, IRA) is what would determine a specific treatment method; these cases are described in the sections above. Landscape conditions change over time, so the appropriate treatment would be identified based on the current conditions on the ground at the time of implementation to achieve the objectives for that focus area.

- **Stand density:** When SDI is above 35 percent of maximum or more, managers would take action to reduce it to 25-35 percent of maximum whenever doing so would not compromise protections for sensitive species. While NRV across the Sierra Nevada is closer to 25 percent of maximum, higher stand densities are acceptable in some areas to preserve late-seral stand conditions in California spotted owl and American goshawk protected activity centers and marten and fisher den sites.
- **Areas that require hand thinning**: When SDI is above 35 percent or canopy base heights are less than 20 feet, areas that are inaccessible or off-limits to mechanical thinning would be thinned by hand using chainsaws or other hand tools.
- **After high-mortality events:** In alignment with the natural range of variation, when large, high mortality patches exceed 15 percent of the previously forested landscape, managers would take action to restore forested conditions. Meadows, rocky areas, ingress-egress prescription, and patches less than 100 acres would not be reforested.
- **Roadside hazard trees:** Roadside hazard trees would be removed after a mortality event, as quickly as is feasible and after required resource surveys are complete.

- **After reforestation:** Based on surveys of planted or natural regeneration units after one and three growing seasons, managers would take action to ensure that by five years post-reforestation, trees are growing with minimal vegetation competition at approximately 150 to 200 trees per acre with shrub cover less than 20 percent.
- **Shrubs:** When shrub cover *in forested stands* exceeds 20 percent, managers would take action to reduce it to below 20 percent. In the WUI Threat Zone, shrub cover would be kept at or below 20 percent whether overstory trees are present or not. Within the WUI Defense Zone and along specified fire management features, shrubs would be kept to a minimum.
- **Windrows inside plantations**: Where windrows exist and the soil scientist or other qualified specialist has assessed them as suitable for spreading, they would be spread to redistribute the piled topsoil after fuels treatment or tree thinning is implemented.

Proposed Actions for Watershed Health

The WLHP area would be assessed to identify restoration opportunities that would move project watersheds towards the desired condition. Treatment types that would improve watershed health include hydrological improvements, meadow enhancement, and upgrades to NFS roads, see Table 14. Specific treatment methods are described in Appendix D.

Table 14. Summary of Treatment Focus Areas for Watershed Health

Treatment Focus Area	Treatment Type	Estimated Treatments
Meadows and Fens	Meadow enhancement treatments (e.g., underburn, hand thin, grazing exclosures, removal of encroaching conifers, hydrologic improvements)	546 acres
Riparian Habitat Conservation Areas	Stream rehabilitation (e.g., LWD structures, BDAs/PALS, channel fill, riffle augmentation)	Up to 535 stream miles
Transportation System	NFS and non-system route decommissioning, NFS road maintenance level changes, system additions, and road extensions	18.69 miles*

* 8.69 miles have already been identified for actions (see Table 15 and transportation maps in Appendix A). Up to an additional 10 miles of routes in proximity to streams will be assessed by hydrology and transportation specialists for potential decommissioning prior to the Environmental Assessment.

Hydrological Improvements

Hydrological improvements may be implemented across the project area to restore natural flow paths, reduce sedimentation, enhance aquatic habitat, and restore floodplain hydrology. A variety of techniques or methods may be used to implement hydrological improvements within wetlands, meadows, streams, and riparian areas. Hydrological improvements would include both process-based and form-based restoration techniques. Process- based restoration would aim to reestablish normative physical, chemical, and biological processes that create and sustain river and floodplain ecosystems (Beechie et al. 2010) using simple, low unit-cost, structural additions (e.g., wood and native materials). In the WLHP, process-based restoration treatments would consist of the construction of three main types of structures: Beaver Dam Analogues (BDA), Large Woody Debris (LWD) Structures, and Post Assisted Log Structures (PALS), see Appendix D for descriptions.

Where feasible, process-based structures would be built by hand using native materials. Potential impacts of surrounding and downstream infrastructure such as roads, campgrounds, trails, and private property would be evaluated before the construction of any process-based treatments in the project area. Follow-up treatments of BDA and/or PALS may be required to help maintain their structural integrity and effectiveness. Common maintenance activities may include adding more wood or posts to existing structures, building new structures where others have washed downstream, and building existing structures further into the floodplain.

The WLHP would also utilize form-based restoration techniques to achieve desired hydrological conditions. Form-based restoration includes riffle augmentation, channel fill, bank armoring, borrowing, hillslope contouring, and grade control structures, see Appendix D for descriptions.

Meadow and Fens

Improvements to meadows and fens in the WLHP would be achieved through hydrological improvements, tree thinning, (mechanical and hand), or grazing management (fencing).

All treatments in meadows and fens would be designed following a meadow assessment, informed by FS botanist, fuels personnel, hydrologist, and aquatics specialists. Treatments in meadows and fens would be needed where:

1) Stream channel incision, excessive soil erosion, or other issues are evident and leading to degraded hydrologic conditions in the meadow or fen, particularly a lowered water table.
2) Existing infrastructure, such as roads, trails, and ditches or other diversions are causing erosion, channel incision, or diversion of stream flows.
3) An assessment concludes that conifers are encroaching the meadow or fen footprint.

Meadows and fens in the WLHP would be assessed for process-based and form-based restoration to increase meadow extent and improve overall functioning of meadow systems. Primary objectives of treatments in meadows include: (1) increase late-season stream flows, (2) reduce and delay peak stream flows, (3) increase water storage capacity, and (4) protect climate refugia, such as floodplain habitat during periods of drought or high-severity wildfire.

Restorative actions would be taken within meadows identified to be in a hydrologically degraded state based on connections with historic meadow floodplains, low water storage capacity, and persistent physical disruptions to the ecological function of the meadow system. **Indicators of these conditions** include incised or eroded stream reaches and riparian areas, a lack of connectivity between meadows and floodplains, a lack of in-stream structural complexity, and significant conifer encroachment. These stream reaches or riparian zones may be treated with any of the hydrological improvement methods outlined in Appendix D. Diverted water supply to meadows and fens would be restored where feasible. Key considerations to the impacts of surrounding and downstream infrastructure such as roads, campgrounds, trails, and private property would be evaluated prior to the construction of any process-based treatments in the project. Follow-up treatments and regular maintenance of BDA and/or PALS structures may be required to help maintain their structural integrity and effectiveness.

Fens are wetlands fed by groundwater that have accumulated 20-40 cm of peat. These systems develop over thousands of years, indicating a long period of hydrologic and geomorphic stability. To maintain these unique systems through periods of drought and high-severity wildfire, proposed actions such as hand thinning in fens would be considered on a case-by-case basis following fen assessments by the FS

botanist. Fences, large boulders, or other structures would be strategically placed in some areas to protect meadows, fens, seeps and springs from damage caused by unauthorized motor vehicles. No mechanical treatment would occur within 150 feet of fens, but hand thinning would be acceptable within this 150-foot buffer. Adequate standing trees, of a variety of ages, would be left around fens to ensure continued woody debris.

Where necessary to restore desired conditions, conifer trees would be mechanically cut and removed from meadows where the upper 10 inches of soils are dry, leaving the best wildlife trees. Meadows that are wet and do not meet the dry soil requirements would have conifer trees cut and removed by hand. Cut trees would either be lopped and scattered in place in the meadow or carried at least 25 feet outside the edge of the meadow, then piled and burned. Felled trees would be left intact where needed to meet woody debris objectives for stream restoration or fens.

Crews would avoid burning piles in meadows wherever this would expose bare mineral soil to erosion or would risk consuming accumulated soil carbon. If lopping and scattering would create unacceptably high dead fuel loading in the meadow, then piling and burning would be necessary, outside the meadow when feasible. An acceptable level of dead fuel loading would be agreed upon by botany and fuels personnel.

Directional felling and in-stream placement of encroaching conifers would occur in reaches deemed deficient in coarse woody debris or where placement of wood would enhance stream bed and bank stability as identified and directed by a watershed or aquatics specialist. Integrated design features (IDF) would minimize disturbance to soils and reduce rutting or other damage to the meadow area during implementation (see meadow-specific IDFs in Appendix C). Grazing fences and meadow monitoring would be considered as needed to meet desired conditions, following meadow assessments. Meadow units may be temporarily rested from livestock grazing to enable prescribed burning and meet vegetation management goals. Temporary fences may be constructed around suitable habitat surrounding an occupied yellow rail marsh bird nest or activity center for up to 25 acres.

Riparian Habitat Conservation Areas

Riparian habitat conservation areas (RHCAs) are defined as portions of watersheds where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines (SNFPA 2001). In this project, RHCA land designations are given in watersheds that provide habitat for anadromous chinook salmon and steelhead (i.e. Antelope, Battle, Deer, and Mill Creek). Interim guidelines for RHCA delineation (SNFPA 2004) will be used as default RHCAs and applied to management activities when site-specific evaluations and recommendations are not provided. Because the need to protect and enhance anadromous fish habitat is a primary goal of the WLHP, all RCAs (Riparian Conservation Areas, or land designations used in non-anadromous watersheds) and RHCAs will be managed using the more conservative RHCA widths (Appendix C). The interim RHCA widths are as follows:

For all Permanently Flowing Streams: The stream and area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or the outer edges of riparian vegetation, or a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

For seasonally flowing streams, wetlands less than one acre, landslides, and landslide- prone lands: The extent of the landslides and landslide-prone areas, the stream channel and the area to the top of

the inner gorge. The stream channel or wetland and the area to the outer edges of the riparian vegetation, or the distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest. Seasonally flowing streams are defined as any non-permanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria. Ditches, road drainage outlets and other features caused by drainage from facilities are not included.

For ponds, lakes, reservoirs, and wetlands greater than one acre: The body of water or wetland and the area to the outer edges of the riparian vegetation, or the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

Site -specific evaluations of the RHCA will occur prior to any implementation work. These evaluations would inform treatments such as hydrological improvements, mechanical and hand thinning treatments, or prescribed fire within the RHCA. Where sensitive riparian species such as Sierra Nevada Yellow Legged Frog, Cascades frog or other ESA species are known or expected to occur, additional suitable habitat buffers may be developed by the aquatics and wildlife specialists. More detail on RHCA widths and design features can be found in Table 25 of Appendix C.

Transportation System

National Forest System (NFS) roads, or “system roads,” are inventoried, maintained, and managed by the Forest Service and are necessary for the protection, administration, and use of National Forests. Non-system roads include existing unclassified roads and new temporary roads needed for short-term access, but not long-term forest management. Water sources are used for project implementation and in support of transportation system use and fire suppression operations. A managed road system provides for safe public access and travel and contributes to economical and efficient management of National Forest System lands. The LNF LRMP (p. 4-3) gives direction to provide a stable and cost-efficient road system through appropriate construction, reconstruction, and/or maintenance.

NFS system roads and water sources used during project implementation would be brought up to best management practice standards and comply with the *Lassen National Forest Motorized Travel Management Record of Decision* (2010) and *Long-Term Strategy for Anadromous Fish Producing Watersheds on the Lassen National Forest* (USDA FS 2001), where applicable.

During project implementation, system and non-system roads would be identified and inventoried to determine existing condition and what road actions would be needed. All road stream crossings with diversion potential and all crossings with connected road approaches greater than 200 feet that are contributing sediment to streams and impacting watershed function would be prioritized for work.

Proposed road management actions include the following to improve safety, provide access for the pubic and project implementation, and reduce negative hydrologic impact, see Appendix D for descriptions of road work.

- Road maintenance
- Road reconstruction
- Road decommissioning and obliteration
- New construction
- Maintenance level changes

- Temporary road construction

According to a preliminary road assessment, approximately 6.14 miles of system and non-system roads would be decommissioned in the WLHP (see maps in Appendix A). Another 48.8 miles of non-system routes have been identified and would potentially be used for project implementation as temporary roads and obliterated after use or added to the NFS. Up to an additional 10 miles system roads in proximity to streams will be assessed by hydrology and transportation specialists for potential decommissioning. New temporary roads would be created as needed for project implementation and be obliterated after use.

The Forest Service classifies maintenance of National Forest System roads by five levels (USDA FS 2009). Maintenance level 1 roads are closed to vehicular traffic and placed in storage between intermittent uses; level 2 roads are open for use by high-clearance vehicles. Maintenance level 3, 4, and 5 roads are open and maintained for use by standard passenger cars at varying degrees of user comfort. Maintenance level changes proposed in the WLHP are outlined in Table 15.

Table 15 summarizes the current proposed changes to the WLHP transportation system and Table 16 describes the routes in more detail. Mileage approximations may be updated based on site visits and road assessments. See the *Transportation Maps* in Appendix A to see the locations where these route changes are proposed.

Table 15. Proposed Changes to the Transportation System in the West Lassen Headwaters Project

Proposed Action	**Miles**
Decommission	6.14
Maintenance Level Change	1.08
Extend road	0.76
Add to System	0.71
New temporary road construction	50
Decommission for water quality	Up to 10
Total Miles	68.69

Table 16. Proposed Route Changes

Route Number	Current Status	Proposed Action	Miles
28N12A	NFS Road ML2	Decommission	1.13
29N48C	NFS Road ML2	Maintenance Level Change to ML1	0.92
29N02YA	NFS Road ML2	Decommission	0.80
29N40	NFS Road ML2	Decommission	1.11
29N71	NFS Road ML2	New construction to extend road	0.76
28N12B	NFS Road ML2	Decommission	0.63
27N56	NFS Road ML1	Decommission	0.74
28N12C	NFS Road ML2	Decommission	0.84
27N56A	NFS Road ML1	Decommission	0.22
UBC104	Non-System Route	Add to System as ML1	0.24
ULA134	Non-System Route	Decommission	0.43
ULA244	Non-System Route	Decommission	0.10
ULA168	Non-System Route	Add to System as ML2	0.41
UR 01	Non-System Route	Add to System as ML3	0.05
UR 02	Non-System Route	Decommission	0.14
29N11Y	NFS Road ML2	Maintenance Level Change: ML1	0.16
TBD	TBD	Decommission	Up to 10*

*An additional 10 miles of routes in proximity to streams will be assessed by hydrology and transportation specialists for potential decommissioning prior to the Environmental Assessment.

Domestic Water Sources

Some streams and springs within the West Lassen Headwaters Project area supply domestic uses, including the water system shared by the community of Mineral and the nearby administrative site for Lassen Volcanic National Park.

The locations of domestic water sources would be identified and inventoried prior to project implementation, to ensure water quality is protected. The existing condition of water supply infrastructure would be assessed to ensure facilities do not negatively affect water quality, water yield, runoff regimes, natural channel geomorphic processes, and fish and wildlife habitats. Maintenance and repair of diversion and conveyance structures may be performed as necessary to minimize or mitigate adverse effects to soil, water quality, and riparian resources. Fuel reduction and hazard tree treatments would be implemented to protect the water supply infrastructure. Potential water source management measures include streambank stabilization, erosion control, ditch or diversion cleaning, and diversion infrastructure repair.

Watershed Health: Conditions that Trigger a Need for Treatment

- **Incised stream channels:** Where a stream channel is found to be incised or no longer hydrologically connected to its historic floodplain, large woody debris structures, BDAs/PALS, channel fill, riffle augmentation, or grade control structures may be installed. Incised or hydrologically disconnected stream channels are defined as those in which streamflow does not reach the observed floodplain elevation during estimated or observed flow recurrence intervals of 1-2 years.
- **Headcutting and streambank erosion:** Where historical land use has altered channel flowpaths such that they have become unstable, actions such as large woody debris structures, channel fill, or grade control structures may be installed. Headcutting and streambank erosion are commonly evident by the presence of excessive rilling, gullying, streambank sloughing, and scouring. Headcut and bank erosion treatments would extend to the elevation or footprint necessary to stabilize the feature and would be created to mimic natural processes present at the site.
- **Lack of Large Woody Debris:** Where analysis and professional judgement of project hydrologist indicate a stream reach is lacking in large woody debris (logs greater than 12 inches in diameter and greater than 6 feet in length) within the active channel or recruitment zone (75 ft from either side of the channel), large woody debris structures and/or BDAs/PALS may be installed to promote stream channel complexity and biologic productivity. Where insufficient recruitable and perched woody debris exists within 75 ft of project stream channels, directionally felled trees may be dropped in the channel and downed trees left or placed within the floodplain to increase wood recruitment potential in the project area.

Proposed Actions for Strategic Fire Management

Proposed treatments described in this section include a broad prescribed fire treatment strategy for the entire WLHP landscape, management actions in the wildland urban interface (WUI), and focused plans for identifying physical features and applying vegetation management techniques to prepare the landscape for fire and support a safer, more strategic response to wildfire. Proposed actions are informed by modeled wildfire behavior across the project area, under current conditions and fuel types. Goals for strategic fire management in the WLHP include:

- Develop conditions that support the capacity to return fire as a beneficial disturbance process across the landscape, manage beneficial fire, and suppress unwanted fire.
- Prepare the wildland urban interface communities for planned and unplanned fires.
- Utilize a comprehensive collaboratively developed strategy to protect communities, values, and assets in the West Lassen Headwaters Project.

Prescribed Fire

Prescribed fire is a versatile tool that can be used to achieve multiple objectives, including restoring, improving, and maintaining forest resource conditions and reducing wildfire threats around communities and infrastructure. Prescribed fire treatments proposed in this project include broadcast burning, which is also called underburning, jackpot burning, and pile burning, see Appendix D for burning descriptions. By imitating the natural ecological role of fire, prescribed fire reduces hazardous surface and ladder fuel accumulation and encourages fire-adapted plant and wildlife species. The post-prescribed fire landscape provides improved wildfire suppression opportunities and reduced likelihood of high-severity wildfire at the landscape scale.

Prescribed fire would be considered as a blanket treatment across all 101,471 acres of NFS lands in the WLHP. This means that forest stands would first be evaluated to determine whether prescribed fire could be applied as an initial treatment or if stands would require an initial surface fuel reduction treatment or a thinning treatment to achieve target conditions for stand density, species composition, and reduction in ladder fuels prior to any burning operations. Recent studies show that variable density thinning coupled with prescribed fire is more effective at restoring forest heterogeneity to mixed-conifer forest, compared to either prescribed fire or thinning treatments alone (Knapp et al. 2017). In areas of the project that currently meet desired ladder and crown fuel conditions, prescribed burning would be a stand-alone treatment to maintain desired conditions.

The purpose of this broad prescribed fire treatment strategy is to provide fire managers the decision space to apply prescribed fire treatments efficiently across the landscape, expanding the timeframes and opportunities for prescribed fire treatments at different elevations, aspects, and slopes. Reintroducing fire to the fire-adapted headwaters of the west Lassen landscape is an overarching goal of this project that plays an integral role in meeting each of the project's three purposes (forest resilience, watershed health, fire management). Prescribed fire would be used under specific environmental conditions that allow fire to play its natural role and behavior within a predetermined area.

Timing and acreage of prescribed fire applications per year would be based on Lassen NF and partner capacity and available burn windows. However, project partners aim to apply prescribed fire annually, when possible, to return the landscape to the NRV. Vegetation communities with short fire return intervals (e.g., ponderosa pine) would be burned more frequently than higher elevation forest types such as red fir.

Prescribed underburn fires are expected to burn slower and with less intensity than a wildfire does under extreme weather conditions, effectively removing surface and ladder fuels from the landscape without causing widespread tree mortality. During underburn operations, some scorching and mortality is acceptable and would provide habitat to support cavity nesting and denning structures. Scorch would generally be less than 10 feet. Expected average mortality in the dominate and co-dominate canopy trees would be less than 10 percent in areas mechanically treated and less than 20 percent in hand treated or untreated areas. Patches of high severity may occur, generally less than two acres in size. Up to 30 percent of down logs 12 inches in diameter and larger and 25 to 50 percent of ground cover would be consumed. IDFs would address resource protection measures in areas where high intensity fire is undesirable. In these areas direct ignition would be excluded, however fire would be allowed to move into these areas on its own.

Fire managers and crews would be responsible for preparing burn plans, establishing fire control lines, coordinating with regulatory agencies, and conducting burning operations. Fire treatments would only be conducted when conditions meet approved burn plan requirements and comply with relevant air quality regulations.

Prescribed fire treatments include all the necessary steps to prepare and implement a burn, including fire control line construction, site-prep (e.g., mastication, chipping, lop and scatter), ignition, and mop-up, and may be applied as a stand-alone treatment or as a follow-up to other treatments.

The method of ignition for each prescribed burn unit depends on safety, vegetation type, topography, current and predicted weather, and the intensity of fire necessary to meet prescribed fire objectives. Prescribed fires can be ignited by hand using a drip torch, by helicopters carrying a helitorch, or by a sphere dispenser machine that drops a fuel mixture to the surface from an unmanned aerial vehicle.

Wildland Urban Interface (WUI)

In the WLHP, WUI principles and desired conditions would be applied to fire management routes, containment features (e.g., fire management routes, maintained dozer lines and trails, and helispots), recreation sites, and areas in proximity to communities. Treatments would be more intensive in these areas to allow fire managers to manage unplanned ignitions more effectively. Within both WUI defense zone (generally ¼ mile buffer around capital improvements) and threat zones (1 and 1/4 mile from the outer edge of the defense zone), surface fuels would be reduced to below 10 tons per acre. WUI treatments would be designed to complement landscape treatments necessary to slow the spread of a fire before it reaches the WUI.

WUI Defense Zone

Vegetation and fuels treatments in the WUI defense zone (generally a ¼-mile buffer around capital investments) would create defensible space around communities and provide safe and effective areas for suppressing wildfire. Treatments would be designed to meet the desired conditions outlined in the SNFPA for the WUI defense zone (2004 SNFPA ROD pp. 40 and 41, and on page 18 of this document) and would complement ongoing defensible space work within communities, such as the hazard tree removal and wildfire risk reduction work being implemented by Tehama County RCD and the Mineral Firewise Council. Campgrounds, recreation home sites, and organization sites are included for WUI defense zone treatment.

Forest stands in the WUI defense zone would be thinned using variable density thinning to disrupt crown continuity and reduce ladder fuels, minimizing the probability of a sustained crown fire through the stand. Ladder fuels would be thinned away from the base of residual trees (up to 25 feet) to reduce the risk of surface fire from moving into the crowns of adjacent trees. Existing surface or ladder fuels would be reduced by mechanical treatment, where possible. Hand thinning would be utilized where equipment is restricted. In most cases these treatments would be followed by pile burning or understory burning. Maintenance treatments would be implemented as needed to address regrowth of shrubs and small trees after the initial treatment.

WUI Threat Zone

In the WUI threat zone (1 and 1/4 mile from the outer edge of the defense zone), the primary objective is to establish and maintain a pattern of treatments effective in modifying wildfire behavior to protect communities while maintaining or enhancing ecosystem services and biophysical processes. VDT would be used to reduce tree density to a level consistent with the site's ability to sustain forest health during drought conditions and to enhance stand heterogeneity in both the overstory trees and understory vegetation. WUI threat zone treatments would be designed to support the desired conditions described for WUI threat zones described in the SNFPA 2004 ROD (pp. 40 and 41) and on page 18 of this document. VDT with gap and clump creation would move forest density, structure, and composition toward the natural range of variation and reduce the likelihood of high-severity crown fires (Safford and Stevens 2017). In the WUI threat zone, shrubs would be kept at or below 20 percent, whether overstory trees are present or not. Table 17 lists the number of acres of WUI by defense and threat zones and Table 18 summarizes proposed WUI treatments. Prescribed fire and targeted hand thinning would occur where WUI overlaps with designated lands (e.g., IRA, proposed wilderness, RNA).

Table 17. WUI acres on NFS land within the project area

WUI Zone Type	Acres
Defense Zone	3,403
Threat Zone	29,128

Table 18. Summary of WUI Treatments

Treatment Type	Estimated Treatment Acres
Hand VDT and Piling	4,462
Mechanical VDT and Piling	25,407
Prescribed Fire and targeted hand thinning	2,663
Reforestation (including herbicide application) *	3,284

*Reforestation overlaps with mechanical and hand treatments and is included within the total reforestation acres listed under *Post-disturbance Forest.*

Strategic Fire Management Features

To prepare for both the widespread application of prescribed fire and unplanned ignitions in the WLHP, a network of permanent strategic fire management features would be maintained across the landscape. These include a network of fire management routes (see the map in Appendix A) made up of maintained roads, dozer lines, foot and motorized trails, and helispots. Identifying and maintaining these permanent features in strategic locations across the landscape, in conjunction with the landscape-level treatments to promote forest resilience, would reduce fuels and the energy of future wildfires, therefore reducing the likelihood of a fire reaching local communities and infrastructure. Table 19 summarizes the amount of proposed strategic fire management treatments. Specific prescriptions for these features are described in the sections below.

Table 19. Treatment Focus Areas for Strategic Fire Management

Feature Type	Estimated Treatment
Fire Management Route	128.0 miles
Dozer Line or Trail	15.6 miles
Helispot	0.35 acres

The intensive prescription for treating fire management features would be applied conditionally and in consultation with forest resource specialists. The prescription would be altered depending on the resource values along the routes being proposed for treatment. When fire management features intersect PACs or the carnivore habitat network, high-quality nesting or denning habitat would be avoided to the greatest extent possible, and the fire management feature prescription would retain existing large tree cover, moderate canopy cover, and a heterogeneous distribution of near-ground cover. Further, treatments would not compromise habitat connectivity for species associated with closed canopy forests (California spotted owl, American goshawk, Pacific marten, Pacific fisher). In more sensitive terrestrial and aquatic habitats, such as den buffers, nest buffers, and steep slope riparian habitat conservation areas, only hand thinning and prescribed fire outside of relevant LOPs would be permitted. Treatments in these sensitive areas would maintain the intended function of the specific land allocations. For example, thinning treatments that would reduce habitat quality within a CSO nest buffer would not occur. Acres of fire management features maintained within a PAC would be included in the ⅓ of the PAC within which CSO or American goshawk habitat quality can be reduced.

Fire Management Routes

Fire managers identified approximately 128 miles of road that would be designated and maintained as fire management routes. Fire management routes would improve fire application and suppression capabilities and provide safe ingress and egress for fire personnel and the public. Improved access roads would also serve as control lines during wildfire suppression activities. These objectives would be balanced with the need to protect high quality habitat and habitat connectivity for wildlife.

Table 20 lists the roads and associated miles for the strategic management routes.

Table 20. Proposed Strategic Fire Management Routes

Route Type	Route Number	Miles
Highway	CA 32	10.6
Highway	CA 36	3.2
Highway	CA 36/89	7.4
Highway	CA 172	6.5
County Road	Plumas County road 311 Old Red Bluff road	3.1
County Road	Tehama County road 769 Wilson Lake road	1.5
NFS Road ML4	31N17	9.8
NFS Road ML3	27N06	4.6
NFS Road ML3	28N12	6.3
NFS Road ML3	28N70	3.6
NFS Road ML3	29N18	13.0
NFS Road ML3	29N48	9.7
NFS Road ML3	30N16	8.3
NFS Road ML2	27N12	7.6
NFS Road ML2	28N49	1.0
NFS Road ML2	29N14Y	1.0
NFS Road ML2	29N16	6.6
NFS Road ML2	29N22	2.9
NFS Road ML2	29N48	16.0
NFS Road ML2	29N48A	0.2
NFS Road ML2	29N60	4.9

The general fire management route prescription includes removal of snags (dead, standing trees) and hazard trees 200 feet from the edge of the road, thinning trees and vegetation 200 feet from the edge of the road as a shaded fuel break retaining 10 to 40 percent tree canopy and removing trees and vegetation greater than 2 feet tall on 50 feet of either side of the road. The width of this prescription is based on Natural Resources Conservation Service guidance that a shaded fuel break should be 2.5 times the height of the adjacent canopy, or a minimum 200 feet wide on level ground, with an additional 10 feet in width added for every 10 percent increase in slope (USDA - NRCS 2020). As mentioned above,

these treatments would be altered when there's overlap with sensitive wildlife features (e.g., PACs, den buffers etc.). Maintenance of this corridor would be performed with a combination of mechanical treatment, hand treatment, and prescribed fire. The prescription applied to fire management routes would depend on the resource values around the route. For example, when a fire management feature intersects a CSO nest buffer, only hand thinning or prescribed fire could be utilized and only to the extent that CSO habitat quality is not reduced.

Treatments along the stretch of California highway 32 that parallels Deer Creek would involve additional treatment strategies and mitigation measures to protect this anadromous watershed. Hand thinning and prescribed fire would be utilized in areas between the highway and Deer Creek and mechanical treatments would occur along the highway in select units on slopes up to 50 percent where feasible and with concurrence from a hydrologist and soil scientist (this will utilize the forest plan amendment for removing trees on steep slopes, see Appendix B). Snags (dead, standing trees) and hazard trees within 200 feet of the highway would be felled and chipped or piled when feasible, in accordance with the Region 5 Hazard Tree Guidelines (USDA – FS 2022b). Shrubs greater than 2 feet tall would be thinned up to 50 feet from the highway on the uphill side. Ladder fuels would be thinned up to 50 feet of either side of the highway and activity-generated and existing fuels would be chipped or piled. Log and hand piles would be piled in a perpendicular arrangement to the slope and highway to reduce the frequency and quantity of rolling debris. Skid trails along the highway would be covered by chips or natural debris and deep track marks would be feathered out flat. Pine and hardwoods would be favored for retention for their fire-resistant properties and may be pruned to achieve adequate canopy base height to reduce ladder fuels.

Maintenance of Selected Dozer Lines and Trails

In addition to the roadside treatments described above, approximately 6.6 miles of selected dozer lines created during the 2021 Dixie Fire, 2.0 miles of dozer lines created during the 2024 Park Fire and 1.0 miles of motorized trail number 51015 used during the Park Fire as a control line would be maintained as permanent fire control features on the landscape (see the *Strategic Fire Management Features* map in Appendix A). Dozer lines designated for maintenance are located along strategic ridges and other areas where fire suppression resources could be located to contain the progression of a wildfire. In addition to select dozer lines, approximately 6.97 miles of the Pacific Crest Trail (PCT) and connector trail 511 would be maintained as control features.

Maintenance of selected dozer lines and motorized trail 51015 would include clearing of shrubs and trees greater than 2 feet tall within 50 feet of either side of the feature and the removal of snags (dead, standing trees) and live hazard trees within 200 feet. Water bars would be maintained on dozer lines to reduce impacts of ground-disturbing activities that would lead to soil erosion and to discourage use by motorized vehicles.

Maintenance of the Pacific Crest Trail and connector trail 511 for use as permanent fire management features would include cutting shrubs greater than 2 feet tall and conifer trees less than 12 inches DBH within 30 feet from the centerline of the trail. Snags and live hazard trees would be cut within 200 feet from the centerline of trails. Treatments of trails would be completed by hand inside the inventoried roadless area (IRA) and the Cub Creek RNA. Areas of heavily concentrated fuels along the trails may be mechanically piled outside the IRA and RNA.

Helispots

Four helispots are proposed in the WLHP for emergency fire access and life flight needs. These helispots would be located on large, flat areas accessible by helicopter. The anticipated locations for these helispots are the Hampton Butte area off the 31N17 road, south of Sifford Mountain off the 29N16 road, on the east side of the Turner Mountain Loop along the 29N48 road, and one in proximity to Butt Mountain. To comply with all safety regulations governing helicopter operations, these locations would be maintained as Type II helispots, which would consist of a 20-foot radius landing pad, with an additional safety circle measuring 120 feet in diameter cleared of vegetation over 2 feet tall using mechanical and hand methods. BMPs will be followed to mitigate potential erosion and manage visual impact. See the *Fire Management Features Map* in Appendix A for approximate locations of proposed helispots.

Strategic Fire Management: Conditions that Trigger a Need for Action

Fire managers take a range of factors into consideration when assessing current conditions to either apply prescribed fire or proactively protect features for when wildfire returns to the landscape. To determine the appropriate management actions, fire managers consider landscape conditions (e.g., topography, forest canopy characteristics) and available historic weather and fuel moisture data, which informs fire behavior prediction. Surface fuels are comprised of grasses, forbs, shrubs, needle or leaf litter, and downed woody debris. Forest canopy characteristics (canopy base height, canopy bulk density, canopy height, and canopy cover) are also used in fire behavior prediction systems to determine whether fire can spread vertically from the surface to the canopy (crown fire initiation/passive crown fire/torching), as well as whether it can spread horizontally through the canopy (active crown fire). To plan for peak fire season conditions that would test the efficacy of the proposed action to meet the purpose and need, National Fire Danger Rating System values will be used to determine 90th percentile fuel moisture conditions in the WLHP.

Model generated outputs of expected fire behavior include flame length, type of fire (surface, passive, crown conditional, active), canopy base height and probability of torching (P-torch). Proposed treatments would be designed to reduce these common fire behavior metrics in the event of a fire.

In the WLHP, the following fire behavior thresholds are considered triggers for action in the WLHP (these may be slightly more restrictive in certain treatment focus areas such as wildlife habitat):

- **Flame length**: Predicted flame lengths greater than 4 feet under 90th percentile weather conditions.
- **Fire Type**: Predicted fire type of active, crown conditional, or passive under 90th percentile weather conditions.
- **Canopy Base Height**: Average canopy base heights less than 20 feet.
- **P-torch:** Probability of torching greater than or equal to 20 percent.

What will be Decided?

The decision to be made is whether to implement this project as proposed, as modified to address any unresolved issues, or not at all.

Forest Plan Amendment

The WLHP proposes project-specific Forest plan amendments to the Lassen National Forest Land and Resource Management Plan (LRMP 1993) as amended by the Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD 2004). The project-specific Forest plan amendments are summarized on page 6 of this document and described in more detail in Appendix B.

Emergency Authorization to Expedite Select Implementation

Due to the critical and time-sensitive nature of some elements in the proposed action, fuels reduction treatments on approximately 3,486 acres within the 101,471-acre WLHP were authorized for implementation in the Forest Service Chief's Emergency Response memo dated September 12, 2024. These activities, along roadsides and in unburned areas adjacent to private land in Mineral, are being analyzed as part of the Proposed Action, although they are currently being implemented on the ground. The Forest may elect to utilize additional emergency authorities to expedite the implementation of specific actions or treatments in select areas within the West Lassen Headwaters Project. While LNF recognizes that expediting implementation reduces opportunities for formal public involvement prior to a final decision, LNF is also aware of the urgency to implement the highest priority fuels reduction and community protection actions, which are supported by, and were co-developed with, the South Lassen Watersheds Group participants and the Mineral and Mill Creek Firewise Committees. When considering the use of an emergency authority or authorities, LNF's intent is to expedite the most time-sensitive actions in the highest priority areas where there is general agreement about actions, such as fuels reduction in the Wildland-Urban Interface (WUI) defense zone for community protection, while allowing for public input prior to final decisions and implementation.

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Appendix A. Project Maps

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Vegetation Treatments

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

- Project Boundary
- Dixie Fire Footprint
- Park Fire Footprint

Mechanical Treatment

- <35% Slope: 31,656 acres
- 35%-50% Slope: 6,292 acres

Wildland Urban Interface

- WUI Defense Zone
- WUI Threat Zone

Designated Lands

- Proposed Wilderness
- Wilderness
- Research Natural Area (RNA)
- Inventoried Roadless Area (IRA)

Land Ownership

- U.S. Forest Service
- National Park Service
- Other State/County/Federal
- Private/Industry

This map does not show site-specific features that may limit mechanical treatment. More acres appear mechanically treatable than would actually be treated. Mechanical treatment within PACs, fisher den buffers, and other sensitive resources would be constrained by Integrated Design Features (IDFs).

No mechanical treatment is proposed within Inventoried Roadless Areas or Proposed Wilderness.

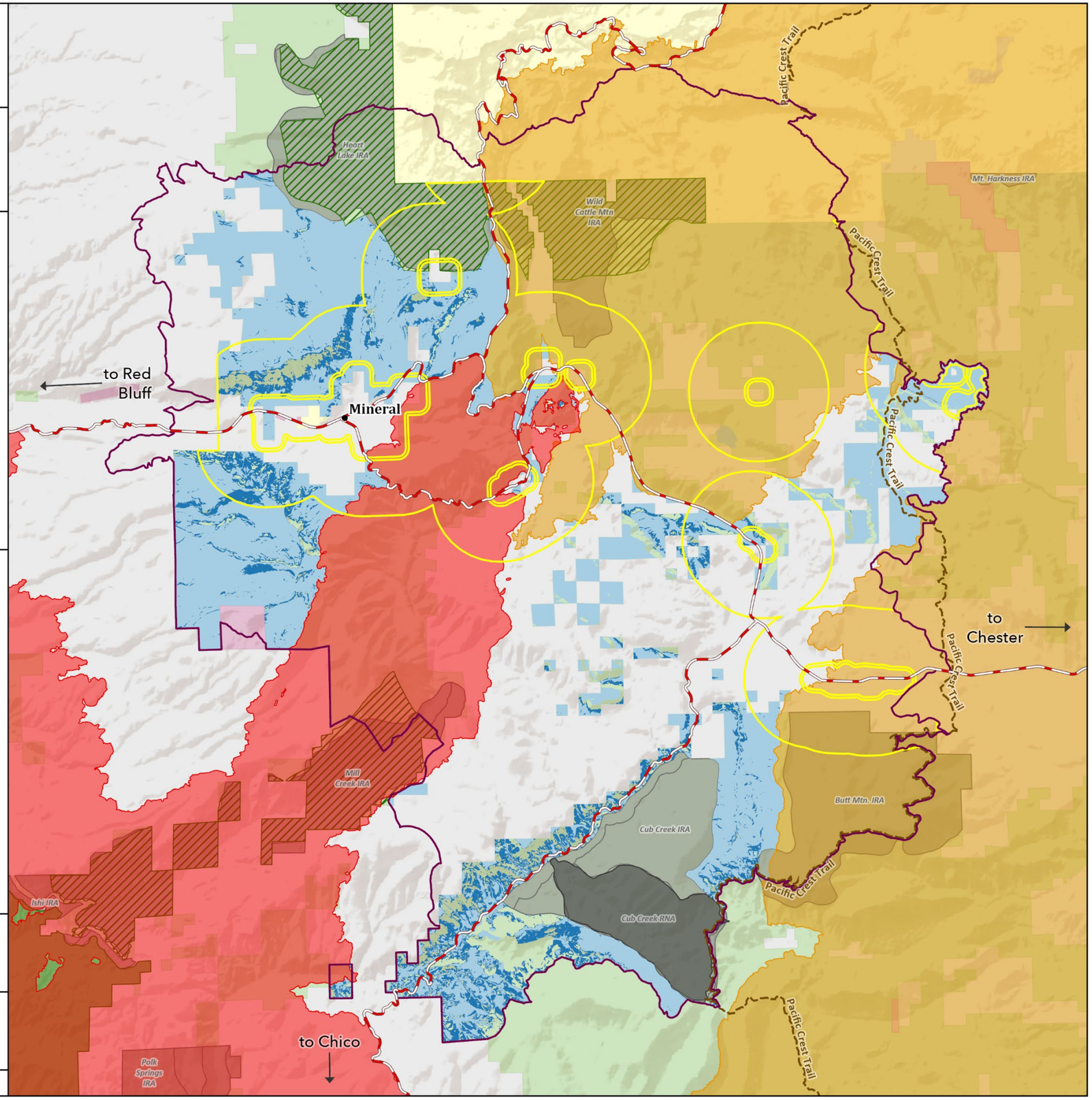
Targeted hand treatments may be used within Inventoried Roadless Areas and Proposed Wilderness, along trails, and on steep slopes.

Prescribed fire may be used throughout the entire project area.

Sierra Institute for Community and Environment

0 1 2 4 6 8 Miles

Map Date: 10/8/2024



Dixie Fire Recovery

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

Project Boundary
Dixie Fire Footprint

Treatment Type

Mechanical Treatment <35% Slope (15,770 acres)
Mechanical Treatment 35%-50% Slope (1,441 acres)
Reforestation (4,404 acres)

Designated Lands

Proposed Wilderness
Research Natural Area (RNA)
Inventoried Roadless Area (IRA)

Land Ownership

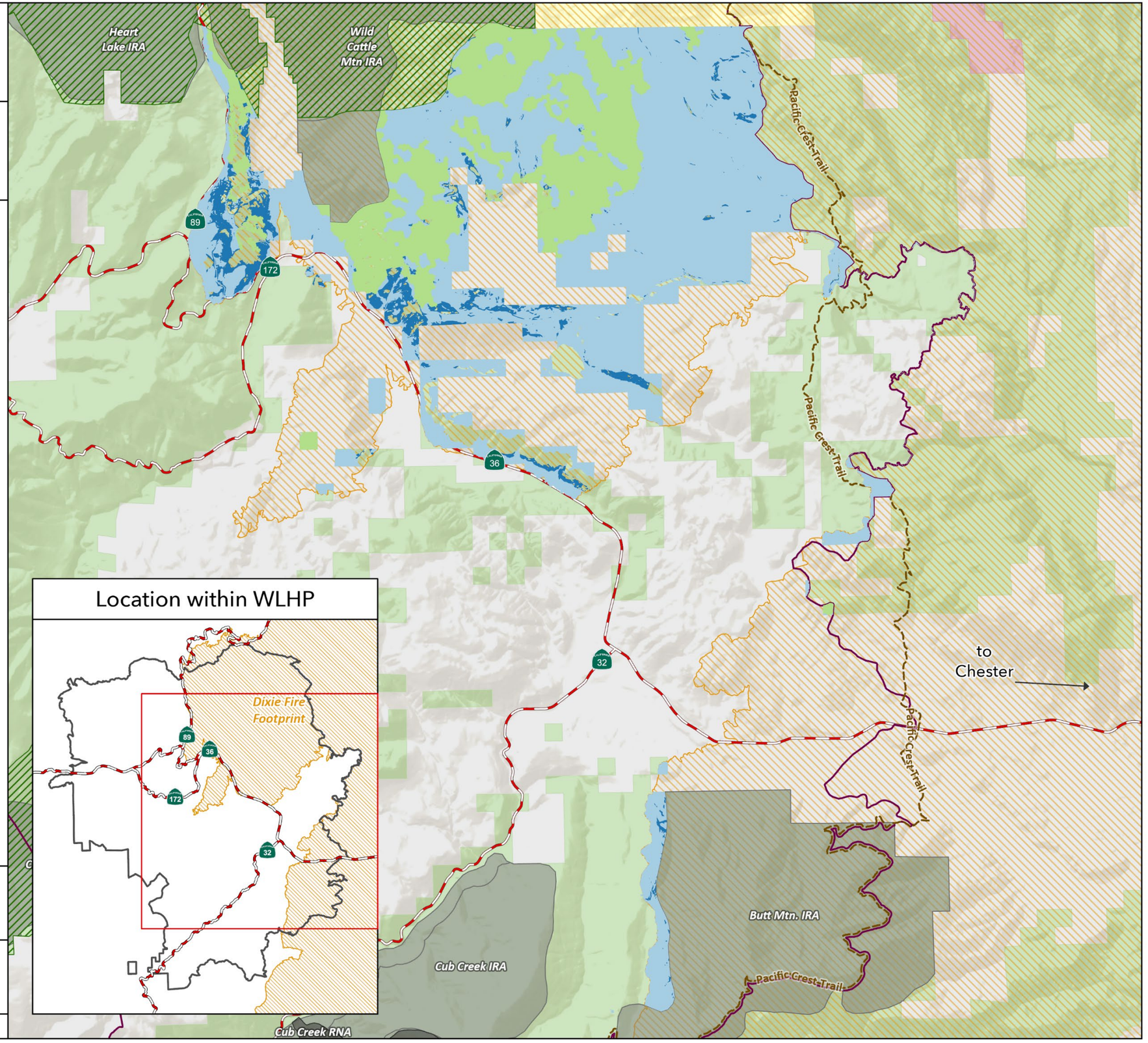
U.S. Forest Service
National Park Service
Other State/County/Federal
Private/Industry

Reforestation actions include mechanical site preparation and herbicide application.

Sierra Institute for Community and Environment

0 ½ 1 2 3 4 Miles

Date: 1/5/2024



Park Fire Recovery

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

- Project Boundary
- Park Fire Footprint

Treatment Type

- Mechanical Treatment <35% Slope (8,255 acres)
- Mechanical Treatment 35%-50% Slope (3,466 acres)
- Reforestation (5,658 acres)

Designated Lands

- Proposed Wilderness
- Wilderness
- Research Natural Area (RNA)
- Inventoried Roadless Area (IRA)

Land Ownership

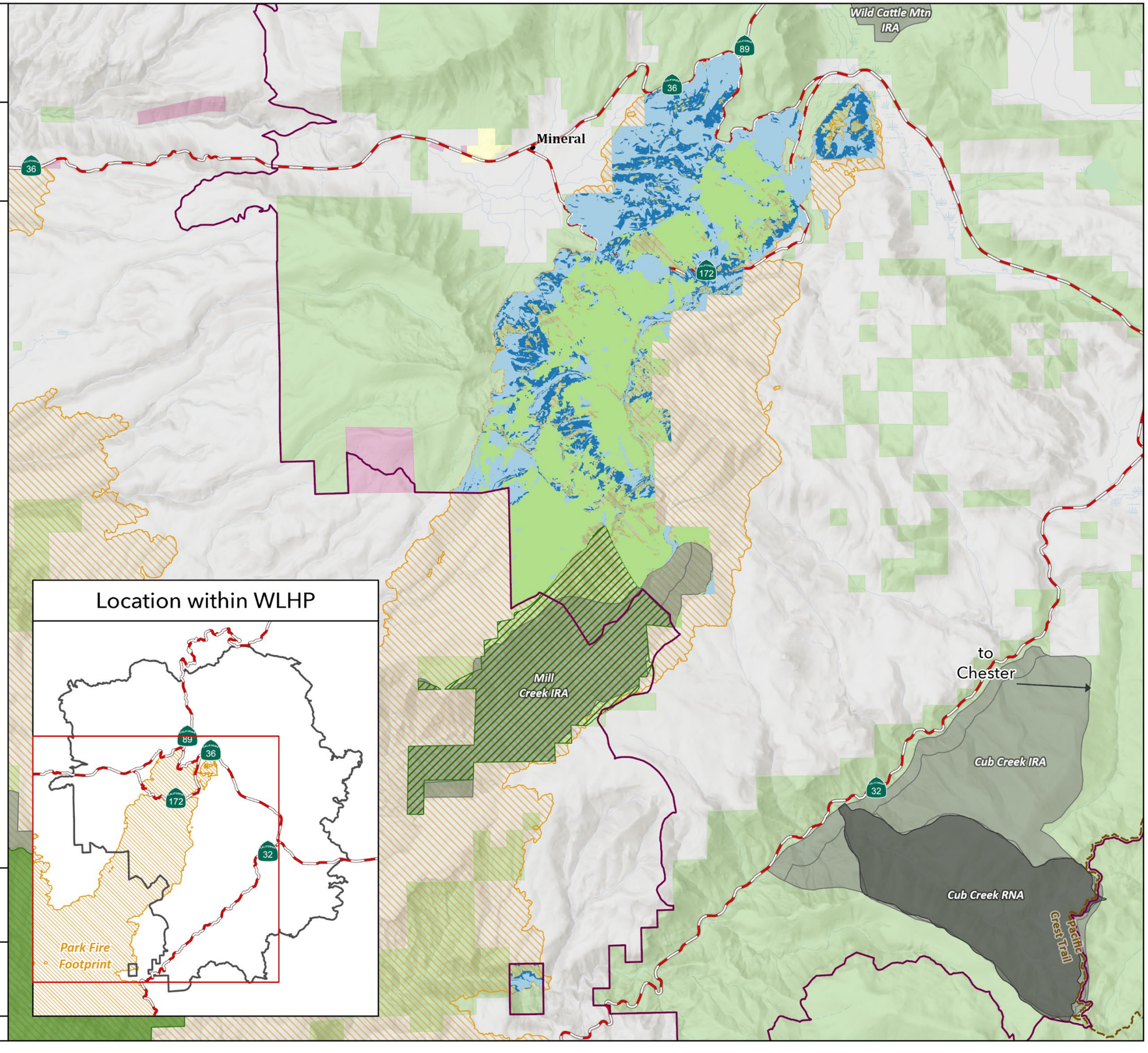
- U.S. Forest Service
- National Park Service
- Other State/County/Federal
- Private/Industry

Reforestation actions include mechanical site preparation and herbicide application.

USDA | Sierra Institute for Community and Environment

0 ½ 1 2 3 4 Miles

Date: 10/8/2024



Rhyolitic Soils and Slope

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

Project Boundary

Treatment Type

Mechanical Treatment

Bedrock

Rhyolitic Bedrock

Percent Slope

35%-50%

>50%

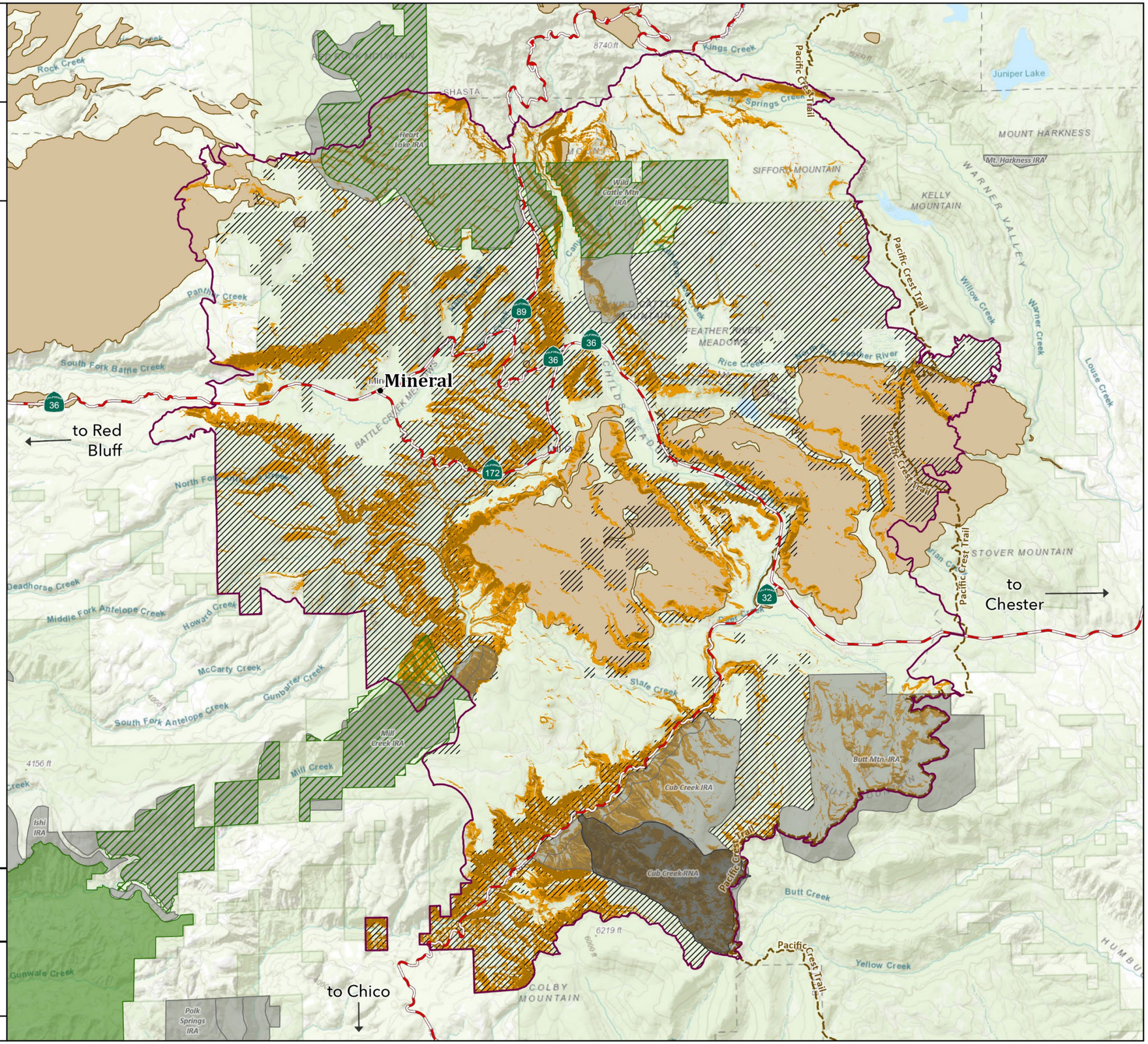
Designated Lands

Proposed Wilderness

Wilderness

Inventoried Roadless Area (IRA)

Research Natural Area (RNA)



USDA | Forest Service | National Parks Service | Sierra Institute for Community and Environment

0 2 4 8 Miles

N

Map Date: 1/9/2024

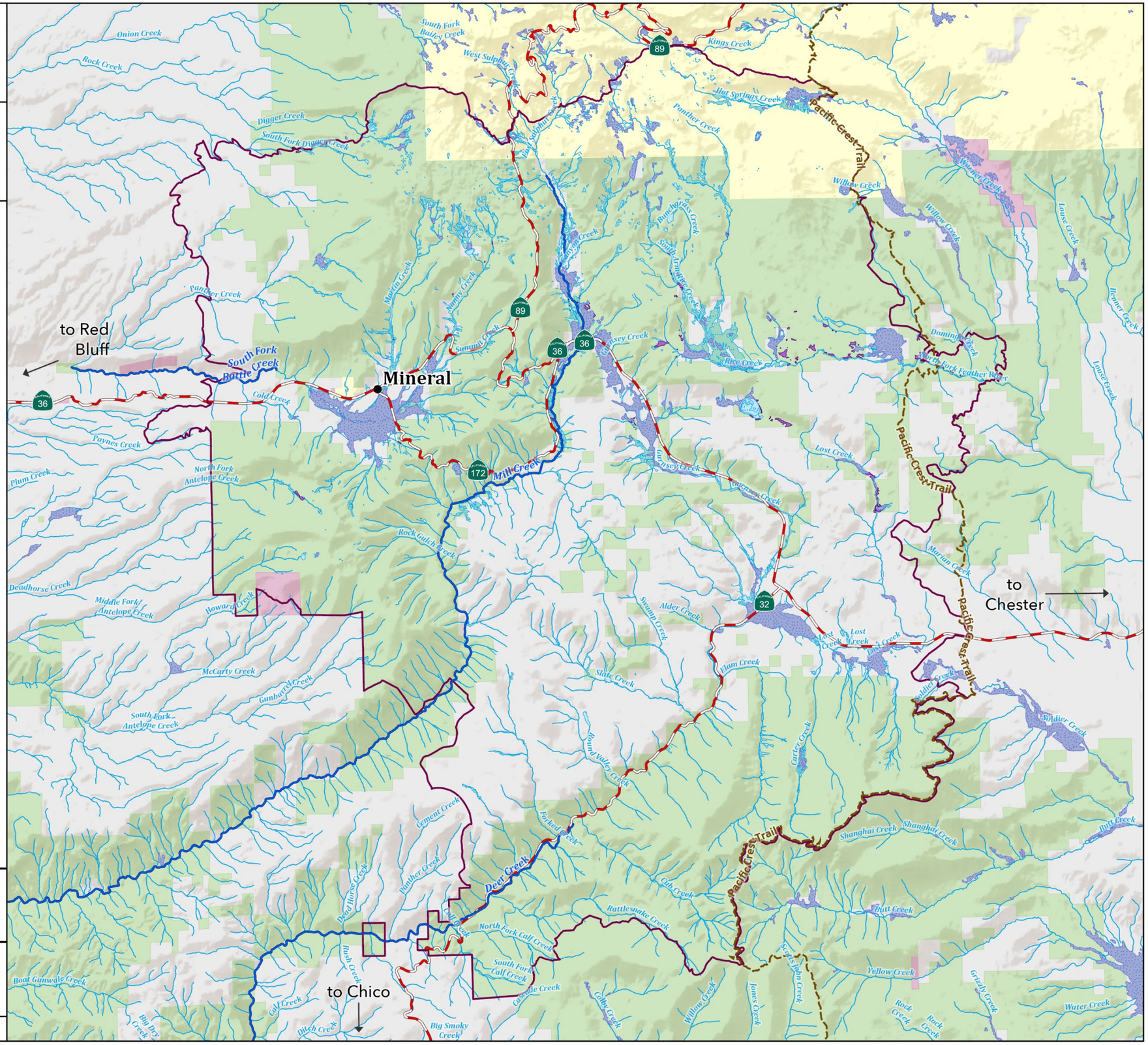
Watershed Health

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

- Project Boundary
- Meadows (545.95 acres)
- Aspen Stands (166.09 acres)
- Anadromous Reaches (22.85 miles)
- Streams (535.05 miles)

Land Ownership

- U.S. Forest Service
- National Park Service
- Other State/County/Federal
- Private/Industry



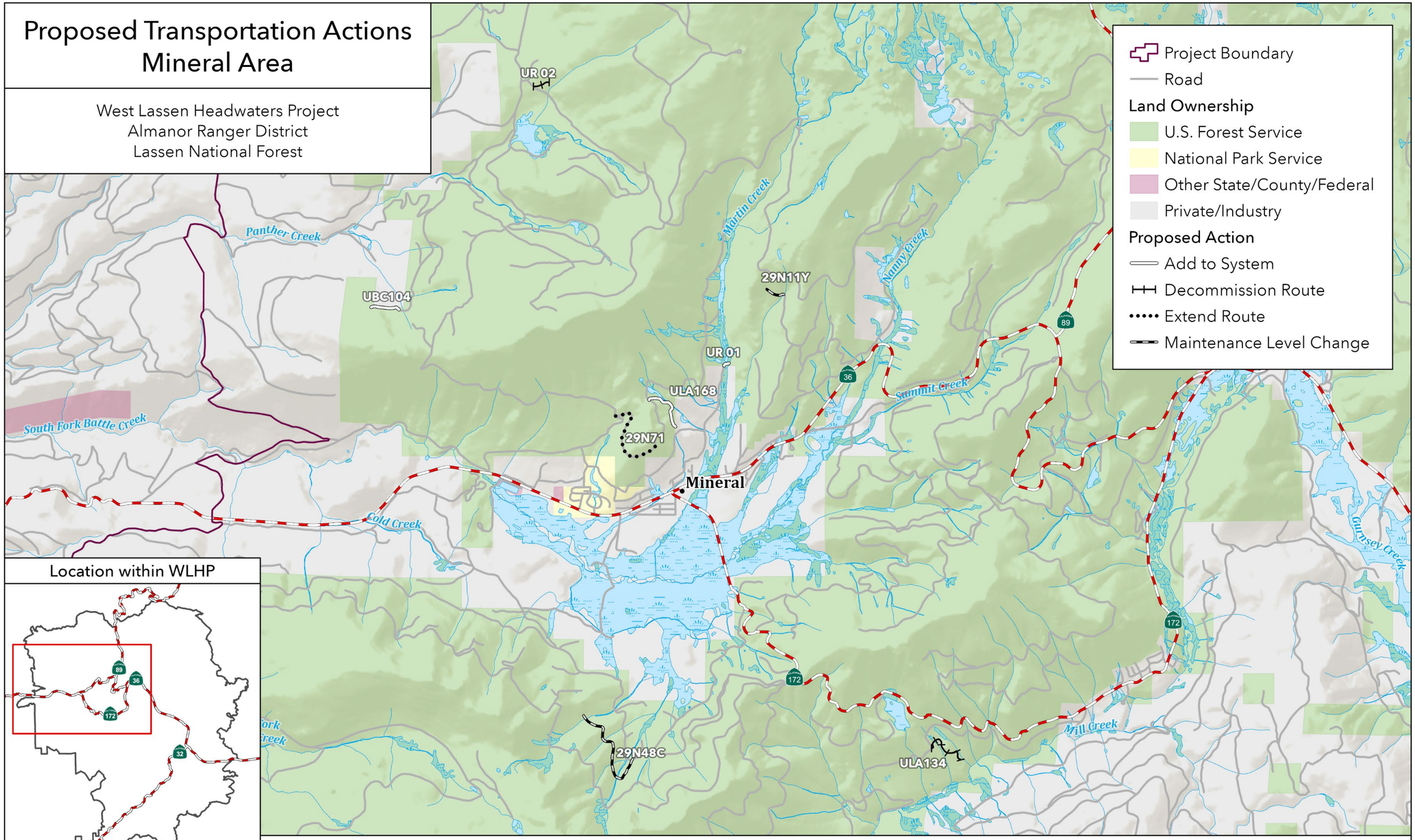
USDA | Forest Service | National Park Service | Sierra Institute for Community and Environment

0 2 4 8 Miles

Map Date: 1/9/2024

Proposed Transportation Actions
Mineral Area

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest



Location within WLHP

Map Date: 1/22/2024

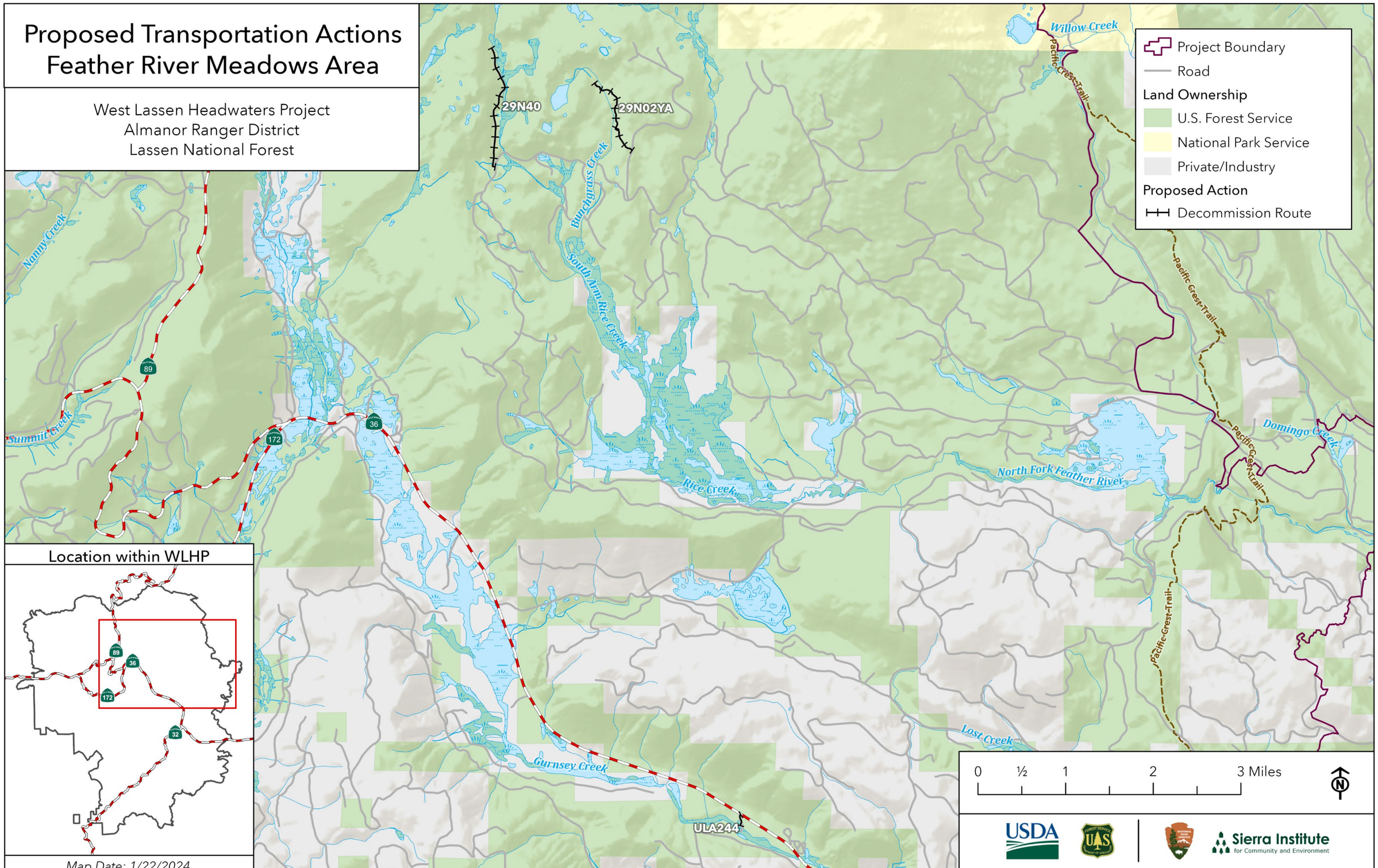
0 ½ 1 2 3 4 5 Miles

N

USDA | Sierra Institute for Community and Environment

Proposed Transportation Actions
Feather River Meadows Area

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest



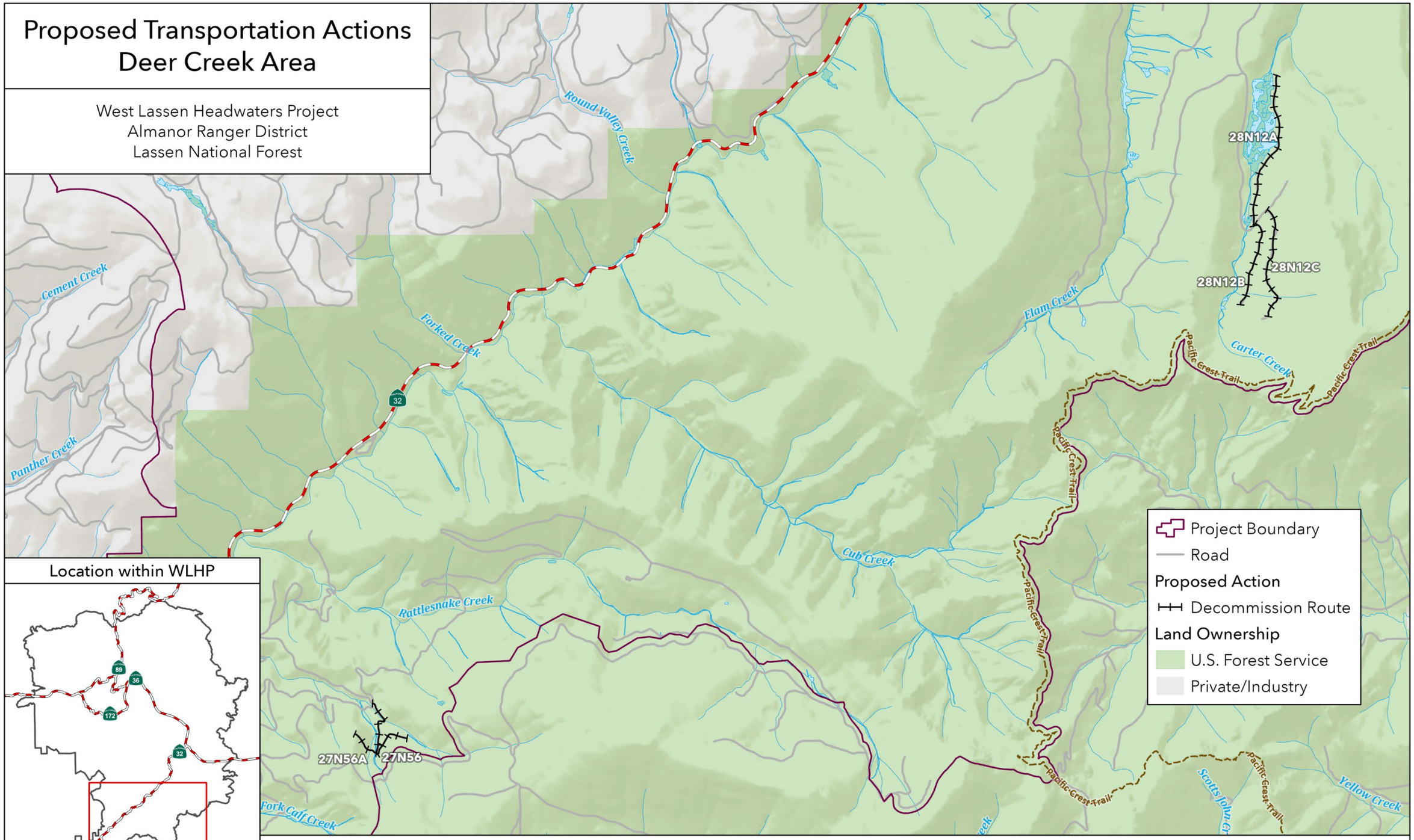
Location within WLHP

Map Date: 1/22/2024

USDA Forest Service | National Park Service | Sierra Institute for Community and Environment

Proposed Transportation Actions
Deer Creek Area

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest



Location within WLHP

Map Date: 1/22/2024

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Fire Management Features

West Lassen Headwaters Project
Almanor Ranger District
Lassen National Forest

Project Boundary
Helispot Location
Rte No Fire Management Feature

Treatment

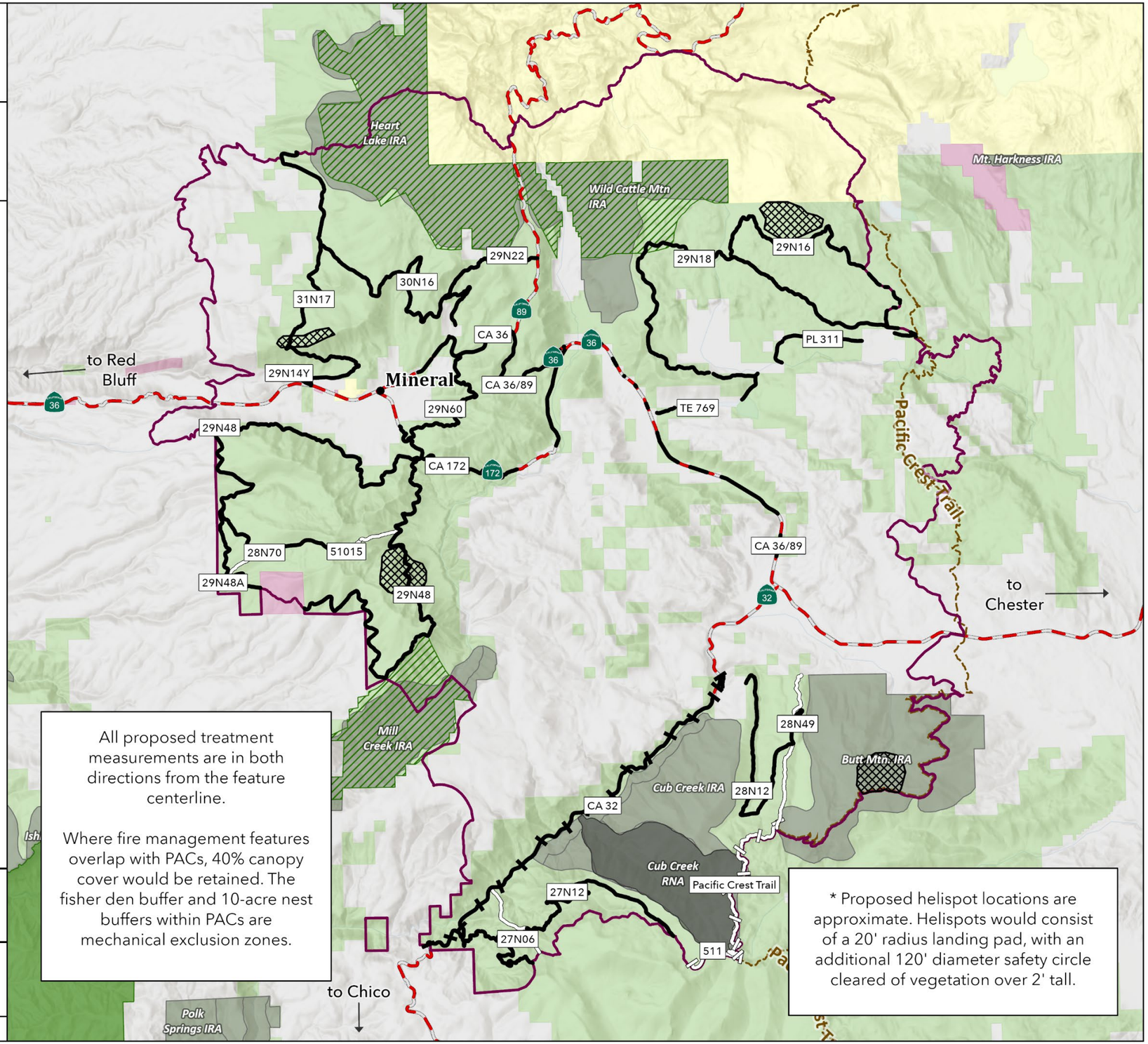
- Remove shrubs and trees > 2' tall within 30' + cut snags and hazard trees within 200'
- Remove shrubs and trees > 2' tall within 50' + cut snags and hazard trees within 200'
- Remove shrubs and trees > 2' tall within 50' + thin to a shaded fuel break within 200'
- Remove shrubs and trees > 2' tall within 50' + thin to a shaded fuel break within 200'; mechanical exclusion between Hwy 32 and Deer Creek

Designated Lands

- Proposed Wilderness
- Wilderness
- Inventoried Roadless Area (IRA)
- Research Natural Area (RNA)

Land Ownership

- U.S. Forest Service
- National Park Service
- Other State/ County/Federal
- Private/Industry



All proposed treatment measurements are in both directions from the feature centerline.

Where fire management features overlap with PACs, 40% canopy cover would be retained. The fisher den buffer and 10-acre nest buffers within PACs are mechanical exclusion zones.

* Proposed helispot locations are approximate. Helispots would consist of a 20' radius landing pad, with an additional 120' diameter safety circle cleared of vegetation over 2' tall.

USDA · UAS · Sierra Institute for Community and Environment

0 2 4 8 Miles

Map Date: 10/29/2024

Appendix B. Project-level Forest Plan Amendments

Abbreviations: **AM:** American Goshawk. **BANRF:** Best Available Nesting Roosting Foraging. **CSO:** California Spotted Owl. **DBH:** diameter at breast height. **CWHR**: California Wildlife Habitat Relationship [class], a classification combining stand density and average tree size. **DC:** Desired Condition. **DES**: Designation. **GDL:** Guideline. **HQNR:** Highest Quality Nesting Roosting. **MGT:** Management [Intent]. **PAC:** Protected Activity Center. **PB:** Prescribed Burning. **QMD:** Quadratic Mean Diameter. **SNFPA ROD:** Sierra Nevada Forest Plan Amendment Record of Decision (2004). **S&G:** Standard and Guideline. **STD:** Standard. **TERR:** Territories

Specific Definitions For California Spotted Owl Amendments

Amendment components included within this document require specific language that have meanings that may differ from other documents or applications. Table 21 defines specific terms that are required for conformity to each component.

Table 21. Definitions used in CSO amendments. Identification column shows how the term is emphasized in the components.

Term	Identification	Definition
Very large trees	very large	Trees 36 inches DBH or greater.
Large trees	large	Trees 30 inches DBH or greater. Includes very **large** trees.
Very large snags	very large snags	Snags 45 inches in diameter or greater.
High canopy cover	high	Canopy cover for the defined area is 60.0% or greater.
Moderate canopy cover	moderate	Canopy cover for the defined area is 40.0-59.9%.
Moderately high canopy cover	moderately high	Canopy cover for the defined area is 50.0-59.9%.
Highest Quality Nesting and Roosting Habitat	**HQNR** habitat	**HQNR**[1] habitat are areas preferred by CSO for nesting and roosting. It includes 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** and/or tall trees (>150 feet tall) and some **very large** trees. d. **High** or **moderately high** canopy cover with areas greater than 70 percent, including hardwoods. e. Two or more tree canopy layers and

Term	Identification	Definition
		f. Contains some **very large snags** 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 habitat	**BANRF**[2] 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** remnant trees; b. Trees in the dominant and co-dominant crown classes ideally average 20 inches QMD or greater and including some **large** trees; c. **High** or **moderately high** canopy cover, including hardwoods, or **moderate** 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** 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	No special designation	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.
Maintain habitat	maintain	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.

Term	Identification	Definition
Improve habitat	improve	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	Not used in components	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	Not used in components	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	No special designation	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.

[1]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).

[2]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).

[3]Adapted from the CSO Strategy Approach 1: Narrative, Paragraph 3 (p. 25).

Plan Amendments for California spotted owl

Table 22. Project Level Plan Amendments for CSO

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
DES-PAC-01	Modify component language – CSO PAC Designation	**California Spotted Owl Protected Activity Center (PACs) Designation.** 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 nor 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. *SNFPA ROD p. 37*	**California Spotted Owl Protected Activity Center (PACs) Designation.** California spotted owl protected activity centers 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 under **HQNR** habitat or, if **HQNR** is scarce, areas including at least the elements a through c listed under **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.	PACs

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
DES-PAC- 02	Modify component language – CSO PAC Designation	**California Spotted Owl Protected Activity Centers Designation:** PACs are maintained regardless of California spotted owl occupancy status. However, after a stand replacing event, evaluate habitat conditions within a 1.5-mile radius around the activity center to identify opportunities for re- mapping the PAC. If there is insufficient suitable habitat for designating a PAC within the 1.5-mile radius, the PAC may be removed from the network. *SNFPA ROD P.37*	**California Spotted Owl Protected Activity Centers Designation:** **PAC retirement after disturbance or long-term lack of occupancy** Existing PACs and territories may not be retired unless loss of suitable habitat or long-term occupancy criteria are met as defined in the 2019 Conservation Strategy for the California Spotted Owl in the Sierra Nevada, or more current guidance for the Pacific Southwest Region. Before authorizing vegetation treatments in California spotted owl territories affected by a large-scale, high-severity disturbance event, assess habitat conditions within a 1.5-mile radius of the most recent nest (where the nest is not known, the most recent daytime roost) to determine whether to modify or retire existing PACs and territories following the 2019 Conservation Strategy for the California Spotted Owl in the Sierra Nevada, or more current guidance from the Pacific Southwest Region. If adequate suitable habitat remains, modify the boundary of the PAC to encompass the best remaining 300 acres of **HQNR** and **BANRF** habitat as per **DES-PAC-01.**	PACs
DC-PAC-01	Modify component language – PAC Desired Conditions	**California Spotted Owl Protected Activity Centers Desired Conditions:** Stands in each PAC have: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches DBH; (3) at least 60 to70 percent canopy cover; (4) some very large snags (greater than 45 inches DBH); and (5) snag and down woody material levels that are higher than average. *SNFPA ROD p. 37*	**California Spotted Owl Protected Activity Centers Desired Conditions:** PACs provide high-quality nesting and roosting habitat that contributes to successful reproduction of California spotted owls. PACs encompass habitat that is essential for nesting and roosting, as defined by the following characteristics: The habitat has a **high** canopy cover (including large clumps of more than 70 percent canopy cover), with multiple layers of tree canopy, and many **large** trees, **very large** trees, and snags (including some greater than 45 inches in diameter). Basal area and tree density tend toward the upper end of the range of desired conditions for the vegetation type. **Large** tree density, snag density, and coarse woody debris align with the old-forest desired conditions for the relevant forest vegetation type.	PACs

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
			Operationally, this desired condition would correspond with CWHR 6 and 5D	
MGT-PAC-01	Modify component language -- Fires and Fuel Management Strategy	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.** *SNFPA 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 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.**	PACs
STD-PAC-01	**Remove components and add new language –** **S&G 7 (within PACs), 72, 73, and 74.**	**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,	In California spotted owl PACs, all management activities must **maintain** or **improve** habitat quality in **HQNR** habitat by: 1. Maintaining or improving existing 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 large trees 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 large trees 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;	PACs

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		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. 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. *SNFPA ROD pp. 50 and 60*	• 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 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 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; • Retain 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	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
GDL-PAC- PB (contextual addendum)	Modify guideline for prescribed burning – S&G 74	**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. *SNFPA ROD p. 60*	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).	PACs
STD-PAC-02	Modify component language – S&G 33.	**S&G 33:** 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. *SNFPA ROD p. 54*	**S&G 33:** 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.	PACs
STD-PAC-03	Replace Components – S&G 75 and 77	**S&G 75 for California Spotted owl PACs:** Maintain a limited operating period (LOP) prohibiting vegetation treatments within approximately ¼ mile of the activity center during the breeding season (March 1 through August 31), unless surveys confirm that California spotted owls are not nesting. Prior to implementing activities within or adjacent to a California spotted owl PAC and the location of the nest site or activity center is uncertain, conduct surveys to establish or confirm the location of the nest or activity center.	**Limited Operating Period (LOP)** To minimize disturbance that may lead to breeding failure during the early breeding season (March 1 to July 9, or following current Pacific Southwest regional guidance), apply a LOP within 0.25 miles of the nest prohibiting: • Activities that only generate noise or smoke (e.g. prescribed burning, hand thinning); • Discretionary low level helicopter flights or hovering over nests; and • Discretionary landing of helicopters.	PACs

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		S&G 77. The LOP may be waived for vegetation treatments of limited scope and duration, when a biological evaluation determines that such projects are unlikely to result in breeding disturbance considering their intensity, duration, timing and specific location. Where a biological evaluation concludes that a nest site would be shielded from planned activities by topographic features that would minimize disturbance, the LOP buffer distance may be modified. *SNFPA ROD p. 60*	For mechanical treatment, including helicopter logging, within approximately 0.25 miles of the nest or known roost site, apply a LOP during the breeding season from March 1 to August 31 or following current Pacific Southwest regional guidance. Where the location of a nest site within a PAC is unknown, apply the limited operating period to the entire PAC or determine the nest site location. **Exceptions:** **The limited operating period may be modified or waived by the responsible official under the following circumstances:** 1. Waived if monitoring or surveys indicate that the nesting owls are absent (refer to current Pacific Southwest regional guidance). 2. Waived or modified for activities addressing imminent threats to life and property. 3. Waived or modified for activities of limited scope and duration if a biologist determines that such activity is unlikely to result in breeding disturbance based on the intensity, duration, timing, and specific location. 4. The limited operating period buffer distance may be modified based upon a biologist's evaluation of the area needed to shield a nest site from disturbance considering topographic features, vegetation, or other screening. 5. Waived or modified for prescribed burning in up to 10% of PACs per year per national forest where necessary to facilitate the benefits of using early season prescribed fire.	

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
GDL-PAC-01	Modify component language – S&G 1.	**S&G 1.** 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. *SNFPA ROD p. 49*	**S&G 1.** 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 & use treatments (including maintenance treatments and new fuels treatments) to fill identified gaps.	PACs
GDL-PAC- 02	Replace Component – S&G 71	**S&G 71**. Within the assessment area or watershed, locate fuels treatments to minimize impacts to PACs. PACs may be re-mapped during project planning to avoid intersections with treatment areas, provided that the re-mapped PACs contain habitat of equal quality and include known nest sites and important roost sites. Document PAC adjustments in biological evaluations. When treatment areas must intersect PACs and choices can be made about which PACs to enter, use the following criteria to preferentially avoid PACs that have the highest likely contribution to owl productivity: • lowest contribution to productivity: PACs presently unoccupied and historically occupied by territorial singles only. • PACs presently unoccupied and historically occupied by pairs, • PACs presently occupied by territorial singles, • PACs presently occupied by pairs, • highest contribution to productivity: PACs currently or historically reproductive.	To minimize potential impacts to California spotted owl reproductive success, vegetation treatments that may reduce habitat quality in the near term should be minimized or avoided in PACs with the highest likely contribution to reproductive success, otherwise **occupancy status** is prioritized as follows (from highest to lowest priority for treatment): 1. Currently unoccupied and historically occupied by territorial singles only. 2. Currently unoccupied and historically occupied by pairs. 3. Currently occupied by territorial singles. 4. Currently occupied by pairs. 5. Currently occupied by pairs and currently or recently reproductive.	PACs

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		Historical occupancy is considered occupancy since 1990. Current occupancy is based on surveys consistent with survey protocol (March 1992) in the last 2-3 years prior to project planning. These dates were chosen to encompass the majority of survey efforts and to include breeding pulses in the early 1990s when many sites were found to be productive. When designing treatment unit intersections with PACs, limit treatment acres to those necessary to achieve strategic placement objectives and avoid treatments adjacent to nest stands whenever possible. If nesting or foraging habitat in PACs is mechanically treated, mitigate by adding acreage to the PAC equivalent to the treated acres using adjacent acres of comparable quality wherever possible. *SNFPA ROD p. 59-60*		
DES-TERR-01	Modify component language – Old Forest Ecosystem and Associated Species Strategy	A network of land allocations, including California spotted owl and American 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 […] *SNFPA ROD p. 31*	A network of land allocations, including California spotted owl and American goshawk protected activity centers (PACs), California spotted owl ***territories***, forest carnivore den sites, and the southern Sierra fisher conservation area, with management direction […]	Territories
DES-TERR-02	Modify component language – CSO HRCA Designation	**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	**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	Territories

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		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 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. *SNFPA ROD p. 39*	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. *Contextually required for all projects that are adjacent to non-national forest lands that have known CSO nest sites:* 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-1B	Replace HRCA Desired Condition with Territory Desired Condition	**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. *SNFPA ROD p. 40 (repeated on p. 46)* **California Spotted Owl Home Range Core Areas (HRCAs) Management Objectives:** Establish and maintain a pattern of fuels treatments that is	**California Spotted Owl Territories Desired Conditions** At least 50 to 60 percent (depending on the terrestrial vegetation type and site conditions) 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	Territories

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		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. *SNFPA ROD p. 46*	the **HQNR** and **BANRF** habitat and the remainder of the territory consists of a diversity of many different structure and canopy classes.	
STD-TERR-1B	Modify component language – S&G 7.	**S&G 7.** 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 to remove the material necessary to meet fire and fuels objectives. • **Within California spotted owl Home Range Core Areas:**	1. In California spotted owl territories that do not currently meet the territory desired condition (**DC-TERR-01B**), **maintain or improve** all **HQNR** and **BANRF** habitat wherever it exists throughout the territory. 2. If **DC-TERR-01B** has been met, a. When a territory consists of a majority of moist habitat types[1] and contains 60 percent or more **HQNR** and **BANRF** habitat, retain[2] at least 60% suitable habitat. Treatments will promote heterogenous structure across the territory and prioritize **maintaining or improving HQNR** habitat in drainages and north- or east-facing slopes. b. When a territory consists of a majority of moist habitat types[1] and contains less than 60 percent **HQNR** and **BANRF** habitat, **maintain or improve** all **HQNR** and **BANRF** habitat wherever it exists throughout the territory. Treatments will promote heterogenous structure across the territory.	Territories

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
		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-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. *SNFPA ROD pp. 50-51*	c. When a territory consists of a majority of dry habitat types[1] and contains 60% or more **HQNR** and **BANRF** habitat, retain2 at least 50% suitable habitat. Treatments will promote heterogenous structure across the territory and prioritize **maintaining or improving HQNR** habitat in drainages and north- or east-facing slopes. d. When a territory consists of a majority of dry habitat types[1] and contains less than 60 percent **HQNR** and **BANRF** habitat, **maintain or improve** all **HQNR** habitat wherever it exists throughout the territory, and retain[2] at least 50 percent of suitable habitat. Treatments will promote heterogenous structure across the territory. **Exception:** For territories occurring in WUI defense zones, within high risk fireshed areas[3], or in territories that contain unavoidable placement of fuelbreaks, retain[2] at least **40 percent** of the territory (including the PAC) in suitable habitat. Treatments will promote heterogenous structure across the territory and prioritize **maintaining or improving HQNR** habitat in drainages and north- or east-facing slopes. [1]Moist and dry habitat types can be determined based on vegetation type or physiographical attributes such as ridge tops and south or west facing slopes for dry territories and drainages and north or west facing slopes for moist [2]Retain refers to the extent of habitat. It does not prevent treatments. [3]High risk fireshed areas are Fireshed Registry Project Areas (areas delineated by regular-sized units as specified in Rocky Mountain Research Station General Technical Report 425) that have a Managed Stands Average Annual Exposure greater than or equal to 3.0. .	

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
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).	Territories
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 large trees 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.	Territories
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 **large** trees, 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.	Territories
DC-OLD- 03	Add Desired Conditions for old forest	**None**	The landscape contains a mosaic of vegetation types and structures that provide foraging and breeding habitat, movement, and connectivity for a variety of old- forest-associated species. Areas of **moderate** to **high** canopy cover composed primarily of **large** trees provide habitat connectivity for old-forest-associated species in key habitat corridors such as canyon bottoms and drainages.	Project Area

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
STD-PROJ-1B	Modify component language – S&G 6.	**S&G 6.** 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. *SNFPA ROD p. 50*	**S&G 6.** For all treatments, design projects to retain live conifer trees greater than 30 inches DBH except in the case of imminent threat to life and property, or if one of the conditions below is met: a. When required for equipment operability, individual trees less than 35 inches DBH may be removed on an incidental basis. b. Outside of California spotted owl territories and where necessary to move towards vegetation desired conditions, live trees greater than 30 inches but less than 40 inches DBH, **other than sugar pine, ponderosa pine, Jeffrey pine, or western white pine,** may be felled to create coarse woody debris (where it's lacking), or removed, under the following limited circumstances: • When removing trees is needed for aspen, oak, or meadow restoration treatments or for cultural or Tribal importance. • In overly-dense stands to favor retention or promote the growth of even larger or older shade-intolerant trees. • To improve the growth and vigor of rust-resistant sugar pine trees greater than 16 inches DBH by reducing competition from surrounding trees; or • Within homogeneous plantations, to reduce loss of **large** trees due to competition in overly dense stands.	Project Area
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.	Project Area
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	Project Area

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
			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.	Project Area
GDL-PROJ-03	Add guideline for old forest connectivity	**S&G 27.** Minimize old forest habitat fragmentation. Assess potential impacts of fragmentation on old forest associated species (particularly fisher and marten) in biological evaluations. **S&G 28.** Assess the potential impact of projects on the connectivity of habitat for old forest associated species. **S&G 29.** Consider retaining forested linkages (with canopy cover greater than 40 percent) that are interconnected via riparian areas and ridgetop saddles during project-level analysis. **S&G 30.** If fishers are detected outside the southern Sierra fisher conservation area, evaluate habitat conditions and implement appropriate mitigation measures to retain suitable habitat within the estimated home range. Institute project-level surveys over the appropriate area, as determined by an interdisciplinary team. **S&G 31.** Identify areas for acquisition, exchange, or conservation easements to enhance connectivity of habitat for old forest associated species. *SNFPA ROD pp. 50-51*	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.	Project Area

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
GDL- SNAG-01	Modify guideline for snag retention	**S&G 11**. Determine snag retention levels on an individual project basis for vegetation treatments. Design projects to implement and sustain a generally continuous supply of snags and live decadent trees suitable for cavity nesting wildlife across a landscape. Retain some mid- and large diameter live trees that are currently in decline, have substantial wood defect, or that have desirable characteristics (teakettle branches, large diameter broken top, large cavities in the bole) to serve as future replacement snags and to provide nesting structure. When determining snag retention levels and locations, consider land allocation, desired condition, landscape position, potential prescribed burning and fire suppression line locations, and site conditions (such as riparian areas and ridge tops), avoiding uniformity across large areas. General guidelines for large-snag retention are as follows: • westside mixed conifer and ponderosa pine types - four of the largest snags per acre • red fir forest type - six of the largest snags per acre • eastside pine and eastside mixed conifer forest types - three of the largest snags per acre • westside hardwood ecosystems - four of the largest snags (hardwood or conifer) per acre • where standing live hardwood trees lack dead branches - six of the largest snags per acre (where they exist to supplement wildlife needs for dead material). Use snags larger than 15 inches DBH to meet this guideline. Snags should be clumped and distributed irregularly across the treatment units. Consider leaving fewer snags strategically located in treatment areas within the WUI. When some snags are expected to be lost due to hazard removal or the effects of prescribed fire, consider these potential losses during project planning to achieve desired snag retention levels. *SNFPA ROD pp. 51-52*	To provide habitat for nesting, roosting, and denning wildlife, maintain a generally continuous supply of snags and live decadent trees suitable for cavity dwelling wildlife across a landscape. Retain some mid- and large diameter live trees that are currently in decline, have substantial wood defect, or that have desirable characteristics (teakettle branches, large diameter broken top, large cavities in the bole) to serve as future replacement snags and to provide nesting structure. Consider vegetation type and landscape position, potential prescribed burning and fire suppression line locations, and site conditions (such as riparian areas and ridge tops), avoiding uniformity across large areas. General guidelines for large-snag retention are as follows: • westside mixed conifer and ponderosa pine types – 25-40 of the largest snags per 10 acres • red fir forest type – 30 – 50 of the largest snags per 10 acres • eastside pine and eastside mixed conifer forest types – 15-30 of the largest snags per 10 acres • westside hardwood ecosystems – 25-40 of the largest snags (hardwood or conifer) per 10 acres Retain snags larger than 15 inches DBH (preferentially greater than 20 inches DBH) to meet this guideline. Retain snags in an irregular patchwork, with clumps and concentrations in drainages and on north- and east-facing slopes. When some snags are expected to be lost due to hazard removal or the effects of prescribed fire, consider these potential losses during project planning to achieve desired snag retention levels.	Project Area

ID	Action	Existing Direction from SNFPA ROD 2004	Project-Specific Plan Amendment	Applies
DC-FIRE- 01	Add Desired Conditions for forests post-fire	None	To provide future habitat for old-forest-associated species following a large- scale, high-severity disturbance in an area that had large trees and high canopy cover prior to the disturbance, identify, retain and promote the best available patches of remaining high-quality nesting, foraging, and denning habitat (6, 5D, 5M, 4D, 4M in descending order of priority). Desired conditions for amount, location, and configuration of retention should be informed by site conditions, aspect, position on slope, and the potential to restore habitat connectivity. **Exception:** Modify as needed in WUI defense.	Post-Fire Disturbanc e
STD-DNA-01	Do Not Amend	**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. *SNFPA ROD p. 53*	**Do not remove**	Project Area

[1]Moist and dry habitat types can be determined based on vegetation type or physiographical attributes such as ridge tops and south or west facing slopes for dry territories and drainages and north or west facing slopes for moist.

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

[3] High risk fireshed areas are Fireshed Registry Project Areas (areas delineated by regular-sized units as specified in RMRS-GTR-425) that have a Managed Stands Average Annual Exposure greater than or equal to 3.0. The West Lassen Headwaters project area does not lie within any high-risk firesheds *as defined by this rubric.*

Additional Project-Level Plan Amendments

Table 23. Additional Project-Level Plan Amendments Not Related to CSO

ID	Action	Existing Forest Plan	Project-Specific Plan Amendment	Applies
1	Modify Forest Standard and Guideline	**Lassen National Forest Land and Resource Management Plan (1992) Chapter 4, Section E, Timber S&G 7 (p. 4-29):** Avoid tractor skidding on slopes greater than 35 percent and on soils with an erosion hazard rating greater than 9.	Replace with: Integrated design feature for soils number 59: A pilot unit would be selected for steep-slope logging in a relatively small area, with representative soils, where consequences would be limited. Unit size and boundaries would be laid out with concurrence of the soil specialist. In the pilot unit, logging would be allowed on sustained slopes up to 50 percent. Outcomes would be monitored by the soil scientist or hydrologist. If outcomes are acceptable, the rest of the project would be open to steep-slopes logging (up to 50 percent) with a soil scientist or hydrologist consulting on a unit-by-unit basis to make sure steep slope logging can be done while meeting the soils objectives in the 2004 SNFPA ROD	Project Area
2	Replace Standard and Guideline	**SNFPA ROD S&G 7.** 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	Design project to a relative stand density index of 25 – 35 percent of maximum. Canopy cover can be reduced to below 40 percent averaged across the treatment unit.	Areas outside of CSO territories, American goshawk PAC, carnivore corridors; and to be consistent with GDL-PROJ-01, GDL-PROJ-02, and GDL-PROJ-03

ID	Action	Existing Forest Plan	Project-Specific Plan Amendment	Applies
		cover, projects are to be designed to remove the material necessary to meet fire and fuels objectives. • **Outside of California spotted owl Home Range Core Areas [now owl territories]:** 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-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. *SNFPA ROD pp. 50-51*		
3	Replace standard and guidelines	**SNFPA ROD** **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[n] … 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 to burning as needed to protect important elements of owl habitat. Treatments in the remainder of the PAC use the forest-wide standards and	All management activities in AGOS PACs must maintain or improve habitat quality in the highest quality nesting and roosting habitat. Where necessary to increase long-term resilience, vegetation treatments that may reduce near-term habitat quality may be authorized in up to 1/3 of the AGOS PAC outside of the highest quality nesting and roosting habitat (e.g., 5M, 5D, 6). Throughout protected activity centers outside of WUI defense zones and fire management features all vegetation treatments must: a. Retain the largest/oldest trees, known nest trees, and other large trees and snags with cavities, deformities, broken tops, or other habitat features of value to old forest species; b. 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,	American goshawk PAC

ID	Action	Existing Forest Plan	Project-Specific Plan Amendment	Applies
		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. *SNFPA ROD p. 60*	use the most recent known roost site) and areas in the rest of the protected activity center. c. Avoid mechanical treatments within a 10-acre area surrounding each known nest tree or nest structure that is still capable of supporting nesting; d. Increase the quadratic mean diameter of trees at the protected activity center scale; and e. Maintain the average canopy cover of the protected activity center at or above 50 percent. When American goshawk PACs are within WUI defense zones, mean canopy cover at the PAC scale must be maintained at or above 40%. Standards a through d (above) apply when PACs are within WUI defense zones. This standard may be modified when constructing a fuelbreak where avoiding overlap with a PAC is unfeasible. Creation of fuelbreaks must: • Avoid the 10 acres surrounding the most recent known nest site, • Retain existing HQNR habitat, and • Maintain at least 40% overstory canopy cover and 10% understory cover in shaded fuelbreaks whenever fuels and fire behavior objectives can be met with this level of vegetation retention.	

Substantive Requirements

Table 24. 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)(1) 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. Ecological sustainability refers to the capability of ecosystems to maintain ecological integrity (36 CFR 219.19). 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, and there is excessive accumulation of surface and understory ladder fuels. Forests are in an overly stressed condition due to changes in precipitation (drought), increasing temperature, and over a century of fire exclusion. Together, these existing conditions greatly reduce the forested landscape's ability to resist or recover from severe disturbances. Competition for limited resources in stressed, overly dense forest stands increase 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	Ecological sustainability of forest ecosystems in the Project is highly compromised. Beneficial low-to-moderate severity fire list 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 disturbances compared to the highly altered forests that exist in this landscape today. Green forest stands in the project area 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 infestation. This was evident during the 2021 Dixie Fire, which burned approximately a third of the West Lassen Headwaters Project landscape. The remaining two-thirds of the project area is still green and is at risk of another catastrophic wildfire event. 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 compared to the no action alternative.

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
		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 West Lassen Headwaters Project to develop forest stands that are more resilient to severe disturbances from wildfire, drought, insects, and diseases, thereby providing for ecological sustainability and ecosystem integrity.	
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)(1) 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	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 Lassen 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 absence of frequent, low- to -moderate-severity fires in the West Lassen Headwaters 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 uncharacteristically 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 West Lassen Headwaters Project was developed with the recognition that maintaining the diversity of plant and animal communities and the persistence of native species in the project area is dependent on a resilient landscape comprised of diverse, heterogeneous forests more closely aligned with historical 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 trees fire-resistant species all contributed

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
	terrestrial and aquatic ecosystem types; (ii) rare aquatic and terrestrial plant and animal communities; and (iii) the diversity of native tree species similar to those existing in the plan area.	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: (i) 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; (ii) promote heterogeneity by allowing; opening creation; and (iii) reduce loss of large diameter trees due to competition in overly dense stands. (USDA-FS 2019)	to a resilient forest that supported a diverse plant and animal community. The Project will create conditions more closely aligned with an active fire regime by reducing fuel loading, retaining the largest, healthiest trees, and increasing stand structural heterogeneity.
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 CFR 219.9(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.	The proposed project-specific Forest Plan amendment is based on recommendations in the Conservation Strategy for the California Spotted Owl in the Sierra Nevada (USDA-FS 2019). 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 California	The California spotted owl depends on large and structurally diverse trees and snags for nesting, roosting, and foraging. (USDA-FS 2019). The West Lassen Headwaters Project was developed to specifically maintain and promote these important habitat characteristics for the California spotted owl in some of the last remaining green forest stands on the Almanor Ranger District of the Lassen National Forest. Consistent with the California Spotted Owl Strategy, more intensive treatments could occur outside of PACs and Territories. The California 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 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

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
	If the responsible official determines that the plan components required in 36 CFR 219.9(a) are insufficient to provide such ecological conditions, then additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area	spotted owl, guided development of the project-specific plan amendment. The amended Forest Plan includes a new standard that specifies the desired ecological conditions to best support the California spotted owl, while retaining standards and guidelines that constrain management actions within PACs and Territories. The plan amendment aims to maintain high quality habitat while protecting it from risk of loss from high severity wildfire and other stressors.	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.
36 CFR219.10 Multiple Use While meeting the requirements of 36 CFR 219.8. Sustainability and 36 CFR 219.9 *Diversity of Plant and Animal Communities* (addressed in the sections above), 36 CFR 219.10 requires forest plans to provide for ecosystem services and multiple uses. 36 CFR 219.10(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	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
	for integrated resource management. Not every item listed- or aspects of each item listed - are directly 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 amendment recognizes 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 CFR 219.7, 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,	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 amendment 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 surrounding California spotted owl and American goshawk PACs and California spotted owl Territories. The project-specific Forest Plan amendment is 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,	The responsible official considered the relevant effects of the proposed plan amendment in an 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
	wilderness, and other relevant resources and uses.	supports effective use of timber harvest, other 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 incited by drought. The Forest Plan's desired conditions, standards, guidelines, and management approaches will be achieved through fuels and vegetation management actions that will provide timber as a by-product	
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 amendment 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 amendment 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	The responsible official considered the relevant effects of the proposed plan amendment in an 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 hunting, fishing, trapping, gathering, observing, subsistence, and other activities.

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
		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.	
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 amendment was developed in consideration of the threat of large, severe wildfire and other major disturbances to impact ecological, social, and economic sustainability. Fire has been largely excluded from the landscape for nearly a century. Fire modeling conducted by the Forest Service and California Department of Forestry and Fire Protection (CAL FIRE) indicates this landscape has some of the highest risk areas in California for high-severity fires. A large, severe wildfire or prolonged drought with accompanying widespread insect or disease infestation would have long- term catastrophic consequences for local communities, forests, air, soils, water, habitats, scenery, recreational opportunities, and local and downstream economies. The sections on 36 CFR 219.8(a)(1) and 219.9(a)(1) above describe how the amended plan addresses risks to ecological sustainability. Social and economic sustainability is considered as the amended plan will allow the West Lassen Headwaters Project to conduct more effective thinning and prescribed fire treatments for enhanced forest resiliency.	The responsible official considered the relevant effects of the proposed plan amendment in an Environmental Assessment, which determined that plan amendment would have no significant effect on socioeconomic 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
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 219.8(1)(iv)). This consideration re-emphasizes the importance of ecological sustainability and integrity as addressed in 36 CFR 219.8(a)(1) 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 a forest plan amendment. Resilient forests more closely aligned with an active 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, increased stand structural and tree species heterogeneity, will 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 and 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-intolerant trees in overly dense stands to meet project objectives more effectively fer tree species composition and forest stand density; and (2) promote heterogeneity by providing for opening creation in sub-basins that are departed. These objectives, which are supported by the project-specific plan	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 wildfires, 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
		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 CFR 219.11 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 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 amendment allows vegetation management (including timber harvest) for the purposes of reducing the risk of undesired wildfire effects 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, and enhancing tree species composition. Mechanical thinning would be utilized as one tool to achieve these objectives. Forest thinning objectives are aimed at improving wildlife habitat by making it more resilient to severe disturbances and reducing the risk of loss of human lives, communities, and valuable resources from catastrophic wildfire.
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 and prescribed fire treatments (including timber harvest) to be conducted to enhance stand- and landscape-level forest health and resiliency.	See sections for 36 CFR 219.9(a) and (b) above.

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Appendix C. Integrated Design Features

The following integrated design features are resource protection measures that are developed by specialists and incorporated as part of the action alternative for the project. They are project-specific and in addition to Best Management Practices (BMP), the Lassen National Forest Wet Weather Operations Guide, Lassen National Forest Wet Weather Haul Agreement, and standards and guidelines from the Lassen LRMP, as amended. These design features are also included to provide implementation parameters that would be incorporated into treatments, contracts, or used to guide forest service personnel in conducting implementation activities.

Aquatics and Watershed:

Riparian Habitat Conservation Areas

Equipment exclusion zones would be established within Riparian Habitat Conservation Areas (RHCAs) measured from the edge of the stream channel or aquatic feature, see Table 25. Equipment would be permitted to reach beyond mechanical restriction zone boundaries into the RHCA, but not allowed to enter. In RHCAs affected by the Dixie Fire or other high-severity fires, mechanical restriction zone widths may be increased to prevent adverse effects on water quality in accordance with IDF number 7. Outside of burned areas, RHCA widths and mechanical restriction zones would be as follows:

Table 25. Riparian Habitat Conservation Area (RHCA) Widths and Mechanical Restriction Zones

Aquatic Feature	RHCA Width	Ground-based Mechanical Equipment Restriction Zone Slope 20 percent or less*	Ground-based Mechanical Equipment Restriction Zone Slope greater than 20 percent
Perennial stream	300 feet	82 feet	150 feet
Seasonal stream	150 feet	82 feet	82 feet
Lake, wetland, wet meadow	300 feet	No distance exclusion zone, see IDF #4	No distance exclusion zone, see IDF #4
Spring	300 feet	20 feet	50 feet
Fen	300 feet	150 feet	150 feet

*For springs, the buffer is measured from the outer edge of the spring's riparian vegetation, if present.

1. Hand felling and hand piling within the RHCA, including within the mechanical restriction zone, would be permitted.
2. Riparian species (aspen, cottonwood, alder, willow, dogwood, etc.) would not be cut or removed.
3. Stream bank stability trees would be identified by a qualified specialist prior to RHCA treatments. Stream bank stability trees would not be felled unless they pose a safety risk, in which case they would be felled and left in place.
4. Soils in the RHCA and in meadow treatment areas would be dry to a depth of 10 inches prior to equipment entry.
5. Turning of mechanical equipment within RHCA would be kept to a minimum.
6. All firing operations entering RHCAs shall be backing fires. No ignitions would take place.
7. Within the Dixie Fire footprint and recently severely burned areas: Consult hydrologist or soil scientist on a unit-by-unit basis to determine mechanical restriction zone widths for RHCAs and aquatic features. This IDF remains in effect until 70 percent effective ground cover has re-

established in the severely burned area. For the purposes of this IDF, burn severity refers to vegetation burn severity, not soil burn severity.

8. There would be no crossing of perennial streams by mechanical equipment. Crossings of seasonal stream channels would be designated by a qualified specialist prior to implementation. Following use of these specified crossings, a qualified specialist would assess the site for potential repair and/or restoration needed.
9. Skid trails within RHCAs would be kept to a minimum. No waterbars would be installed on skid trails within RHCAs following treatment.
10. Fuel piling with a dozer or other bladed equipment would not be allowed in RHCAs. Mechanical grapple pilers are allowed if they adhere to all other soil and water IDFs for mechanical equipment.
11. Skid trails within RHCAs would require 90 percent ground cover following project implementation. Rocks would only count towards this if they were in place before project activities began.
12. No cut and fill would be allowed for new skid trails within RHCAs.
13. Where mechanical equipment is used to fell timber within RHCAs, one-end suspension would be used to remove felled timber where feasible. If one-end suspension is not feasible, endlining would be permitted if objectives for 90 percent groundcover on non-rocky riparian soils are met.
14. Endlining of material would be permitted within RHCAs with slopes greater than 20 percent but would not be permitted within 25 feet of any continuous scour channels.
15. No piling of material for burning would occur within 25 feet of an aquatic feature. If piles for burning cover more than 10 percent of the RHCA in a unit, only one-third of the piles would be burned in any given year to avoid impacting the nearby riparian environment.
16. There would be no construction of new landings or use of old or existing landings within an RHCA without concurrence by a qualified specialist. Landings would not be within 25 feet of the existing riparian or meadow vegetation. Landings within RHCAs would be decommissioned following project implementation and a qualified specialist would evaluate them for compaction or erosion potential. Mitigations may include obliteration of the landing, spreading of native seed, mulch, woody debris, or certified weed-free straw.
17. If streamflow is greater than or equal to 4.0 cubic feet per second, the water drafting rate should not exceed 350 gallons per minute.
18. If streamflow is less than 4.0 cubic feet per second, the water drafting rate should not exceed 20 percent of the streamflow.
19. Water drafting sites would be brought up to Best Management Practices (BMP) standards. Water drafting would cease when bypass surface flows drop below 2.0 cubic feet per second.
20. Large, downed wood in stream channels and hydrologic depressions would remain in place.

Botany

Threatened, Endangered and Sensitive, and Special Interest Plant Species

21. Rare plant surveys would be completed prior to project implementation and any occurrences of threatened, endangered and sensitive TES or Special Interest (SI) plant species discovered would

be protected through flag-and-avoid methods and with incorporation of any additional protection measures recommended by Forest Botany personnel.

Forest Botany personnel would be consulted during design and layout of any subsequent activity under this project, with enough time provided so that existing botanical data can be consulted, new surveys ordered if existing surveys are not sufficient, and any necessary control areas can be flagged for withdrawal from the treatment activity.

22. All occurrences of *Meesia triquetra (*three-ranked humpmoss)*, Meesia uliginosa* (Broad nerved humpmoss)*, Eriophorum gracile* (cottongrass)*, Carex limosa* (Shore sedge)*,* and *Utricularia minor* (lesser bladderwort) and their associated springs, meadows and fens would be flagged and avoided from all ground disturbing activities and displayed as control areas on contract maps.
23. Only hand treatment methods would be allowed within 150 feet of fens, after assessment by Forest Botany personnel. Where hand thinning is conducted around or in fens, sufficient standing trees and woody debris must be left behind after thinning to meet the fen's ongoing needs for woody debris.
24. All TES and Special Interest Plant occurrences would be avoided by pile burning.
25. Planting would not occur within known locations of TES or Special Interest plant species without prior consultation with Forest Botany staff.
26. Mechanical thinning treatments will not occur within 50 ft of all known occurrences of *Piperia colemanii* (Coleman's piperia); however, hand thinning will be allowed with consultation with botany personnel.
27. All ground-disturbing activities would be excluded from within 50 feet of occurrences of *Botrychium* species and all incense cedar would be retained within 150 feet. Locations would be displayed as control areas on all contract maps.
28. Underburning in any rare plant population would only occur in the fall. No ignitions would occur within these populations; however, prescribed fire would be permitted to back into these sites.
29. When rare plant species are within 25 feet of digging, covering, or flaming treatment of invasive plant species, the rare plants would be clearly identified, and care taken to avoid direct impacts to individuals. No buffers are required for hand pulling.
30. New occurrences of rare plant species discovered before or during ground-disturbing activities would be protected through flag and avoid methods or measures like those described above.

Invasive Plant Species

31. Surveys for invasive plant species would be completed prior to project implementation and all occurrences would be mapped, flagged for avoidance, and evaluated for treatment.
32. All off-road equipment would be weed-free prior to entering the Forest. Staging of equipment would be done in weed free areas.
33. Known noxious weed infestations would be identified, flagged where possible, and mapped for this project. Locations would be displayed on contract maps. Identified invasive plant species' sites within or adjacent to the project area would be evaluated by forest personnel and treated by forest botany staff prior to project implementation and the sites avoided. Any larger or un-pullable infestations would be avoided by harvesting equipment or equipment used would be washed on site before leaving the infested area and entering un-infested areas to prevent spreading invasive plants across the project area.

34. New small infestations identified during project implementation would be evaluated and treated using Early Detection Rapid Response (EDRR) methods according to the species present and project constraints and avoided by project activities. If larger infestations are identified after implementation, they would be isolated and avoided by equipment, or equipment used would be washed after leaving the infested area and before entering an un-infested area.
35. Post project monitoring for implementation and effectiveness of treatments and control of new infestations would be conducted as soon as possible and for a period of multiple years after completion of the project.
36. If project implementation calls for mulches or fill, they would be certified weed-free. Seed mixes used for re-vegetation of disturbed sites would consist of locally adapted native plant materials.

Cultural Resources

37. Cultural Resources are managed and protected through the *Programmatic Agreement (PA) among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region* (2018; PA) Prior to implementation of each proposed activity, the Area of Potential Effect (APE) will be examined by Cultural Resources staff. The cultural resources present in the APE and the site specific Approved Standard Protection Measures outlined in the Region 5 PA, Appendix E will be used to manage and maintain cultural resources in order to ensure that the undertaking will not adversely affect historic properties (i.e., no adverse effect).
38. In the event that cultural resources are discovered, or historic properties are inadvertently affected during implementation of the Project, all work shall immediately cease in the area identified and the Lassen National Forest Heritage Staff shall be notified immediately. Should any cultural resources become damaged in unanticipated ways by activities proposed in this Project, the steps described in the PA for inadvertent effects will be followed.
39. The District Archaeologist shall be kept informed of the status of various stages of the Project to ensure Standard Resource Protection Measures are in place and adhered to during implementation.
40. Monitoring of cultural resources may occur during and after the Project has been completed to ensure the effectiveness of protection measures.

Fuels

41. Hand and machine piles would not be placed in locations that would result in the mortality of surrounding trees when piles are ignited.
42. All prescribed fire, including pile burning and underburning, would be completed under an approved prescribed burn plan.
43. Any constructed control lines would be rehabilitated after burns have been completed and declared out by the appropriate fire and fuels personnel unless the control line is selected to be permanently maintained for use in future prescribed burns and wildfire.
44. All burning would comply with California Ambient Air Quality Standards (CAAQS).

Range

45. Grazing permittees would be informed in advance of planned treatments and implementation actions which may be in the vicinity of livestock use areas. If vegetation treatments require short-term modification of grazing practices in portions of a permitted allotment these would be developed in coordination with the permittee.
46. All known structural rangeland improvements, such as fences, corrals, cattle guards, and spring developments, would be protected from disturbance. If these structural improvements are damaged during project operations, they would be repaired to Forest Service standards by the party responsible for causing the damage, prior to scheduled livestock use.

Recreation/Special Uses

47. Designated trails would be protected during project activities and impacts to the trail system would be minimized where possible. Where damaged by operations trails would be restored to a standard condition for the designated use as described by the trail management objective for those trails.
48. Trails and roads accessing trailheads and day use areas would be kept open and free of debris.
49. In addition to seasonal closures identified by the Travel Management, roads identified as open for public use may be temporarily closed via Forest Order during inclement weather to protect reconstruction investments until those roads have stabilized.
50. Forest roads and trails would be signed as needed for safety during project implementation.
51. All interpretive and wayfinding signage meets Forest Service universal accessibility guidelines.
52. Recreation related infrastructure and improvements would be protected during activities.
53. Where they intersect roads or trails, fire control lines would be camouflaged after completion of the project to deter future use as trails.
54. Seasonal restrictions are in place for winter recreation (cross-country ski, snowmobile) from December 26 through March 31 annually for NFS roads 29N22, 30N16 29N64 and 29N64Y (McGowan Lake Cross Country Ski Trail) and a portion of CA State Hwy 172 and NFS roads 29N62, 29N60, 29N48, 29N44, 29N58, 28N70 and 28N28 (Morgan Summit Snowmobile System).
55. Fuels treatments in or around recreation residence tracts, campgrounds and organization camps would be conducted prior to Memorial Day or after Labor Day when feasible.

Silviculture

56. Cut stumps of live conifers with a 14-inch and greater stump diameter would be treated with an Environmental Protection Agency (EPA)-approved borate compound which is registered in California for the prevention of annosus root disease using the Forest Health Report #RO-21-02 “Priorities for borate stump treatments to prevent *Heterobasidion* root disease (USDA FS 2021a).

    Cut stumps of live conifers with a 3-inch and greater stump diameter would be treated with a borate compound in recreation and administrative sites.

    No EPA-approved borate would be applied within 25 feet of known Sensitive and Special Interest Plants or within 25 feet of live streams and meadow/wetlands.

57. When considering where to remove dead trees and where to leave high-mortality patches (i.e., snag patches), managers would prioritize leaving snag patches in steep areas, areas outside the WUI, and not on ridgetops or in the bottoms of drainages. Ideally, snag patches would be adjacent to or surrounded by standing green forest.
58. All sugar pine identified as rust resistant or as a candidate for rust resistance would be protected. A $20,000 fine would be imposed for each rust-resistant or candidate tree damaged during operations. Healthy sugar pine showing no observable signs of blister rust would be favorably retained.

Soils

59. A pilot unit would be selected for steep-slope logging in a relatively small area, with representative soils, where consequences would be limited. Unit size and boundaries would be laid out with concurrence of the soil specialist. In the pilot unit, logging would be allowed on sustained slopes up to 50 percent. Outcomes would be monitored by the soil scientist or hydrologist. If outcomes are acceptable, the rest of the project would be open to steep-slopes logging (up to 50 percent) with a soil scientist or hydrologist consulting on a unit-by-unit basis to make sure steep slope logging can be done while meeting the soils objectives in the 2004 SNFPA ROD.
60. Ground cover of 70 percent (including slash) would be maintained on all skid trails above 35 percent slope.
61. No skidding of fire-killed trees would occur in severely burned areas over 35 percent slope. On these slopes, trees would be piled using feller-bunchers or otherwise disposed of in place. This IDF remains in effect until effective ground cover has re-established with hydrologist or soil scientist consultation.
62. Unless a hydrologist or soil scientist has approved otherwise pursuant to IDF 59 above, limit skidding with rubber-tired or fixed track equipment to slopes under 35 percent; limit low-ground-pressure tracked equipment (e.g., traditional masticator or feller-buncher) to less than 45 percent; and limit heel-boom loaders/shovel yarding to less than 40 percent unless otherwise approved by a soil scientist or hydrologist. Limit dozer piling to less than 25 percent slopes and mulching mastication treatments to less than 35 percent slope.
63. Tethered logging or skyline hybrids: Consult soil scientist or hydrologist during unit layout to determine the need for site-specific requirements. May be needed if Erosion Hazard Ratings are predicted to be higher than moderate, or if displacement hazard is high in more than 1/3 of a treatment unit.
64. Soil quality standards and appropriate best management practices (BMP) that protect forest soils would be implemented for the entire project. BMPs and soil standards are described in Water Quality Management Handbook, Best Management Practices (USDA FS 2011b), LNF LRMP (1993), and the 2004 SNFPA ROD.
65. In treatment units outside of RHCAs, soil moisture conditions would be evaluated using Forest-established visual indicators before equipment operation proceeds. Lassen National Forest (LNF) Wet Weather Operations and Wet Weather Haul Agreements would be followed to protect the soil and transportation resources.
66. Arieal extent of detrimental soil disturbance would not exceed 15 percent of the area dedicated to growing vegetation. Following implementation, the mechanical treatment units would be evaluated by a qualified specialist to determine if detrimentally compacted ground exceeds the

LNF Land and Resource Management Plan standard of 15 percent areal extent. If restoration is needed to achieve compliance, an appropriate subsoiler, ripper or other implement would be used to fracture the soil in place leaving it loose and friable.

67. In mechanical treatment units, landings within treated areas no longer needed for long-term management would be evaluated by a qualified specialist to determine whether remediation is needed to restore productivity and hydrologic function. If so, appropriate remediation would be implemented. Where landing construction involved cut and fill, the landing would be re-contoured to match the existing topography.
68. Machine piling operations would remove only enough material to accomplish project objectives and would minimize the amount of soil being pushed into burn piles. Duff and litter layers would remain as intact as possible, and the turning of equipment would be minimized. Piles would be constructed as tall as possible, within limits of safety and feasibility. A mixture of fuel sizes in each pile is preferred, avoiding piles of predominately large wood when practicable. Dozer piling would be limited to slopes less than 25 percent. (On slopes greater than 25 percent, grapple-piling or other methods that lift the log off the soil are acceptable)
69. To the extent possible, existing landings and skid trails would be used.
70. In areas that burned at higher severity, where pre-fire organic ground cover has mostly been consumed by fire, and few needles or leaves remain to fall and provide short term ground cover, additional actions should be taken to increase ground cover either before or as mechanical thinning work starts in an area, or as determined by an appropriate specialist. Additional ground cover could be generated by mastication or hand falling of non-merchantable material or other appropriate methods that would generate more ground cover than would be produced by traditional whole-tree mechanical thinning. In these units, mechanical piling of material would be delayed until at least two winters have passed since any mechanical thinning has occurred.
71. Where it exists, large woody material greater than 20 inches in diameter would be retained at a rate of at least five logs per acre.
72. In severely burned areas where watercourses are at risk of post-fire sedimentation/debris flows, logs may be contour felled (starting as soon as the area can be safely re-entered) to retain soil and reduce erosion. A soil specialist should establish the timing of contour felling and ideal log spacing.

Transportation

73. To minimize fugitive dust, when hauling material and operating non-earthmoving equipment, limit speeds to 15 miles per hour (mph). Limit speed of earth-moving equipment to 10 mph. Dust palliatives would not be used within 25 feet of hydrologic features and riparian vegetation.
74. Ensure implementers reduce unnecessary idling. Prohibit engine tampering to increase horsepower, except when meeting manufacturer's recommendations.

Wildlife

75. The District Biologist or Forest wildlife program manager would be consulted during design and layout of any subsequent activity under this project, with enough time provided so that existing wildlife data can be consulted, new surveys ordered if existing surveys are not sufficient, and any necessary control areas can be flagged for withdrawal from the treatment activity.

American Goshawk

76. An American goshawk limited operating period (LOP) from February 15 to September 15 would be maintained annually prohibiting all project actions within approximately ¼ mile of a PAC or within ¼ mile of a nest unless surveys confirm that goshawks are not nesting. If surveys do not locate the nest stand within the PAC, the LOP would be applied to a ¼ mile area surrounding the PAC.
77. American goshawk surveys: Conduct surveys in compliance with the Pacific Southwest Region's survey protocols prior to treatments that are likely to reduce habitat quality that are proposed in suitable American goshawk nesting habitat that is not within an existing California spotted owl or American goshawk PAC.
78. If an active American goshawk nest is found within any of the proposed treatment units, the nest and a 10-acre core area (372-foot buffer) around the nest would be protected. Hand treatment and/or prescribed fire would be considered within the 10-acre nest buffer, on a case-by-case basis, outside of breeding season.

California Spotted Owls – see also Table 22

79. California spotted owl surveys: Conduct surveys in compliance with the Pacific Southwest Region's survey protocols when proposed vegetation treatments are likely to reduce habitat quality in suitable California spotted owl habitat with unknown occupancy.

California Spotted Owls and American Goshawk:

80. Landings would be avoided in PACs to the extent possible. Where they cannot be avoided, they would be avoided in nest core areas, and existing landings or openings would be used outside of nest core areas. Landings would be carefully planned to minimize multi-year impacts to nest core areas and would consider site-specific factors such as topography, watershed and other resource protection concerns, and contract operational needs. Where using existing landings that need to be increased in size for biomass and chip van access, the landings would be extended in size away from drainages, known nesting sites or other resource concerns.
81. Avoid creating new skid trails, new temporary roads, or canopy gaps larger than 0.25 acres within PACs.

Great Gray Owl:

82. If a great gray owl active nest is found, a PAC would be established following direction in the SNFPA 2004 ROD. An annual LOP would be implemented from March 1 through August 15. Prior to implementing projects in meadows adjacent to great gray owl nest stands, the need to implement the LOP and the specific area covered by the LOP would be coordinated with a qualified biologist.

Willow Flycatcher:

83. In willow flycatcher occupied meadows, an LOP from February 15 through August 15 will be maintained annually. Prior to implementing projects in these meadows, the need to implement the LOP and the specific area covered by the LOP would be coordinated with a qualified biologist.

Greater Sandhill Crane:

84. If sandhill cranes are observed nesting within the project area before or during project implementation, an LOP shall be in effect April 1 through August 1 within 0.25 miles of occupied areas.

Marten:

85. If a marten den site is identified, a 100-acre area consisting of the highest quality habitat in a compact arrangement would be placed around the den site. The den site area would be protected from vegetation treatments with a limited operating period (LOP) from February 15 through July 31st as long as habitat remains suitable or until another Regionally approved management strategy is implemented.
86. If a marten rest site (female or male) is found within a treatment unit, the rest site structure, (e.g., log, snag, tree) would be protected from being damaged during project implementation.

Fisher

87. If a fisher den site is identified, a 700-acre area consisting of the highest quality habitat in a compact arrangement would be placed around the den site. The den site area would be protected from vegetation treatments with a limited operating period (LOP) from March 1st through June 30th as long as habitat remains suitable or until another Regionally approved management strategy is implemented.
88. If a fisher rest site (female or male) is found within a treatment unit, the rest site structure, (e.g., log, snag, tree) would be protected from being damaged during project implementation.

Marten and fisher:

89. Maintain a well-connected network of carnivore habitat cores identified by the wildlife resource specialist. Desired conditions for cores include high proportions of suitable marten and fisher denning habitat (CWHR size and density classes 6, 5D, 4D, 5M, and 4M, in order of descending priority), and greater than10 tons per acre of coarse woody debris, and mean canopy cover 60-80 percent. Corridors connecting carnivore habitat cores will be greater than or equal to 600 feet wide and will be delineated along forested ridges, riparian areas, and steep slopes greater than 35 percent where possible. Identification of carnivore habitat cores and corridors will be conducted at a landscape scale to ensure connectivity between high quality denning habitat areas inside and outside of the project area boundary. Treatments will not change the CWHR structural class of 5D or 5M stands within the carnivore habitat network (cores and corridors), but 4D stands can be reduced to 4M.
90. Avoid treatments in marten and fisher den site buffers to the extent possible. The only instance when a den buffer would be treated would be when there is overlap between the den buffer and a WUI threat or defense zone that does not meet desired conditions for WUI. If areas within den site buffers must be treated to achieve fuels objectives for the urban wildland interface zone, treatments would focus solely on the removal of surface and ladder fuels. Mechanical equipment can be utilized in den buffers overlapping WUI only when fuels objectives cannot be met by hand thinning treatments. Burning of piled debris is allowed. Prescribed fire may be used to treat fuels if no other reasonable alternative exists. All project-related activities within den buffers will occur outside of the fisher or marten LOP.

Wolves

91. If activities occur during the breeding season (March 15-August 15) near known den or rendezvous sites, the U.S. Forest Service shall contact CDFW one month prior to commencement of activities to determine the presence of wolf activity near the action area for the duration of the project. The U.S. Forest Service would update the U.S. Fish and Wildlife Service with the information received from the California Department of Fish and Wildlife.
92. If a den or rendezvous site is found within 1 mile of project activities prior to or during project implementation, an LOP restricting all project actions within 1 mile of the site would be instated from April 1 through August 15. Coordination with CDFW and U.S. Fish and Wildlife Service may result in modified distances or more flexible dates for this specific conservation measure. For example, if the den or rendezvous sites are clearly separated from project-generated disturbances by topographic features or terrain, seasonal restrictions may be adjusted or eliminated, as approved by the Service. Historical dens may require a LOP if CDFW or the Service determines it is necessary.

Bald Eagles

93. For bald eagle nest territories: maintain a LOP prohibiting actions within approximately 0.25 miles of any active nest tree during the breeding season (January 31 through August 31).

Osprey

94. For osprey nest territories: maintain a LOP prohibiting actions within approximately 0.25 miles of any active nest tree during the breeding season (March 1 through August 31).

Northwestern Pond Turtle:

95. If northwestern pond turtles are detected within the project area, mechanical exclusion buffer distances around occupied bodies of water would be adjusted using the best available science and site-specific factors (e.g., movement barriers, distance between upland and aquatic habitat) to protect adjacent upland habitats used by the species for nesting and overwintering.

Yellow Rail

96. If yellow rails are detected within the project area before or during project implementation, an LOP from April 1 to September 31 prohibiting project-related activities would be applied to a 25-acre area of suitable habitat surrounding a nest or activity center. The area under LOP would be adjusted based on the spatial arrangement of suitable habitat. Areas under LOP may be less than 25 acres when a nest or activity center occurs in an isolated habitat patch that is less than 25 acres. Grazing activity within occupied yellow rail habitat would be monitored and critical habitat components (e.g., nest sites) would be protected where necessary, as determined by the wildlife specialist. Project-related water drafting sites in or around occupied yellow rail habitat would be identified in consultation with the wildlife specialist. Management of occupied wetlands would consider the application of frequent (every 3-5 years) low severity prescribed fire outside of the LOP season to maintain existing high-quality yellow rail nesting habitat.

Snags and Down Logs

97. In green forest treatment units, retain all snags larger than 15 inches DBH within the limits of safety and operability. To encourage snag recruitment, retain an average of two mid- and large diameter live trees per acre that are in decline, have defects, or desirable wildlife characteristics (e.g., teakettle branches, stick nests, large diameter broken top, cavities, and woodpecker excavations) where they exist.
98. Some proportion of activity-generated and existing surface fuels would be piled within the identified carnivore habitat network to provide resting and foraging habitat for Pacific marten, fisher, and small mammal prey species. Coarse woody debris piles consisting primarily of whole large logs in decay classes 1 and 2 would be retained at a density of one pile per acre where treatments involve the piling of fuels and post-treatment canopy cover is less than 60%. Piles would be at least 6 feet high and 15 feet wide, would be placed in areas that minimize damage from burning to large trees and snags, and would not be actively ignited during prescribed fire operations.
99. When removing dead trees in burned or insect-killed forest, retain snags in islands or clumps across 10 percent of the area affected by the stand-replacing event. Snag islands will be located within high- quality woodpecker habitat in proximity to tall, dense forest (CWHR classes 4M, 4D, 5M, 5D) and will occur in rugged or difficult to access terrain where snag retention will not compromise other resource objectives (e.g., reforestation, WUI). Snag islands will be at least one acre in size.

Aspen and Oak

100. All aspen greater than 8 inches DBH would be protected during operations within the limits of safety and operability.
101. All oak greater than 4 inches DBH would be protected during operations within the limits of safety and operability.
102. Landings would not be placed in aspen stands if possible.

Herbicides

General

103. Herbicide application would comply with product label directions and applicable legal requirements.
104. Herbicide formulations would be limited to those containing one or more of the following active ingredients: aminopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. Herbicide applications would only treat the minimum area necessary to meet site objectives.
105. Herbicide application methods are limited to select (e.g. wicking, wiping, dipping clippers or handheld nozzle to aim application at specific target species), directed spray (use of backpack sprayer) and broadcast spray using a backpack. No aerial or vehicle-based broadcast herbicide applications would occur.
106. Spray application drift control measures:
    a. Only ground based equipment would be used.
    b. All applications would cease when weather conditions exceed those on the label.

c. Except for the indaziflam/glyphosate tank mix, no herbicide will be applied when the National Weather Service forecasts a greater than 50 percent probability of measurable precipitation (greater than 0.1") within the next 48-hour period.
d. Applications would cease when wind speed exceeds 10 mph or 5 mph when spraying within 200 feet of rare plants.
e. Spray nozzles would produce a relatively large droplet size (500- 800 microns)
f. Low nozzle pressures would be used (15 psi)
g. Spray nozzles would be kept within 20 inches of target vegetation during spraying.
h. A pressure gauge or pressure regulator would be required on each backpack sprayer.
i. Spray would be directed away from live water.

107. Herbicides would be applied under the direction of a certified applicator in accordance to label instructions and applicable federal and state pesticide laws.
108. Personal Protective Equipment (PPE) would be used in accordance with the product label and California Department of Pesticide Regulation requirements.
109. Chemicals would be stored in designated storage facilities consistent with FSH 2109.14, Chapter 40. Unused herbicides would be disposed of in accordance with the product label and FSH 2109.14, Chapter 40. If the product label and FSH differ, the more restrictive storage and disposal guidelines would be followed.
110. Reforestation treatments would only occur after consultation with a California licensed Pest Control Advisor (PCA).

Botany

111. For reforestation treatments, no broadcast or direct applications would occur within 150 feet of TES or Special Interest plant species. Modifications may be made with consultation with a staff botanist.
112. For invasive plant treatments, no directed spray or select application would occur within 25 feet of TES or Special Interest plant species. Buffers may be waived if plants are covered by a protective barrier. Under saturated/wet soil conditions, select is the only herbicide application permitted within 100 feet of rare plant species. Modifications may be made with consultation with a staff botanist.
113. If needed, herbicide contractors would be instructed on the proper identification of rare plant species prior to project implementation activities.

Hydrology

114. Only non-ionic surfactants would be used. All surfactants used within RHCAs will be approved for aquatic applications (WSDE 2021 and CDPR 2023).
115. All wells, ponds, in-stream diversion points, and springs used for domestic water supplies would be protected with a 300-foot buffer for herbicide treatment and mixing. Prior to herbicide application, water rights will be checked with the state and potential affected parties will be contacted.
116. Streams used for domestic water supply would be protected with a 15-foot buffer for 0.5 miles upstream of the diversion point for herbicide treatment and a 200-foot buffer around the

diversion intake. Directed spray can occur within this buffer, if

(a) use near a domestic water source is directed on the product label; AND

(b) water quality is monitored.

117. Except for the indaziflam/glyphosate tank mix, herbicide will not be applied during the wet season (November 1 - April 15) to minimize herbicide transport in the environment.

118. Herbicide mixing would not occur within 150 feet of live surface waters, wetlands, fens, or intermittent/ephemeral streams.

119. Herbicide use buffers have been established for streams and other water bodies (Table 26 and Table 27) Buffers vary by herbicide and application method.

Table 26. Water Feature Buffers for Invasive Plant Treatment Activities by Herbicide and Application Method

Herbicide Active Ingredient	Live Water Directed Spray	Live Water Select	No Live Water Directed Spray	No Live Water Select
Aminopyralid	20 feet	Water's edge	20 feet	No buffer required
Chlorsulfuron	100 feet	25 feet	50 feet	25 feet
Glyphosate	10 feet	Water's edge	20 feet	No buffer required
Triclopyr	25 feet	25 feet	25 feet	10 feet

Live water – perennial streams, lakes, ponds, springs, seeps, fens
No live water – seasonal wetlands when dry, seasonally flowing/intermittent channels
Buffer distances are measured from the edge of the scoured continuous channel or water's edge.
Buffers for domestic water sources are specified in IDF number 121 and 122.

Table 27. Water Feature Buffers for Reforestation Treatment Activities by Herbicide and Application Method

Herbicide Active Ingredient	Live Water Directed Spray	Live Water Broadcast Spray	No Live Water Directed Spray	No Live Water Broadcast Spray
Glyphosate	110 feet	Not applicable	110 feet	Not applicable
Triclopyr	110 feet	Not applicable	110 feet	Not applicable
Imazapyr/Glyphosate tank mix	Not applicable	200 feet	Not applicable	150 feet
Indaziflam/Glyphosate tank mix	Not applicable	200-300 feet	Not applicable	150 feet

Live water – perennial streams, lakes, ponds, springs, seeps, fens
No live water – seasonal wetlands when dry, seasonally flowing/intermittent channels
Buffer distances are measured from the edge of the scoured continuous channel or water's edge.
Buffers for domestic water sources are specified in IDF number 121 and 122.

120. Adhere to the resource protection measures in the Chemical Use Management Activities as designated in the National Best Management Practices for Water Quality Management on National Forest System Lands (USDA April 2012).

121. For projects meeting the eligibility criteria of Category 5A (post-fire activities) of the General Order Waste Discharge Requirements (**Order No. R5-2017-0061**) for Timberland Management Activities on Non-Federal and Federal Lands:

a. Where management activities are planned on a burned area (with slopes greater than 30 percent, a minimum of 50 percent average effective groundcover is required to be documented prior to pesticide application.

b. Notify the Central Valley Water Board in writing at least 30 days prior to any proposed

application of pesticides. The written notification shall include the pesticide products(s) to be applied, the proposed date(s) of application, the methods of application, the area(s) of application (Township/Range/Section), a description of measures that will be employed to assure compliance with the applicable Basin Plan, and documentation of 50 percent or greater effective ground cover (as applicable). Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

122. For projects meeting the eligibility requirements of Category 5B (all timberland activities except post-fire) of the General Order Waste Discharge Requirements (Order No. R5-2017-0061) for Timberland Management Activities on Non-Federal and Federal Lands:

    The Discharger shall notify the Central Valley Water Board, in writing, at least 15 days prior to any proposed application of pesticides; the notification does not need to include information on hack and squirt or individual stump applications. The written notification shall include the pesticide product(s) to be applied, the proposed date(s) of application, the method(s) of application, project name, area(s) of application (include map), and a description of measures that will be employed to assure compliance with the applicable Basin Plan. Subsequent changes to the proposal must be submitted in writing no less than 48 hours prior to pesticide application.

Silviculture

123. When using herbicide, avoid or shield desired conifer seedlings and desired woody vegetation (black oak, aspen, alder, willow, etc.) when spraying nearby.

Soils

124. Application of aminopyralid (including equipment rinsing) would not occur on deep, coarse textured, saturated soils. The appropriate Forest Service specialists would be consulted about the proper timing of herbicide application in the spring prior to treatments.

Wildlife

125. Avoid spraying while an invasive plant or targeted shrubs are in bloom to prevent exposure of pollen-feeding organisms to herbicide.

Aquatics

126. Reforestation treatments will only occur within RHCAs after consultation with FS watershed specialists. Buffers may be adjusted if Riparian Conservation Objectives can be met.

127. Herbicide will not be applied to riparian vegetation during herbicide treatments in RHCAs.

128. When spraying Glyphosate within RHCAs throughout the project area, only aquatic formulations will be used.

129. Herbicide treatment cannot occur within 110 feet of any water feature in suitable habitat and/or water features determined to be occupied by the Sierra Nevada Yellow Legged Frog (SNYLF), Cascades frog or other ESA species. Surveys may be required to verify current occupancy status for ESA species prior to implementation. If ESA species are detected, work will stop immediately, and the district will contact the services for guidance. If no species are detected, Forest Biology personnel may allow herbicide treatment within exclusion buffers on a case-by-case basis.

Appendix D. Treatment Methods

Table 28. Treatment methods

Treatment Method	Description
Variable density thinning: Mechanical thinning	Mechanical thinning involves the use of heavy forestry equipment (e.g. feller-buncher) to cut and remove trees under a timber sale or stewardship contract or to cut and pile trees. Cut trees can be alive or dead. Under a timber sale, sawtimber size trees, typically 10 inches DBH and larger, are cut and moved to a landing. At the landing the trees are delimbed by a processor and loaded on a log truck to be hauled to a sawmill. Biomass size trees, typically 3.0-9.9 inches DBH, and the tops of larger trees can be chipped and hauled to a biomass facility. Remaining slash is piled at the landing to be burned or left in the treatment unit.
Variable density thinning: Hand thinning	Hand thinning involves using hand tools and hand-operated mechanical tools (including chainsaws) to cut vegetation, trees, and brush to reduce stand density and ladder fuels and to raise the canopy base height. Hand thinning includes cutting down entire trees as well as limbing or pruning. The resulting slash may be scattered or left in place in preparation as surface fuels for understory burning or piled for burning. Hand thinning is useful to avoid impacts from heavy equipment to cultural sites, wildlife habitat, riparian areas, sensitive resource sites, and known avoidance areas or where topographic features may prevent use of mechanical equipment such as steep slopes.
Fuel reduction: Machine piling	Machine piling is the process by which down, woody debris and/or activity generated slash is piled using forestry equipment such as excavators and dozers. Grapple piling involves using a grapple on a hydraulic excavator to lift and pile down woody material. Dozer piling involves using a tracked or wheeled dozer equipped with a brush rake, or in rarer cases, a dozer blade to move or push material into piles. Piles are placed in areas where they would not damage other timber or residual trees when burned.

Treatment Method	Description
Fuel reduction: Hand piling	Manually moving down, woody material and/or slash created during a thinning operation into piles. Woody material is placed in openings and locations where residual trees are not damaged when the piles are burned. Piles are located twice their height away from residual vegetation to minimize risk of fire spreading. Crews compress slash tightly in piles to ensure full consumption when burned. A hand line cleared to mineral soil can be created around each pile to prevent fire from spreading.
Fuel reduction: Mastication	Mastication treats brush, shrubs, slash, or sapling-sized trees by using an excavator or tractor with a masticator attachment to mulch vegetation into fine chips. Masticated material is typically left in place to decay and provide mulch cover for soils. Mastication is effective for clearing along roadsides, ravines and places that could be difficult to reach with other equipment or on foot. Mastication does not reduce or remove fuels initially. Rather it rearranges ladder fuels into surface fuels and creates smaller pieces of wood that will decay faster.
Fuel reduction: Chipping	Chipping is the use of a woodchipper to process woody debris into relatively uniform small pieces. Chipped material may be removed or left on-site. Chipping is used instead of piling material for visual aesthetics, where pile burning is unacceptable, or when material needs to be moved off-site.
Prescribed fire: Broadcast burning, also known as underburning	Broadcast burning, or underburning treatments are a type of prescribed fire designed to consume surface and ladder fuels and mimic the role of frequent fire in an active fire regime. Underburning is often used as a follow-up to a treatment such as thinning or pile burning to further reduce surface fuels, maintain a desired landscape condition, and generally to enhance the overall health and resiliency of the stand. Additional activities associated with underburning include fireline construction with hand tools and/or ground-based equipment (e.g., rubber tracked skid-steer) along treatment boundaries following topography that is most favorable to control the burn. Other site preparation work may include large-tree protection (raking), reinforcing containment lines by removing live or dead trees or brush, limbing, bucking, or rearranging fuels to assist with safety and containment. Mop up activities would utilize hand tools to extinguish all heat to a minimum of 25 feet from the containment line.

Treatment Method	Description
Prescribed fire: Pile burning	Pile burning is a form of prescribed fire used to ignite piles of down, woody material and cut vegetation resulting from fuels or vegetation management activities. Piles can be made mechanically using heavy equipment or manually. Piles are burned during periods of low fire danger, generally under fall or winter conditions, to reduce the risk of damage to residual trees, as well as limit outward spread around piles. Pile location and size are based on existing conditions; however, piles are preferentially placed to reduce impacts to sensitive areas, such as riparian areas, CSO PACs, and cultural resource sites.
Prescribed fire: Jackpot burning	Jackpot burning is like an underburn or broadcast burn, except instead of targeting the entire forest floor, the target is specific areas with high fuel concentrations (called "jackpots"). Jackpot burns result in mosaic burn patterns, with limited burning in low-fuel concentration areas. Jackpot burning may be an initial or follow-up treatment.
Invasive plant species management: Manual control	Manual control refers to hand pulling, clipping, digging, mulching, or tarping to control invasive plant species. **Hand pulling**: Pulling or uprooting plants by hand. It can be effective against certain herbaceous invasive plants, particularly annuals and tap-rooted plants. It is not effective against perennial invasive plants with deep underground stems and roots that are often left behind to resprout. **Clipping**: Cutting or removing seed heads and fruiting bodies to prevent germination. This method is labor-intensive and feasible only for very small infestations. **Digging**: Using hand tools such as shovels and sharp shooters (shovels with a narrow blade). **Mulching**: Covering with certified weed-free mulch such as rice straw, grass clippings, wood chips, or newspaper. Mulching is a non-selective treatment and may injure non-target plants. **Tarping**: Placing tarps (visqueen, geocloth, or similar material) to shade out or solarize—injure by long exposure to heat of the sun—plants. Tarping is most effective when the soil is damp. Tarping is a non-selective treatment and may injure non-target plants.
Invasive plant species management: Cultural control	**Thermal**: Using heat to desiccate and kill plants. Methods include steaming, flaming, torching, infrared, or microwave. While some equipment uses an open flame, thermal treatment is only executed when weather and fuel conditions permit and requires certain fire safety precautions. This method is most effective for seedlings and plants

Treatment Method	Description
	in the rosette stage. It can be used in combination with other methods to treat seedlings that germinate after mature plants are removed. **Prescribed Fire**: Directly killing a plant through prescribed fire methods. This method can be used to reduce weed infestations in native communities. Can be used in combination with other methods. Not suitable for all species. Timing of the fire is crucial to the effectiveness of this treatment. **Seeding**: Use of native grasses, forbs, trees, and shrubs to prevent and control infestations as well as provide competition for resources would be used in combination with other methods, to prevent spread and restore sites degraded by weed infestations. Methods for reseeding could include drilling, broadcast seeding, or plugs.
Invasive species management: Chemical control (herbicide)	Chemical control refers to the use of herbicides to control invasive plant species. Two specific treatment methods include: select and directed spray. Select method includes: 1. **Directed foliar spray** - Application of herbicide directly to foliage with a hand- held sprayer or hand-pumped spray or squirt bottles. 2. **Dip & clip** - Cutting tool is first dipped in concentrated herbicide, then used to cut target plant; this may be used on individual or groups of target plants. 3. **Hack & squirt, cut stump** - Herbicide is applied to cut surfaces, such as tree or shrub stumps, to eliminate or greatly reduce re-sprouts; this is used on individual target plants. 4. **Wick, wipe, drizzle** - Target plants by touched with a wipe or wick containing herbicide; this may be used on individual or groups of target plants. Because these select methods involve direct application, there is a very low likelihood of drift or delivery of herbicides away from treatment sites. Select applications are used in sensitive areas, such as near water, to avoid applying herbicide on the soil, in the water, or to non-target plants. These methods can be used in more variable conditions than directed spraying. **Directed spray method**: Spraying herbicide on individual target plants using a regulated nozzle. A regulator nozzle helps to concentrate application towards target plants. This method uses a backpack-mounted wand sprayer.

Treatment Method	Description
Reforestation herbicide application: Directed spray method	**Directed spraying** is spraying herbicide on individual target plants using a regulated nozzle. A regulator nozzle helps to concentrate application towards target plants. This method uses a backpack-mounted wand sprayer.
Reforestation herbicide application: Broadcast application	**Broadcast spraying** is an application of herbicide on all plants within a selected area and/or soil adjacent to plants using a regulated nozzle. This method does not target individual plants.
Hydrological improvements: Process-based instream structures	The three main types of instream structures include Beaver Dam Analogues (BDA), Large Woody Debris (LWD) Structures, and Post-Assisted Log Structures (PALS). **Beaver dam analogues** use native materials to mimic the function of a natural beaver dam to reconnect a stream to the floodplain. Higher groundwater encourages the growth of riparian plants, creating a wetter, more drought-resilient meadow with improved habitat for wildlife. **Post-assisted log structures** are another type of low-tech restoration structure that mimics and promotes the accumulation of large woody debris. Both PALS and BDAs are hand-built, temporary structures made of natural materials, intended to become self-sustaining influences on stream geomorphology. **Large woody debris structures** feature large wood that moderates stream flow and serves as aquatic habitat. LWD would include anchored and non-anchored structures, chop and drop LWD, or helicopter distributed LWD. Additional engineered and non-engineered process-based structures that can restore stream and riparian areas include bank protection and deflection, bioengineering, wood jams, and directionally felled trees. Where feasible, process-based structures would be built by hand using native materials. Potential impacts of surrounding and downstream infrastructure such as roads, campgrounds, trails, and private property would be evaluated before the construction of any process-based treatments in the project area. Follow-up treatments of BDA and/or PALS may be required to help maintain their structural integrity and effectiveness. Common maintenance activities may include adding more wood or posts to existing structures, building new structures where others have washed downstream, and building existing structures further into the floodplain.

Treatment Method	Description
Hydrological improvements: Riffle augmentation	**Riffle augmentation** is the process of adding material (e.g. gravel, rock) to raise the streambed elevation at specified locations within a stream channel or reach. This treatment is used to reduce the conveyance capacity of oversized channels on stream reaches that have been disconnected from their historic floodplains. Riffles would be installed to reduce erosive force, increase groundwater levels, increase dissolved oxygen levels, and expand the floodplain.
Hydrological improvements: Channel fill	**Channel fill** (partial or complete) is a hydrological improvement method that involves adding soil or debris to a channel to raise its base elevation or to arrest ongoing head cutting or streambank erosion. This method uses earth-moving equipment to reshape and fill erosional features and incised stream channels that are disconnected from their historic floodplains or otherwise causing excessive erosion. This technique is used when it is not possible to restore floodplain connectivity or reduce erosion through process-based techniques. Channel fill would also be used to redirect surface water flow back to its historic floodplain where flow paths have been altered. Channel fill treatments aims to achieve a material balance by utilizing soil and debris from on-site borrow areas, where feasible. If all fill material cannot be sourced on-site, some may be imported from a nearby quarry. Before filling the channel, the sod and topsoil from within the channel is removed by an excavator and positioned near the channel. Once the fill material is transported into the channel, the sod and topsoil is replanted and covered with erosion control fabric. Erosion control fabric is made from biodegradable material and is used to stabilize soil and reduce erosive forces.
Hydrological improvements: Bank armoring	**Streambank armoring** is the process of reinforcing a streambank with protective covering (e.g. rocks, vegetation, or engineering materials such as jute mats) to reduce bank cutting and erosion due to peak flows. Bank armoring is utilized where needed, especially in post-fire areas and recreation sites near water.
Hydrological improvements: Borrowing	**Borrowing** is the technique of excavating soil from an upland area to fill down-cut areas impacted by erosion. This option is used when it is not feasible to purchase fill. Earth-moving equipment is used to take borrowed material to use in channel-fill activities. Afterward, the borrow areas is shaped and reclaimed/revegetated.

Treatment Method	Description
Hydrological improvements: Hillslope contouring	**Hillslope recontouring** is used to help provide the remaining fill material needs. Hillslope recontouring restores hillsides to their natural topography to avoid capturing surface and subsurface water flows. Recontouring can also aid in defining incised channel areas and providing fill material. These sites are revegetated post-recontouring.
Hydrological improvements: Grade control structures	**Grade control structures** are composed of large rocks which help to capture sediment, reduce erosive forces, promote regular floodplain inundation, and maintain stream bed elevation.
Transportation: Road maintenance	Maintenance actions include, but are not limited to grading, clearing, roadside brushing, reconditioning or reconstructing existing drainage structures, culvert and ditch cleaning, culvert removal or replacement, hazard tree removal, and aggregate surfacing In timber sale contracts, roads used for log and chip hauling receive pre-, during, and post-haul maintenance outlined in the T-specifications of the contract and require a dust abatement plan for safety and to control wind-caused erosion from use. Dust abatement includes applying a dust suppressant product, such as water or magnesium chloride, on road surfaces. A surface replacement deposit collection is required based on haul volume on any gravel- or cinder-surfaced NFS road
Transportation: Road reconstruction	System roads showing signs of active erosion, such as rills and gullies, or hydrologic connectivity, where road drainage is routed directly to a water body, are identified for road reconstruction. Road reconstruction could include, but would not be limited to, outsloping or insloping the roadbed, installing new drainage features, such as rolling dips, critical dips, culvert replacement and installations (removal and resizing), fillslope armor, engineered fill, bridge installation, sediment basins, armored fill crossings, dissipater rock, cut/fill ditch, or road resurfacing. Some specific road segments could be realigned to treat hydrologic connectivity, (i.e. sever the connection between the road segment and a nearby stream channel). Culverts found to be undersized are replaced with correctly sized culverts, armored crossings, or bridges based on the results of road and stream assessments. Realignment actions may include all facets of road construction such as installing drainage structures, blading, tree removal, etc. The abandoned road alignment is then obliterated, potentially removing drainage structures, using sub-soiling, ground cover placement, blockage berms and / or reseeding. Where road or crossing improvement actions occur, additional instream construction may be required to restore natural stream grade and channel function within the affected areas. Instream construction surrounding road and crossing improvements may include channel fill, grade control structure installation, and revegetation.

Treatment Method	Description
Transportation: Temporary road and draft site construction	Temporary roads are constructed to facilitate treatment and are obliterated after the project ends. Construction of new temporary roads will generally be designed to limit skidding distances to less than ¼ mile. Where appropriately located, existing unclassified roads can be used as temporary roads. In some cases, the roads need to be widened or brushed to provide adequate access. Water drafting sites are brought up to best management practices to reduce sedimentation to the stream or aquatic feature by installing road surface material, aligning slope to pool reservoir, and adding a "bump log" or structure to prevent a water truck or fire equipment from backing into the stream.
Transportation: Route Decommissioning	Route decommissioning refers to actions to permanently close temporary roads and unauthorized routes such as user-created trails. Decommissioning limits undesired access, increases hillslope stability, minimizes erosion, restores natural drainage patterns, protects endangered plants and wildlife, and restores aquatic and wildlife habitat. Decommissioning may involve demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded roads or road segments, including necessary cleanup work. Decommissioning actions include, but are not limited to, subsoiling or ripping the roadbed to reduce compaction, removing drainage structures (such as culverts), constructing waterbars, recontouring to original slopes, restoration of vegetation cover, improvement to water drafting sites, and blocking vehicle access.
Transportation: Road Storage	Road storage refers to actions to eliminate motorized use while providing basic custodial maintenance and preserving the integrity of a route so that it may be reopened and used in the future. These roads are Operational Maintenance Level 1 and are not in use for periods of 1 year or more. Road storage actions include, but are not limited to, blocking off the entrance of the route to motor vehicles with barriers, recontouring, removing live culverts, removing cross drains, reestablishing natural drainage, installing waterbars, outsloping and stabilizing the road prism, scarifying the roadway, scattering slash, restoring natural contour, and seeding and mulching to allow vegetation to reestablish on the roadway if desired.

Appendix E. Herbicide Characteristics and Application Considerations

Herbicides proposed, including herbicide characteristics and application considerations are outlined in Table 29. Additional information available from Tu et al. (2001) and DiTomaso et al. (2013).

Table 29. Herbicide Characteristics and Application Considerations

Herbicide Active Ingredient (Example Trade Name)	Initial Proposed Use*	Estimated Use Rates (% solution)	Action	Selectivity Target Species	Biological Application Timing	Restrictions[1] (Seasonal, Temperature, near water[2])	Soil Persistence (average soil half-life in days)	Potential for Leaching	Comments[3, 5]
Aminopyralid (Milestone®)	Invasives	0.1%	Growth regulator (auxin mimic)	Broadleaf species, esp. Asteraceae and Fabaceae	Pre- and post-emergence; for annuals, seedling stage; for perennials, when plants are fully expanded	Product should be >40°F to prevent crystalizing. Do not apply directly to water.	35	Limited, but may leach into ground water if there are permeable soils and water table is shallow	
Chlorsulfuron (Telar®)	Invasives	0.03%	Inhibits synthesis of certain amino acids	Broad spectrum, best on broadleaf	Pre- and post-emergence; bud to bloom or fall rosette stage	No seasonal or temperature restrictions.	28-42	Low as herbicide readily adsorbed to soil	

Herbicide Active Ingredient (Example Trade Name)	**Initial Proposed Use***	**Estimated Use Rates (% solution)**	**Action**	**Selectivity Target Species**	**Biological Application Timing**	**Restrictions[1] (Seasonal, Temperature, near water[2])**	**Soil Persistence (average soil half-life in days)**	**Potential for Leaching**	**Comments[3, 5]**
						Do not apply directly to water			
Glyphosate, aquatic formulation (Rodeo®)	Invasives	5%	Inhibits synthesis of amino acids	Broad spectrum	Post-emergence; rapidly growing plants	None. Can be applied in and around aquatic sites and wetlands.	47 but no soil activity	Inhibits synthesis of amino acids	
Glyphosate, non-aquatic formulation (Roundup®)	Reforestation site preparation, release	Site prep: 2% glyphosate, 2% oil soluble Imazapyr, and 2% methylated seed oil (MSO) (oil-based adjuvant)	Inhibits synthesis of amino acids	Broad-spectrum.	Glyphosate and imazapyr tank mix – spray in May to mid-July to target deciduous and evergreen	For upland use only.	47 but no soil activity	Very low, as herbicide has high adsorption to soil particles	Tank-mixed with Imazapyr and Indaziflam for site prep. Used by itself for release.

Herbicide Active Ingredient (Example Trade Name)	**Initial Proposed Use***	**Estimated Use Rates (% solution)**	**Action**	**Selectivity Target Species**	**Biological Application Timing**	**Restrictions[1] (Seasonal, Temperature, near water[2])**	**Soil Persistence (average soil half-life in days)**	**Potential for Leaching**	**Comments[3, 5]**
		Site prep: 2 quarts per acre glyphosate and 7 ounces per acre of indaziflam Release: 5% glyphosate and 5% MSO			woody shrubs[4] Release – deciduous shrubs in late summer, evergreen shrubs in May and June, herbaceous vegetation in the spring.				
Indaziflam	Reforestation site preparation	Site prep: 7 ounces per acre of indaziflam and 2 quarts per acre glyphosate	Cellulose biosynthase inhibitor	Pre-emergent control of grasses and forbs	Indaziflam and glyphosate tank mix – use in October and November to	For upland use only. Do not apply directly to water, or to areas where surface	150	Not very mobile in soil but may leach into ground water if there are permeable soils and	Indaziflam only has soil activity, use as a preemergent for about 2 years control of

Herbicide Active Ingredient (Example Trade Name)	**Initial Proposed Use***	**Estimated Use Rates (% solution)**	**Action**	**Selectivity Target Species**	**Biological Application Timing**	**Restrictions[1] (Seasonal, Temperature, near water[2])**	**Soil Persistence (average soil half-life in days)**	**Potential for Leaching**	**Comments[3, 5]**
					maximize amount of soil moisture and treat grasses, forbs, and shrubs	water is present. Requires rainfall (minimum 0.25 inches) within several weeks after application to activate herbicide.		water table is shallow.	grasses and forbs.
Imazapyr (Chopper® Arsenal®, Polaris®, Stalker®)	Reforestation site preparation	Site prep: 2% oil soluble Imazapyr, 2 % glyphosate, and 2% MSO	Inhibits synthesis of amino acids	Oil soluble formulation control evergreen shrubs	Imazapyr and glyphosate tank mix – spray in May to mid-July to target deciduous and evergreen	Can be applied in and around aquatic sites, if using aquatic formulation	25-142, depending on soil type	Low potential for leaching, but is susceptible to surface runoff, and exuded out through the roots or move into untreated	Imazapyr has very strong soil and foliar activity and provides brush control for about 5 years; may stunt tree growth if planting

Herbicide Active Ingredient (Example Trade Name)	Initial Proposed Use*	Estimated Use Rates (% solution)	Action	Selectivity Target Species	Biological Application Timing	Restrictions[1] (Seasonal, Temperature, near water[2])	Soil Persistence (average soil half-life in days)	Potential for Leaching	Comments[3, 5]
					woody shrubs[4]			plans via root grafting.	occurs shortly after herbicide treatment, Shrubs damaged from mechanical site prep treatment will not take up herbicides well, need to wait a year to allow shrubs to recover and grow to about 12 – 18 inches tall.

Herbicide Active Ingredient (Example Trade Name)	**Initial Proposed Use***	**Estimated Use Rates (% solution)**	**Action**	**Selectivity Target Species**	**Biological Application Timing**	**Restrictions[1] (Seasonal, Temperature, near water[2])**	**Soil Persistence (average soil half-life in days)**	**Potential for Leaching**	**Comments[3, 5]**
Tryclopyr (Garlon 3A®, Vastlan®)	Reforestation release	2% triclopoyr and 5% MSO	Growth regulator (auxin mimic)	Broadleaf and woody species. Would target woody brush	Early spring, rapidly growing plants	Do not apply the ester formulations in hot weather due to volatilization	30 (10-46)	Not considered to have high potential for ground or surface water contamination.	Do not combine with glyphosate or imazapyr, triclopyr will inhibit glyphosate or imazapyr from working on many species due to the damage it does to the translocating tissue of the plants. Most all conifers are intolerant to foliar applications of triclopyr, protect

Herbicide Active Ingredient (Example Trade Name)	**Initial Proposed Use***	**Estimated Use Rates (% solution)**	**Action**	**Selectivity Target Species**	**Biological Application Timing**	**Restrictions[1] (Seasonal, Temperature, near water[2])**	**Soil Persistence (average soil half-life in days)**	**Potential for Leaching**	**Comments[3, 5]**
									conifer seedlings.

* Future invasives treatments could potentially use any herbicide analyzed within this project.

1. Not all restrictions are listed here. Restrictions are per herbicide label direction and can vary from application rate restrictions to timing requirements and may include delays of grazing following herbicide application.
2. Per herbicide label directions. Labels do not specify distance in feet to water. Project specific herbicide buffers would be implemented, see Table 26 and Table 27.
3. All applications would be select, directed, or broadcast using a backpack sprayer (not vehicle-or aerial based)
4. Woody shrubs include snowbrush, manzanita, whitethorn, deerbrush and other species.
5. Most applications would also likely include 1-5% methylated seed oil in the tank mix.