



Social and Ecological Resilience Across the Landscape

Final Environmental Impact Statement

Volume I. Chapters 1 through 6 and Appendices



Forest Service

Stanislaus National Forest

February 2022

Cover photo: Stanislaus National Forest staff: Photo taken from near Forest Service Road 5N17, looking west into the SERAL project area on 8/27/2020. A layer of smoke from fires burning outside the Stanislaus National Forest can be seen in the background.

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Social and Ecological Resilience Across the Landscape (56500)

Final Environmental Impact Statement

Stanislaus National Forest

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Abstract: The final environmental impact statement (FEIS) identifies the Responsible Official's preferred alternative (Alternative 1) and two additional action alternatives to (Alternatives 3 and 4) designed to reduce wildfire risk and to improve forest health and resilience. The actions proposed include forest thinning, fuel reduction, prescribed fire, limited salvage, fuelbreaks, and non-native invasive weed control. The FEIS also presents a focused analysis addressing the potential direct, indirect, and cumulative environmental effects related to issues that may occur from the proposed actions as well as the effectiveness of the proposed treatments.

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¹ (36 CFR 218.5(a))

² (36 CFR 218.8(d))

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List of Acronyms

BA	Biological Assessment or Basal Area	PIF	Project Input Form
BMP	Best Management Practices	ORV	Outstandingly remarkable values
Cal-IPC	California Invasive Plant Council	POD	Potential Operational Delineations
CC	Condition Class	PPE	Personal protective equipment
CCF	Hundred Cubic Feet	QMD	Quadratic Mean Diameter
CDFA	California Department of Food and Agriculture	RfD	Human Reference Dose
CFR	Code of Federal Regulations	ROD	Record of Decision
CSO	California Spotted Owl	SDI	Stand Density Index
CWA	Clean Water Act	S&G	Standards and Guidelines
CWE	Cumulative Watershed Effects	SPI	Sierra Pacific Industries
CWHR	California Wildlife Habitat Relationship	TOC	Threshold of Concern
DBH	Diameter at Breast Height	TPA	Trees Per Acre
DEIS	Draft Environmental Impact Statement	USDA	United States Department of Agriculture
EEC	Expected Environmental Concentration	USFS	United States Forest Service
EIS	Environmental Impact Statement	WHR	Wildlife Habitat Relationship
ESA	Endangered Species Act	WSR	Wild and Scenic River
ESD	Emergency Situation Determination	WUI	Wildland Urban Interface
FERC	Federal Energy Regulatory Commission		
FIA	Forest Inventory and Analysis		
FRID	Fire Return Interval Departure		
FSH	Forest Service Handbook		
FSIM	the large-fire simulation system		
FSM	Forest Service Manual		
FVS	Forest Vegetation Simulator		
GIS	Geographic Information System		
GTR	General Technical Report		
HRCA	Home Range Core Area		
HQ	Hazard Quotient		
HUC	Hydrologic Unit Code		
HVRA	Highly Valued Resource and Asset		
LIDAR	light detection and ranging		
LMU	Land Management Unit		
LOP	Limited Operating Period		
MCL	Maximum Contaminant Level		
MDBM	Mt. Diablo Base and Meridian		
MSDS	Material Safety Data Sheet		
NCFS	Northern California Fire Severity Prediction System		
NF	National Forest		
NEPA	National Environmental Policy Act		
NFS	National Forest System		
NOA	Notice of Availability		
NOAEC	No observed adverse effect concentration		
NOEL	No-observed-effect-level		
NRV	Natural Range of Variation		
OHV	Off-highway vehicle		
PAC	Protected Activity Center		

SUMMARY

The Social and Ecological Resilience Across the Landscape (SERAL) project has been developed to restore forest resilience and the ability of the landscape across the project area to persist with fire as a natural process.

The SERAL project is centrally located on the Stanislaus National Forest, within the Yosemite Stanislaus Solutions collaborative area, with portions located on the Calaveras, Mi-Wok, and Summit Ranger Districts (Figure 1). The SERAL project area is located south and east of the North Fork Stanislaus River and north and west of the North Fork Tuolumne River. The project area is also almost entirely to the north and west of Highway 108 (T2N-T5N, R14E-R18E; MDBM).

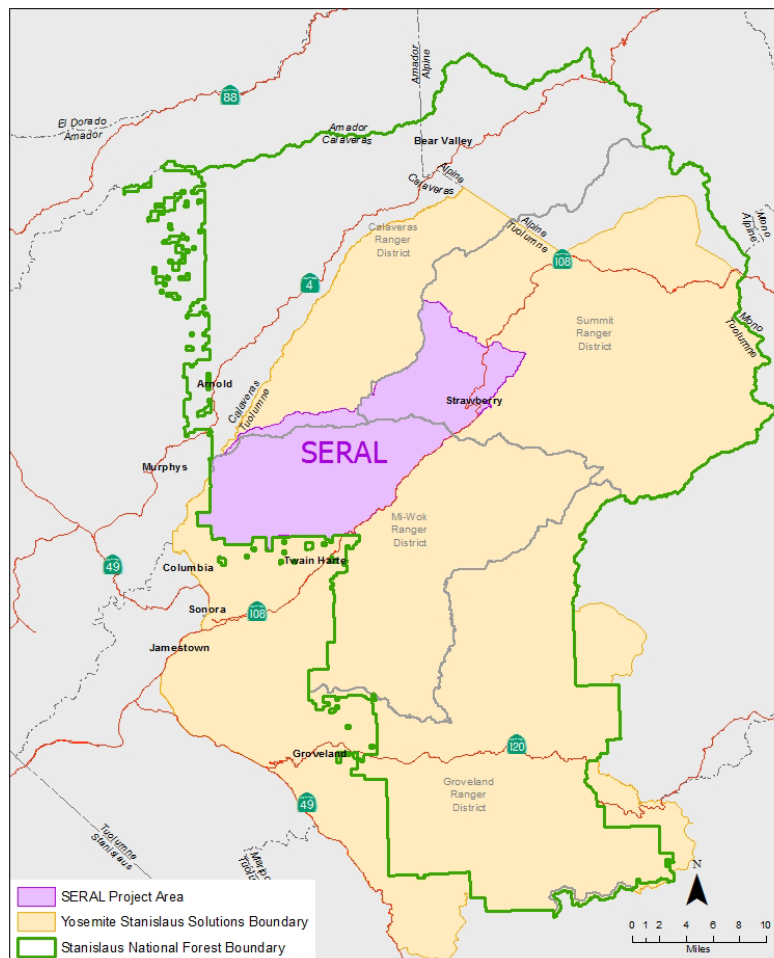


Figure 1. Project area vicinity map.

Project Purpose and Need

After comparing the exiting and desired conditions of the project area's landscape and reviewing public feedback received during scoping, the Forest identified and refined the following purpose needs for the project:

- Increase Landscape Resilience to Natural Disturbances (drought, insects, disease, wildfire) by Restoring Resilient Forest Conditions as Guided by the Natural Range of Variation

- Increase forest heterogeneity (within- and between stands)
 - Reduce stand densities
 - Retain large, old, and structurally diverse trees and snags
 - Increase the relative abundance of fire-tolerant and shade-intolerant trees
 - Reduce surface and ladder fuels
 - Increase management use of fire through larger, watershed scale efforts that mimic the natural range of fire severity and frequency
 - Construct and maintain a network of fuelbreaks to support prescribed fire and wildfire operations
 - Salvage drought, insect, disease, and wildfire disturbed areas for NRV-based restoration and conservation benefits
- Provide Economic Opportunities to Local Communities
 - Maintain Safe Access to Public Lands
 - Reduce the Spread of Invasive Non-Native Weeds.

Concerns Identified by the Public (Issues)

Issues were identified from public comments received during scoping and the DEIS comment period. Issues summarize concerns or perceived issues submitted by the public related to the actions proposed. These public concerns were molded into cause-effect statements to describe what aspect of the proposed actions or EIS content a concern is related to and the environmental effect(s) or impacts expected to result from that specific action or actions. These cause-effect statements serve to highlight effects or unintended consequences that may occur from the proposed actions and action alternatives and to focus the EIS analysis. The FEIS presents an analysis which directly addresses and resolves each of the perceived issues. Table 23 presents each of the main concerns submitted by the public.

The key concerns or perceived issues submitted by the public were related to DBH limits, potential impacts to CSO habitat, concerns regarding the proposed project-specific forest plan amendments, the use of herbicides, and the potential impacts to wild and scenic river characteristics.

Response to DEIS Comments

During the 45-day opportunity to comment on the DEIS, 23 unique individual letters and 38 form+ letters were submitted from private individuals, organizations, groups, agencies, and industry professionals (Table G.X). Letters included comments expressing support for and / or concerns regarding certain aspects of the proposed actions and other DEIS content. Updates have been made to the FEIS and supporting documentation in response to many of the comments and written responses to each comment, including reference to any updates that were made are provided in Table G.X.

Alternatives Considered in Detail

The action alternatives – Alternative 1, 3, and 4 and the no-action alternative – Alternative 2, are considered in detail. There are 94,383 acres of NFS lands within the SERAL project area and all of the actions proposed are located on these NFS lands. The action alternatives include proposed actions which respond to current and future (to a limited degree) restoration needs.

A partnership of scientists and land managers considered experts in their field worked collaboratively to develop relevant, high-quality landscape conditions metrics which were used to inform where treatments were needed and located across the project area. The developed metrics fall into 6 main categories: landscape resilience, wildfire risk, CSO habitat, economics, forest structure, and fire dynamics and behavior. The scenario planning tool, ForSys, was used to synthesize the information provided by the metrics. As a team, we selected two metrics as the overarching drivers to inform which areas were selected for treatment because they best represented the overall purpose of the project – To increase the

landscape's resilience to natural disturbances. These chosen objectives identified areas across the project area where the predicted fire effects were most negative and where forest structure was most departed from reference conditions. The total acres proposed for treatment was partially based on the restoration need informed by an assessment comparing existing forest structure to average pre-settlement landscape conditions and was incorporated into ForSys runs as a constraint. The preferred alternative also limits mechanical treatments within CSO PACs to areas most departed from reference conditions and to a maximum of 100 acres per PAC.

Alternative 1 (Preferred Alternative)– was developed in collaboration with Yosemite Stanislaus Solution collaborative group and incorporates the management approaches and conservation measures presented in the 2019 *Conservation Strategy for the California Spotted Owl in the Sierra Nevada* (hereafter referred to as the **CSO Strategy**). Application of the CSO Strategy is only included in Alternative 1 and made possible by the suite of proposed project-specific forest plan amendments (Appendix B, Table B-1).

Actions proposed in Alternative 1 include, forest thinning, fuel reduction, prescribed fire, fuelbreak maintenance and construction, salvage, hazard tree abatement, temporary road construction, and non-native invasive weed control and eradication.

Alternative 3 varies in comparison to Alternative 1 to comply with current management direction (USDA 2017). Alternative 3 does not include any project-specific forest plan amendments or adopt the management approaches or conservations measures presented in the CSO Strategy.

Alternative 4 was developed to comprehensively address comments, concerns, and suggestions received during scoping and further refined in response to comments received during the 45-day DEIS opportunity to comment. Like Alternative 3, Alternative 4 was developed to comply with current management direction (USDA 2017) and does not adopt the CSO Strategy or include forest plan amendments. Unlike Alternative 1 and 3, however, Alternative 4 does not propose mechanical treatments within CSO PACs, salvage, hazard tree abatement, or herbicide use for the control and eradication of non-native invasive weeds.

Comparison of Alternatives

Summary Table S- 1. Proposed treatments among action Alternatives (Alt. 1, 3, and 4).

Proposed Activity	How?	Where?	Restoration Needs	Alternative 1	Alternative 3	Alternative 4
Forest Thinning	Timber Harvest, Biomass Removal, or Mastication	In dense conifer stands where average diameters are greater than 6 inches and canopy covers are greater than 40%.	<ul style="list-style-type: none"> - Increase forest heterogeneity by restoring the proportion of different size and density classes across forested areas best mimic natural, historic conditions - Reduce stand densities - Increase the relative abundance of fire-tolerant and shade-intolerant trees. -Provide wood products 	30,498	26,471	25,234
Fuel Reduction	Mastication, or piling and burning,	In areas with small conifers with average diameters less than 6 inches, conifers with diameters greater than 6 inches and canopy cover less than 40%, or oaks, shrubs, or other herbaceous vegetation types generally occurring on slopes averaging less than 35% within WUI defense zones or within 250 feet of a level 2, 3, 4, or 5 road.	<ul style="list-style-type: none"> - Reduce and maintain low levels of surface and ladder fuels. 	7,437	7,460	7,448
Fuelbreak Construction and Maintenance.	Timber harvest, biomass removal, mastication, hand thinning, or piling and burning	Where fire and fuels staff delineated the linear feature.	To achieve the goal of returning fire to the entire landscape at regular intervals.	13,430	Same as Alt. 1	Same as Alt. 1

Proposed Activity	How?	Where?	Restoration Needs	Alternative 1	Alternative 3	Alternative 4
Follow-up Prescribed Fire	Prescribed Fire	Wherever forest thinning, fuel reduction, or fuelbreak work has occurred	-Reduce and maintain low levels of surface and ladder fuels. - Apply or reintroduce fire to the landscape at larger, more regular intervals to mimic the natural range of fire severity and frequency.	51,366	47,361	46,292
Prescribed fire	Prescribed Fire	Where no other treatments are proposed and therefore prescribed fire is the primary treatment.	- Reduce and maintain low levels of surface and ladder fuels. - Apply or reintroduce fire to the landscape at larger, more regular intervals to mimic the natural range of fire severity and frequency.	19,763	21,007	21,304
Forest Thinning, Mastication, Fuelbreak Network, and Prescribed Fire				71,121	68,307	67,518

Summary Table S- 2. Additional Treatments Proposed to respond (in a limited manner) to future disturbance which result in tree mortality rates exceeding the natural range of variation or to maintain safe access to public lands.

Proposed Activity	How?	Where?	When?	Alternative 1	Alternative 3	Alternative 4
Salvage of Insect-, Disease-, or Drought-Killed Trees	Timber Harvest	Within 0.25 miles of Level 2, 3, 4, and 5 National Forest system (NFS) roads; in mixed conifer/fir, mixed conifer/pine, and pine dominated areas with large conifers greater than 6 inches in diameter and located outside of PACs and the proposed W & S River corridors. This equates to an area of approximately 37,243 acres where salvage may potentially occur. Salvage of insect-, disease-, or drought killed trees may not occur outside of this defined area of potential salvage. Much of the area of	When patches containing more than 75% beetle, diseased, or drought killed trees exceed 10 acres in size or when multiple mortality patches combined exceed 15 percent of a HUC 6 watershed. -When will not exceed CWE TOC.	Yes	Yes	No

Proposed Activity	How?	Where?	When?	Alternative 1	Alternative 3	Alternative 4
		potential salvage overlaps areas with other treatments proposed. Only 2,416 or 3,374 acres (in Alternative 1 or Alternative 3) are unique areas without any other proposed treatments.				
Salvage of Wildfire-Killed Trees	Timber Harvest	Up to 500 acres per HUC 6 watershed with maximum of 3,000 acres in the project area.	In areas burned at high severity (>75% mortality) which exceed 10 % of a HUC 6 watershed -When will not exceed CWE TOC.	Yes	Yes	No
Hazard Tree Removal	Timber Harvest, Biomass Removal, Felling	Along the 285 miles of public access roads traversing forest service lands in the project area.	Any tree identified as a hazard within 1 tree length of a road following current regional standards and direction.	Yes	Yes	No

Summary of Major Conclusions

The analysis presented to address the issues related to the proposed actions and the alternatives (Section 3.01) and the ability of the proposed actions to meet the purpose and need of the project (Section 3.02) clearly demonstrate that Alternative 1 best addresses each issue and most effectively meets the purpose and needs of the project. Alternative 3 and 4 are also effective to varying degrees, but despite seemingly small differences between these alternatives and Alternative 1, their differences will likely impact implementation: economically, feasibility, and duration to completion

1. PURPOSE OF AND NEED FOR ACTION

1.01 Increase Landscape Resilience to Natural Disturbances (drought, insects, disease, wildfire) by Restoring Resilient Forest Conditions as Guided by the Natural Range of Variation

Past management actions, including fire suppression and historic logging practices, over the last one and a half centuries have extensively altered current forest conditions and ecosystem processes in the Sierra Nevada. Some of the key changes in yellow pine and mixed conifer forests include loss of old, large-diameter, fire-resistant trees and associated large, downed logs; shift in tree species composition towards shade-tolerant species; denser forests with multiple canopy layers and ladder fuels that facilitate crown fire; and more densely forested landscapes with continuous high fuel levels. These trends have led to forest stands, watersheds, and landscapes that are highly susceptible to threats such as large, high severity wildfires, widespread drought- and insect-induced tree mortality, as well as climate change (Safford and Stevens, 2017).

Modeled estimates for the Sierra Nevada indicate temperatures will increase by 5.4 to 10.8 degrees Fahrenheit (3 to 6 degrees Celsius) during the twenty-first century. Climate change projections indicate many of the low- and mid-elevation forests in the Sierra Nevada are vulnerable to conversion to woodlands, shrublands, and grasslands (USDA 2019). Projected increases in temperature and decreases in snowpack for the Sierra Nevada (Safford et al. 2012) are likely to continue the increasing trend in the size of stand-replacing fires and proportion of landscape impacted by high severity fires (Stephens et al. 2013), as well as triggering insect species population increases and subsequent tree mortality (Millar and Stephenson 2015).

Natural Range of Variation (NRV) assessments provide baseline information on the composition, structure, and function of forested ecosystems that can be compared to current conditions to develop an idea of trend over time and an idea of the level of departure from their natural state (Safford and Stevens 2017). Restoring forest composition, structure, and processes based on NRV conditions has been linked to greater resilience to wildfire, climate change, and other stressors and is a central and guiding principle of the Conservation Strategy for the California Spotted Owl in the Sierra Nevada (USDA 2019). The concept of restoring the landscape into closer alignment with historic reference conditions is rooted in the assumption that the structural composition of forests occurring in pre-settlement times, were, and would still be, more resilient to disturbances such as insects, disease, drought, and climate change, and less susceptible to large-scale, high severity wildfires. Pre-settlement reference conditions represent forests where ecological processes and adaptive capacity can continue to evolve together. Aligning the landscape with NRV is the first step towards an eventual resilient future range of variation (USDA Forest Service 2019).

The current forest structure in the SERAL project area is considerably departed from the reference conditions described in Safford and Stevens (2017) and Meyer and North (2019) (Figure 2). In both the Yellow Pine/Dry Mixed Conifer (e.g., pine-dominant mixed conifer) and Fir/Moist Mixed Conifer (e.g., fir-dominant mixed conifer) forest types, current departure is pronounced in both mid- and late-developmental stages, with the current landscape containing much more closed canopy and much less open canopy in both developmental stages. These general vegetation types represent more than two thirds of the project area (Table 1, Map 1).

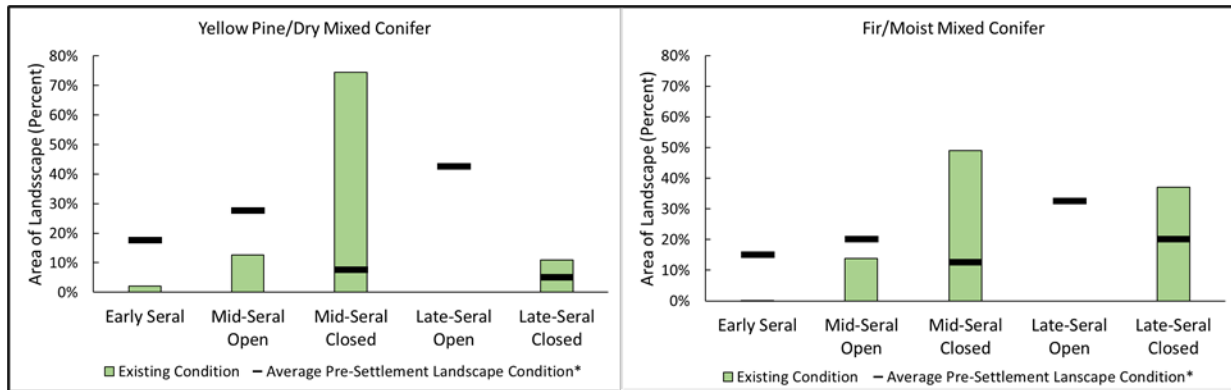


Figure 2. Current landscape structure of Yellow Pine/Dry Mixed Conifer and Fir/Moist Mixed Conifer forest types compared to historic conditions.

Table 1: General vegetation types in the project area³.

General Vegetation Type	Total Acres / Percent of Total (NFS and non-NFS lands)	NFS Land Acres / Percent of Total NFS Lands (NFS lands only)
Yellow Pine / Dry Mixed Conifer	73,030 / 61%	58,143 / 61%
Oak Woodland	21,421 / 18%	17,737 / 19%
Shrub	15,321 / 13%	11,736 / 12%
Fir / Moist Mixed Conifer	6,753 / 6%	6,113 / 6%
Herbaceous	1,104 / <1%	489 / <1%
Non-Vegetated	1,166 / <1%	562 / <1%
TOTAL ⁴	118,795 / 100%	94,779 / 100%

A comparative assessment between the current forest structure and the reference conditions broadly informed the proportion of the project area in need of restoration as well as the type of restoration needed (Appendix A, Table A.2 and Table A.3). The restoration needs to increase resiliency include (1) increase within- and between-stand heterogeneity; (2) reduce stand densities; (3) increase the large tree component on the landscape; (4) increase the relative abundance of fire-tolerant and shade-intolerant tree species; (5) reduce surface and ladder fuels; (6) increase management by fire, both prescribed and managed wildfire; and (7) actively restore habitat after disturbances that do not align with NRV (USDA 2019). Each of these desired conditions are further addressed in items A through G below.

A. Increase Forest Heterogeneity (within- and between stands)

Based on the NRV assessment of conifer forest types in the SERAL project area, there is a need to increase the amount of open canopy habitat and reduce the proportion of closed canopy conditions in mid- and late-seral stages (Figure 2) to get a patchy distribution of diverse stand types across the landscape. To best mimic NRV conditions and achieve within-stand and multi-stand diversity, applied silviculture and prescribed fire treatments need to create a pattern of individual trees, clumps of trees, and openings containing various sizes of clumped trees and openings. The understory of mid- and late-seral areas should be managed for a patchy distribution of shrubs, forbs, tree regeneration patches, and bare ground to increase diversity, and reduce fuel continuity.

³ F3 derived (Huang et. al 2018); "Forest Type".

⁴ F3 derived data are raster-based products and acres are approximate and explain why the total project area and NFS land acres do not equal 118,808 and 94,823 acres respectively.

B. *Reduce Stand Densities*

Native insects and diseases are major contributors to natural disturbance, ecosystem dynamics, and nutrient cycling in forests. Much of the time, their impacts are minor and localized, but the synergistic effects of high tree densities, coupled with drought, create conditions that are optimal for intense insect infestations and outbreaks. Low- to mid-elevation coniferous forests of the Sierra Nevada range have recently experienced one of the largest tree mortality events in recent history. Since 2010, more than 10 million trees have been killed within the Stanislaus National Forest, according to U.S. Forest Service Forest Health Protection's Aerial Detection Survey Data (2019). Between 2014 and 2017, tree mortality levels increased more than 100-fold in many areas of the southern Sierra Nevada. During this period, 55% of the California spotted owl (CSO) Protected Activity Centers (PACs) on the southern Sierra national forests (Sierra, Sequoia, and Stanislaus) experienced tree mortality of more than 20 trees per acre with greater loss in larger-diameter trees (USDA 2019, Koontz 2021). The vast majority of these millions of dead trees remain on the landscape, and tens of thousands of acres of live trees in the SERAL project area remain at risk to insect outbreaks and associated widespread, ecosystem-altering mortality due to current densities of live trees.

Recent results from USFS insect and disease aerial detection surveys (ADS) have shown moderate insect activity throughout the SERAL project area. While level of insect activity and tree mortality has fluctuated in recent years (2014-2021), some areas have started to become significantly impacted, particularly with pine mortality, though landscape-scale outbreaks have not yet occurred. Among recent years, 2016 saw the most activity of insect-related damage, with groups of mortality ranging from 15-30 trees/acre; activity was also clustered in the southwestern end of the project boundary, primarily in ponderosa and sugar pines. If drought and above-average temperature days persist into 2022, increased tree mortality is expected to be visible this summer and into next year (2023).

Prevention strategies for minimizing further tree mortality by reducing water stress and competition are critical. Hayes et al. (2009) reported that stand density, measured as basal area or stand density index (SDI) is the most important predictor of western pine beetle-caused tree mortality at large spatial scales in California, likely due to the effect of stand density on individual tree vigor and water availability. Multiple studies have shown that forest thinning can relieve competitive stress among residual trees, improve their vigor, and make them less prone to successful attack by bark beetles (Restaino et al. 2019, Fettig 2012, Hayes et al. 2009).

A common metric used to quantify the level of competition in forested areas is stand density index (SDI), which is based on the number of trees per unit area—trees per acre, for example—and the diameters of those trees. It can be used to describe “how dense” trees in a forest are growing and is also an indicator of forest health. In general, higher stand densities predispose trees to damage and/or mortality from drought, bark beetles and other forest pests due to increased inter-tree competition for limited resources (Oliver 1997). Hayes et al. (2009) reported that stand density, measured as basal area or stand density index (SDI), is the most important predictor of western pine beetle-caused tree mortality at large spatial scales in California. Areas with the highest stand densities tend to experience the highest levels of tree mortality on both an absolute (trees/acre) and proportion (percentage of mortality) basis (Hayes et al. 2009, Fettig 2012). Research supports lowering stand densities as a critical component of promoting healthy, resilient forests with vigorous trees that are resilient to insect attacks (Hayes et al. 2009, Fettig 2012, Long and Shaw 2012), specifically maintaining densities below approximately 60% of the maximum SDI levels to provide for reduced density-related mortality and relatively high vigor (Oliver 1995). Modeling by Hayes et al. (2009) suggests that it might be appropriate to consider even lower SDI thresholds under some conditions, such as during elevated bark beetle populations as associated with extended drought (Fettig 2012), and also to ensure treatments are effective for some period of time before they again approach the 60% of maximum SDI threshold.

Current SDI values of conifer stands within the SERAL project area are often close to 100% of maximum SDI, which is the “theoretical maximum” (similar to the concept of “carrying capacity” in ecology) for combinations of mean diameter and density of trees. Recent research of historic SDI values in the Sierra Nevada suggests that relative SDI in pre-settlement stands averaged 23-28% of the maximum SDI, and that “tree densities on average increased by six to seven-fold while average tree size was reduced by 50%” between 1911 and 2011 (North et al. 2022). They suggest that managers could use a range of 14-36% of maximum SDI “to create stands with higher relative SDIs on sites with greater soil moisture availability and lower potential fire intensity, and lower relative SDI values on drier, steeper slopes more prone to drought and higher intensity burns.”

USDA Forest Health Protection has utilized SDI thresholds in order to identify forested areas considered to be at high risk of drought- and bark beetle-induced tree mortality and which also have a high likelihood of experiencing stand-replacing wildfire (Table 2). Current SDI values within the SERAL project area average approximately 240 in pine-dominant stands and 280 in fir-dominant stands, with more than 48,000 total acres of conifer forest stands having SDI values considered to be at “High-risk” to mortality from drought, insects, disease, and wildfire (USDA 2021(c)). Left unmanaged, high levels of inter-tree competition would persist and continue to increase. Stand vigor will stagnate, and resilience to drought-, insect-, disease-, and wildfire-related mortality will continue to decline.

Table 2. High risk SDI thresholds (USDA 2021(c)).

Forest Type	Stand Density Index (SDI)
Yellow Pine / Dry Mixed Conifer	>220
Fir / Moist Mixed Conifer	>330

C. Retain Large, Old, and Structurally Diverse Trees and Snags

The California spotted owl (CSO) requires both highest-quality nesting and roosting habitat and sufficient habitat diversity / heterogeneity to provide for foraging (USDA Forest Service 2019). The status of the existing CSO habitat within the SERAL project area was assessed at multiple scales (PAC, Territory, HRCA, and HUC 6 Watershed).

For the purposes of SERAL, WHR size and density as well as canopy cover, were modeled using the F3 framework (Huang et al. 2018). F3 extrapolates the details of forest inventory plots (FIA) and individual-tree model outputs to a spatially-contiguous landscape by fusing tree-list field measurements, individual tree growth and yield models, remote sensing including lidar, and environmental geospatial datasets.

Using these imputed size, density, and canopy cover metrics, habitat quality categories for CSO nesting and roosting based on structural characteristics of forests were classified into two general categories: 1) highest-quality habitat and 2) best-available habitat (Table 3).

Table 3: Habitat quality categories for CSO nesting and roosting based on structural characteristics of forests.

Habitat Quality Categories Based on Structural Characteristics	WHR Classification	Tree Size	Canopy Cover
Highest-Quality	5D, 5M, 6	More than 24-inches	40 to 100 Percent
Best-Available	4D, 4M	11 to 24 inches	40 to 100 Percent

Defining habitat quality using these data provides a rough metric to quantify, in acres, the existing quality of structural characteristics of nesting/roosting and foraging habitat at multiple scales across the project area (Table 4). Table 4 presents the acres of CSO habitat at multiples, but the quantification presented was calculated simply on the size and density of the trees as the lone indicator of habitat quality. Other factors such as high-risk densities, mid-story canopy densities, high fuel loads, competition, drought

conditions, insect and disease infestations, and warming temperatures are not accounted for in Table 4 but are no less important. These other abiotic parameters should be considered when assessing and defining habitat quality and when determining where retention of large, old, structurally diverse trees and snags are appropriate.

Table 4: Acres of California spotted owl habitat at multiple scales⁵.

Land Allocation	Highest-Quality	Best Available	All Other	Total Acres
PAC	3,157	10,696	1,868	15,722
Territory/HRCA ⁶	3,422/3,308	19,080/13,509	11,485/1,950	33,987/18,768
All Other ⁶	3,887/4,001	39,532/45,103	25,680/35,215	69,099/84,318
Total	10,466	69,308	39,034	118,808

Management objectives and desired conservation outcomes vary across each land allocation as it relates to CSO habitat (Table 5). Each of these objectives and desired conservation outcomes helped to identify the need for management actions across the project area. Knowing the quantity and quality of the existing habitat also provides the foundation in which to analyze each alternative's effectiveness of maintaining quality habitat.

Table 5: California spotted owl management objectives and desired conservation outcomes.

Land Allocation	Overall Management Objective	Desired Conservation Outcome
PAC	Maintain high-quality habitat at occupied nest sites for the CSO while more resilient habitat is developed across the landscape	Manage PACs for resiliency and sustainability while minimizing potential near-term effects of resiliency treatments
Territory	Maintain and increase high- quality nesting, roosting, and foraging habitat while increasing habitat heterogeneity and resilience	Maintain and promote 40 to 60 percent of a territory in mature tree size classes with moderate and high canopy cover for nesting, roosting and foraging.
HRCA	Manage these areas to retain their value as suitable owl habitat.	Maintain (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.
Watershed Matrix (HUC 6)	Restore resilient forest conditions guided by NRV	The desired conservation outcome for multiple territories comprising more than 75 percent of a watershed is to maintain 30 to 50 percent of the watershed in mature tree habitat at moderate and high canopy cover.

Currently, approximately 20% and 68% of the mapped CSO PACs structural habitat characteristics associated with the highest-quality or best-available habitat, respectively (Table 4). When locating treatments and assessing treatment needs, the management objectives and desired conservation outcomes as well as forest plan direction must be met and followed.

⁵ PAC and HRCA acres are located only on NFS-lands. Territory and All Other acres include non-NFS lands. Total 118,808 acres includes all lands: NFS and non-NFS lands.

⁶ Territory / HRCA: Two values are presented for each cell to represent the acres calculated for CSO Territories or CSO HRCAs. Alternative 1 proposes to adopt CSO Territories while Alternatives 3 and 4 would retain CSO HRCAs. Therefore, assessing the acres for either territory or HRCA is important throughout the FEIS. The values presented for Territory/HRCA do not include the overlapping PAC acres.

After a desired condition evaluation conducted for each individual territory based on the proportion of each territory comprised of the highest-quality or best-available habitat we found that all but one territory (fully located within the project area) met the desired condition to contain 40 to 60 percent of the area in mature tree size classes with moderate and high canopy cover for nesting, roosting, and foraging (in order of descending priority: 6, 5D, 5M, 4D, and 4M). In all but five of territories with at least 70% of the area within the SERAL project area, the desired condition is met either completely or primarily by best-available habitat, because either highest-quality habitat does not exist or it is very limited (e.g., less than 2%). Extra attention is needed to ensure treatments are designed to meet the desired condition while promoting resilient CSO habitat throughout the landscape.

Territories (and HRCAs) comprise more than 75% of all six of the HUC 6 watersheds located within the SERAL project area. The composition of mature tree sizes and moderate and high canopy cover falls within the desired range of 30 to 50% in each of the HUC6 watersheds (Wildlife BE Table CSO7). However, very little (less than 10 percent) of the mature tree size classes are in the CWHR 5D and 5M categories associated with the highest-quality habitat.

Management activities that maintain the structural characteristics of highest-quality habitat while protecting it from risk of loss from high severity wildfire and other natural disturbances, require trade-offs. Balancing the retention of highest-quality habitat with necessary treatments to increase resiliency, may cause short-term decreases in habitat quality. To minimize near-term effects of resiliency treatments, such treatments should be implemented only when needed (e.g., where landscape is vulnerable to natural disturbance and loss of habitat) and should be designed to maintain the most important habitat components, such as areas of high canopy cover (more than 55 percent) in large/tall trees within PACs.

It is important to note that maintaining or improving CSO habitat is complex and requires a multi-faceted evaluation. It is imperative to avoid putting an over-emphasis or narrow focus on structural habitat characteristics and failing to consider that areas containing these desirable structural owl habitat characteristics may contain other characteristics that put them at high-risk from natural disturbances such as insect-, disease-, drought-, and high severity wildfires (e.g., high SDIs; accumulated surface and ladder fuels, and too few shade-intolerant and fire-tolerant trees).

It is well documented that a forest, PAC, or Territory containing the large trees and high canopy cover (structural characteristics of the highest-quality and best-available habitat), can also be overly dense, lack forest openings, contain lush understory vegetation which act as ladder fuels, and experience the same climate related stressors (lack of precipitation, warmer temperatures,) as the rest of the landscape across the Sierra Nevada. Characteristics which are supported indicators to assess the landscapes vulnerability to natural disturbances are just as critical to maintain and improve CSO habitat quality. To fail to comprehensively evaluate all of the habitat characteristics when assessing habitat quality and developing a project would be inconsistent with the overall CSO Strategy and fail to promote resilient CSO habitat throughout the landscape.

The SERAL project needs to find a balance between maintaining structural characteristics associated with the highest-quality and best-available habitat while promoting resilient CSO habitat across the landscape.

D. *Increase the relative abundance of fire-tolerant and shade-intolerant trees*

Throughout Sierra Nevada montane forests, many decades of fire suppression have led to a major shift from dominance of shade-intolerant species, such as pines and oaks, to dominance of shade-tolerant species, primarily white fir and incense cedar (Safford and Stevens 2017). The intent here is to promote species compositions more in line with NRV, by decreasing the abundance of shade-tolerant species (for example, white fir and incense cedar) and promoting the growth of fire-resistant, shade-intolerant species (for example, ponderosa pine, sugar pine, and black oak). Historically, more fire-resistant and shade-intolerant pine and oak trees represented a greater proportion of trees across the landscape than current

conditions. To correct this imbalance, these shade-intolerant species would be favored for retention during forest thinning and prescribed fire treatments. Tree removal would target smaller trees and fire-sensitive species, primarily white fir and incense cedar, that would not be as abundant under a natural fire regime (USDA 2019).

E. *Reduce Surface and Ladder Fuels*

A mosaic or NRV of vegetation and fuel load conditions across the landscape was most likely commonly found in the Sierra Nevada, but that was in the context of a frequent fire regime when surface and ladder fuels were regularly consumed. Historically fires burned so often in yellow pine / mixed conifer forests that it is unlikely that much large woody material survived repetitive fire processes long enough to decompose fully (Skinner 2002 *in* Safford and Stevens 2017). Accumulated surface and ladder fuels, including coarse woody debris and tall, dense shrubs, increase the risk of higher flame lengths, increase residence or burning time, increase resistance to control a fire, and/or may increase fire severity (i.e., vegetation mortality). Collectively these effects are likely to result in loss of wildlife habitat and community infrastructure and impact the stability and health of soil and water.

The suite of 40 fire behavior fuel models (Landfire 2016 [updated for tree mortality conditions in 2017], Scott and Burgan 2005) enables an assessment of different dead and downed fuel and understory vegetation loading and structural categories that contribute to the leading edge, or head of the fire. This fuel modeling effort provides a descriptive and partially qualitative assessment of the existing understory vegetation and dead fuel loads across the landscape within the SERAL project area and spatially outlines the need for treatment (Table 6). The total fuel and vegetation loads on the landscape are often more than is represented in Table 6, but these models and loads are those that are used when modeling fire behavior. In the SERAL project area, fuel models with moderate to high fuel loads – those exceeding 6 tons per acre – within shrub, timber understory, and timber litter fuel model types dominate the landscape (Table 6). The ratio of moderate and high fuel loads in comparison to lower load fuel models in the project area is not desirable and inhibits resilient landscape conditions. Fuel or vegetation reduction treatments are needed to rebalance the ratio of fuel loading and reduce the moderate and high fuel loads across the landscape to enable moving towards condition class 1 (see Section F below) or resilient conditions. Under an average range of weather conditions, lower fuel loads generally have lower flame lengths, reduced fire severity, and are more likely to burn as a surface fire rather than enter into the tree crowns (or move as a crown fire).

Table 6: Existing understory vegetation and dead fuel loads across the landscape.

Fire Behavior Fuel Model Type	Fuel Model Description & Load Category	Partial fuel load total (tons/ac)	Non-NFS lands (acres)	NFS-Lands (acres)	All Lands (acres)
Non-burnable	urban/developed	N/A	168	151	319
	agricultural	N/A	0	2	2
	open water	N/A	415	440	855
	bare ground	N/A	0	2	2
Grass	short sparse grass	0.4	18	126	144
	low load	1.1	673	4,487	5,160
Grass-Shrub	low load	1.4	291	476	768
	moderate load	2.6	4,289	17,508	21,797
Shrub	low load (dry)	2.0	1	23	24
	moderate load (humid)	8.4	894	2,324	3,217
	moderate load (dry)	9.7	1	1	2
	low load (humid)	4.8	0	6	6
	high load	8.6	449	1,937	2,385

Fire Behavior Fuel Model Type	Fuel Model Description & Load Category	Partial fuel load total (tons/ac)	Non-NFS lands (acres)	NFS-Lands (acres)	All Lands (acres)
	very high load	14.4	228	2,610	2,838
Timber-Understory	low load	3.7	88	813	902
	moderate load	4.2	184	663	847
	very high load	14.0	10,913	41,609	52,523
Timber Litter	low load, compact conifer	6.8	57	566	623
	low load, broadleaf	5.9	33	199	232
	moderate load, conifer	5.5	1,137	3,457	4,594
	small, downed logs	6.2	163	2,737	2,900
	high load, conifer	8.05	145	449	594
	moderate load, broadleaf	4.8	1,944	7,317	9,262
	large, downed logs	9.8	1,496	4,675	6,170
	long-needle litter	8.3	65	1,125	1,190
	very high load, broadleaf	14.1	331	1,120	1,451
Totals			23,984	94,823	118,808

F. Apply or reintroduce fire to the landscape at larger, more regular intervals to mimic the natural range of fire severity and frequency

Fire fills an important role in nutrient cycling, biodiversity maintenance, and habitat structure. Long term fire suppression can lead to unforeseen changes in ecosystems that often adversely affect the plants, animals, and humans that depend upon that habitat. Many ecosystems benefit from periodic fires. Fire returns nutrients to soils, encourages growth of older fire-resistant trees, and creates forest openings which facilitate the establishment of diverse understory plants and tree seedlings (new growth). Fire also consumes and reduces the continuity and connectivity of grasses, shrubs, and saplings in the understory which can become ladder fuels, through which flames can climb into the forest canopy. Once fire enters a forest canopy, fires can spread easily and are likely to result in tree mortality.

Regionally, we are concerned by the accumulating fire threats and recent fire history throughout California. As Forest Service employees, we are stewards of the environment, and it is our mission to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. Without active management, our forests, and the many processes reliant on their productivity are at grave risk of damage due to the continuing pattern of unprecedented large and severe wildfires. Innately we are also alarmed by the loss of life and infrastructure that are now all too common because of wildfires.

For most of the 20th century, land management has focused on suppressing all fires on national forests to protect timber resources and the rural communities adjacent to the federal lands. A century of fire exclusion has resulted in an ingrowth of shade-tolerant trees and an accumulation of surface and ladder fuels, increasing both the amount and patch size of high severity fire in the Sierra Nevada (particularly in the low- and mid-elevation conifer forest types) (USDA 2019, Mallek et al. 2012, Miller et al. 2009, Steel et al. 2015). In just the past seven years the Stanislaus National Forest and surrounding community has experienced extensive death of mature forest and infrastructure loss from wildfires. Local wildfires have also created significant impacts to watershed functions and have contributed to air quality concerns across a large portion of the region. The size and severity of wildfires have been increasing and most scientists and managers see this trend continuing. These larger fires coupled with a greater expanses of high severity fire effects cause exponentially greater environmental damage and disrupt layers of processes that rely on properly functioning ecosystems (Stevens et al. 2017, Miller and Safford 2012).

Prior to the 20th century, fires were a common occurrence in the Sierra Nevada and foothills for thousands of years. Much of the forests burned at regular intervals on a 15- to 30-year cycle from natural causes like lightning or intentional ignitions and vegetation management by indigenous people. This historic, regular pattern of fire, known as a fire regime, created a mosaic of vegetation patterns including varying degrees of canopy cover and forest openings. As the fire return interval increases beyond those which ecosystems evolved with, then the landscape's vulnerability increases to disturbances such as intense wildfires, insect and disease infestations, and drought mortality. After nearly a century long over-emphasis on fire suppression, Sierra Nevada forests are now uncharacteristically dense with understory ladder fuels often coupled with suppressed to codominant sized trees, and a thick layer of dead and down woody material, litter, and duff. Often now, when fires ignite, forests erupt into massive infernos which generate their own weather, burning large expanses of forested lands at much higher intensities and severities than historic levels, consuming or killing most of the live vegetation, and leaving long-lasting fire scars on huge expanses of our public lands.

The fire history within the SERAL project area is the same. Very little area has burned over the past few decades. Approximately 80% and 14% of the SERAL project area is highly departed (Condition Class 3) and moderately departed (Condition Class 2⁷) respectively, from the frequency of fire that occurred prior to Euro-American settlement⁸ (Table 7, Map 2). This indicates that multiple fire cycles have been missed in greater than 90% of the SERAL project area.

Table 7: Acres of estimated fire return interval departure by condition class (CC) category.

Fire Return Interval Departure		All Lands	NFS-Lands
Less Frequent (+ CC)	High (CC3)	91,540	71,891
	Moderate (CC2)	15,971	14,413
	Low (CC1)	3,366	3,244
More Frequent (- CC)	High (-CC3)	0	0
	Moderate (-CC2)	76	74
	Low (-CC1)	289	286
No Data or Unburnable Areas (e.g., rock and water)		7,566	4,915
Total		118,808	94,823

Historically, more fires burned more frequently and with less severe effects than current trends. Historic fires regularly consumed surface vegetation and fuels and maintained a diverse range (e.g., spacing, age cohorts, species heterogeneity) of less dense understory and overstory vegetation. Under these historic conditions and fire regimes, fire severities and flame lengths were low.

Fire behavior can be categorized into simple fire types ranging from surface fires to active crown fires, and fire type describes the main layer or strata of fire behavior movement across the vegetation. The goal for most lands is to reduce or maintain vegetation to only support surface fires during most weather scenarios. It is difficult to plan for extreme weather events when wanting to manage the landscape for multiple uses such as reduced fire behavior and wildlife habitat conservation, especially considering the growth rates and interconnectivity of vegetation and fuels in our Sierra Nevada ecosystems. In the Sierra Nevada Range, Collins and Skinner (authors within Long et al. 2014) synthesized recent publications and found that stand-replacing fire was a low proportion component (about 5 to 15 percent) of fire types and

⁷ Positive condition classes (CC) have greater fire return intervals – fires burned less often – than presettlement frequencies, while negative condition classes have experienced more frequent fire than presettlement frequencies.

⁸ To conduct a comparative fire return interval departure (FRID) analysis and quantify the difference between presettlement and current FRI the current existing vegetation types within the SERAL project area were organized into four presettlement fire regime (PFR) groups according to their historical relationships with fire (Van de Water and Safford 2011, Safford and Van de Water 2014). For each PFR group, presettlement and current FRIs were calculated based on Van de Water and Safford 2011. Van de Water and Safford 2011 organized the vegetation types into 28 PFR groups. For SERAL these 28 PFR groups were further clumped.

severity across the landscape, consisting of mostly small patches (less than 10 acres) and a few large patches (about 150 acres).

Nexus (Pyrologix LLC 2021, Scott 1999, USFS Enterprise Program 2021) modeled estimates of fire type for forested vegetation under existing conditions predict that approximately 6% of the forested project area is expected to support active crown fire, and approximately 63% would support passive or conditional crown fire (Table 8, see also glossary for definitions of fire type categories). Passive crown fire is less of a concern than active crown fire but, when other variables are close (such as flame heights and burn probability as outlined below), it is valuable to consider passive crown fire in the context of both severity and its potential to become active crown fire under worse conditions, such as changing climate (Prichard et al. 2021). With the changing climate and associated recent trends in larger and more severe effects from wildfires in western states (Prichard et al. 2021, Mallek et al. 2012, Miller et al. 2009), creating conditions that only favor surface fire across most of the landscape at 90th percentile weather conditions (or more extreme weather if possible) are the desired objectives. Very similar fire types are predicted for current conditions regardless of land ownership or NFS WUI designation, which highlights that wildfire risks are a universal concern for most forest ecosystems in all watersheds of the SERAL project area.

Table 8. Expected fire type.

Expected Fire Type	Percent of All Lands	Percent of NFS-Lands	Percent of NFS-Lands in WUI Defense Zone
Non-burnable or non-forested	12%	10%	9%
Surface	20%	19%	19%
Passive or Conditional Crown	63%	64%	69%
Active Crown	6%	7%	4%

Modeled estimates of expected wildfire burn severity under existing conditions at 90th and 97th percentile weather conditions predict that 55% and 71% (respectively) of the landscape within the project areas (all lands) would burn at high severity (Table 9, Map 3, Drury et al. 2021, Taylor et al. 2021). Burn severity in this context is defined as fire effects primarily to vegetation based on comparing satellite images of live vegetation in the same area (Miller and Thode 2007). High severity is vegetation that has high to complete mortality. Moderate severity is a mixture of effects ranging from unchanged to high severity. While low severity is a small change in vegetation cover and a small amount of mortality of the dominant vegetation (Miller and Thode 2007).

Similarly, the large-fire simulation system, or FSim (Finney et al. 2011), was used to model conditional flame length estimates under existing landscape conditions (given the condition that a wildfire burns the pixel under different simulated wildfire conditions). A pixel is a spatial unit of land, for example one pixel equals a 90 by 90-meter area of land for this FSim model. FSim predicted that greater than 70% of the landscape in the project area (all lands) have flame lengths between 4 to 8 feet or greater than 8 feet (Table 10, Map 4). A correlation exists between flame lengths and wildfire vegetation severity: high severity (stand-replacing) fire is greatest when flame lengths exceed 8 feet, as these flame lengths are commonly associated with tree torching and crown fire initiation (Collins et al. 2013; Stephens et al. 2016).

Table 9. Acres of predicted vegetation burn severities.

Predicted Vegetation Burn Severity	90 th percentile weather		97 th percentile weather	
	Non-NFS lands	NFS Lands	Non-NFS lands	NFS Lands
High	11,361	21,892	16,419	29,956
Moderate	7,194	24,506	2,100	20,658
Low	4,590	46,562	4,627	42,347
Total ⁹	23,984	94,823	23,984	94,823

Table 10. Acres of conditional flame length categories.

Conditional Flame Length	Non-NFS lands	NFS-Lands	All Lands
0	583	595	1,178
Greater than 0 to 4 feet	6,457	23,253	29,710
Greater than 4 feet to 8 feet	8,879	30,869	39,748
Greater than 8 feet	8,066	40,106	48,172
Total	23,984	94,823	118,808

Another good indicator of the health and resilience of forested landscapes is the prediction of crown fires. Crown fires pose increased safety hazards for personnel and risks to ecosystem resiliency because crown fires often have sustained flame lengths above 4 ft (often times higher), move in unexpected, fast patterns that are difficult to control or suppress, and often burn across large landscapes in one burn period (i.e., one day) with limited time for evacuation and contingency planning. Forested landscapes with a lower proportion of areas experiencing active crown fires and higher proportion of surface fires would experience lower severity wildfire effects and related vegetation mortality across the landscape.

FSim was also used to estimate annual burn probability or likelihood across the SERAL area. Annual burn probability is calculated for each pixel on the landscape as the number of iterations that resulted in the pixel burning divided by the total number of iterations (10,000). Burn probability and expected flame lengths vary substantially across the project area (Table 11, Map 5), and the highest ratio of acres in the project area (all lands) have 1 to 5 percent chance of burning annually for the existing conditions.

Table 11. Acres of annual burn probabilities from FSim modeling.

Annual Burn Probability	Non-NFS lands	NFS-Lands	All Lands
0	583	595	1,178
Less than or equal to 1%	1,144	8,491	9,635
Greater than 1% to 2 %	17,761	61,839	79,599
Greater than 2% to 5 %	4,497	23,898	28,395
Total	23,984	94,823	118,808

Collectively, the estimated proportion of the landscape predicted to burn at high severity (Table 9), at greater than 4-foot flame lengths (Table 10), as crown fires (Table 8), and elevated annual burn probabilities (Table 11) quantifies the threat to resources and the health and well-being of surrounding communities. Management actions are urgently needed to change the wildfire risk, also known as the combination of fire hazard and vulnerability of this landscape (USDA 2021(d)). Increased use of prescribed fire supported by the construction and maintenance of a fuelbreak network is key to addressing this urgent need across the landscape.

⁹ Approximately 2,702 acres of the project area were considered non-burnable in this model due to being reservoirs, rock, river, or roads and are not included in this table.

G. *Construct and maintain a network of fuelbreaks to support prescribed fire and wildfire operations.*

The concept behind fuelbreaks is to create a corridor or safer space that facilitates firefighter operations before and during prescribed fire projects or wildfire incidents. Fuelbreaks are generally not designed to stop a high intensity or fast-moving wildfires on their own, but instead, are corridors or landscape features where vegetation and fuels have been altered to reduce fire behavior and to help facilitate safer fire management actions. When fuelbreaks are constructed and maintained in advance of a potential future wildfire, they become high value, proactive, and existing landscape tools or features that are ready to be employed during prescribed and wildfire management operations (Kennedy et al. 2019, Hersey and Barros 2022). Fuelbreaks are designed to break up large expanses of continuous fuels, provide for firefighter access and safety, increase suppression opportunities, and provide pre-existing control points for prescribed fires and wildfires (USDA 2017, p. 37, USDA Forest Service 2020, Thompson et al. 2021). Fuelbreaks provide more effective retardant application areas and prescribed fire or backfire ignition zones. They serve as critical attack locations to anchor and improve containment lines, as well as to modify high-intensity wildfire behaviors.

Fuelbreaks are most effective when they are strategically located to best support fire management actions, and when adjacent to larger vegetation and fuel reduction projects or polygons (as proposed in this SERAL project). Vegetation and fuels in fuelbreaks need to be reduced in advance to increase efficiency and probability of success for prescribed fire and wildfire management operations. Fuelbreaks increase safety for emergency responder access (to any kind of emergency) because these maintained corridors are largely free of hazard trees, have greater tree spacing than surrounding areas, and most understory vegetation is sparse or short (e.g., herbaceous plants), so intense fire behavior is less likely.

Active and effective fuelbreaks contain a vegetative arrangement that supports reduced wildfire intensity as it burns as a surface fire with low flame lengths across the fuelbreak. This vegetative arrangement retains the dominant tree or shrub canopies to create shaded conditions. The goal is to create shaded fuelbreaks, and the shaded part is key to limit rapid herb and shrub growth; the shade lowers temperatures and increases humidity levels underneath the dominant vegetation. The remaining trees create wind resistance, that when coupled with lower temperatures and higher humidity all can reduce fire behavior compared to wide open sunny spaces with no wind barriers. This vegetative arrangement includes the removal of ladder fuels so fire cannot easily spread to tree or shrub canopies, and where the contiguous vertical and horizontal understory, dead and downed, and canopy fuel arrangement is interrupted. This general arrangement retains species diversity of individual younger, middle aged and older plants, which allows the opportunity for an uneven aged vegetative type, without compromising fire behavior or safety objectives.

Currently, an important strategic need for additional fuelbreaks exists across the project area, and several existing fuelbreaks have critical improvement and maintenance needs. For example, some fuelbreaks are in an unmaintained, overgrown status and need treatment to restore functionality. To create shaded fuelbreak conditions in areas dominated by oaks and shrubs, understory vegetation needs to be reduced and includes pruning of lower branches while retaining some larger, taller shrubs and overstory trees (if any present, or younger trees if that is all that is present) to slowly facilitate the development of shaded understory conditions.

H. *Salvage Drought, Insect, Disease, and Wildfire Disturbed Areas for NRV-based restoration and conservation benefits*

There is a reasonable likelihood that insect-, disease-, drought-, or wildfire-related mortality will occur within the project area after the decision before the full suite of restoration proposed actions are implemented because of the current susceptibility to natural disturbances.

When disturbances like drought, fire and insect or disease outbreaks occur a common outcome is an accumulation and eventual overabundance of fuels: coarse woody debris, snags, litter, and duff. These fuels collectively heighten the landscape's risk to experience high severity wildfire. In these instances, management activities to reduce the fuels may be necessary to restore resilient condition. Prior to the 20th century, regular patterns of fire created a mosaic of vegetation patterns including varying degrees of canopy cover and forest openings at densities far less susceptible to insect-, disease-, or drought mortality. Now, when insect- or disease-outbreaks or lengthy droughts occur widespread mortality is common. Our intent is that the other SERAL proposed actions will create a resilient landscape before much additional insect-, disease-, or drought-related mortality occurs. However, until SERAL treatments are fully implemented, the ability to respond to large scale mortality events would eliminate a degree of accumulated fuels and reduce the risk of further exacerbating wildfire risk on the landscape. Because the value of dead trees declines rapidly, especially that of insect-killed pines, the proposed salvage would allow for economic recovery of material to facilitate fuel reduction. A delayed response to the mortality creates the need for more costly, and more dangerous treatments as the trees weaken.

Generally, NRV can inform the salvage needs in response to both fire- and insect-related mortality. Historically, fire effects that mimic NRV would have produced a mosaic of patches burned at low (30 to 60 percent) and moderate (15 to 35 percent) severities interspersed with large, unburned patches (10 to 30 percent) and small, high severity patches (1 to 10 percent) (USDA 2019). High severity burns are most likely to result in tree mortality. Where that occurs in excess of 10 percent of the landscape, there would be an NRV-based restoration need to salvage.

Similarly, insect and disease outbreaks that mimic NRV would have produced patches of beetle- or disease-killed trees between 0.25 and 10-acres over up to 15 percent of the landscape (Fettig 2012 *in* USDA 2019). When insect or disease cause mortality in excess of this condition, there would be an NRV-based restoration need to salvage.

1.02 Provide Economic Opportunities to Local Communities

The surrounding communities near the project area have social and economic ties to National Forest System lands. Management decisions made by the Forest Service can often impact the economies of smaller, natural resource-based communities nearby. Economic effects can include changes in local employment and income, as well as changes in local services and community infrastructure. Businesses in small rural towns often rely on tourism and wood product revenue throughout the year, so maintaining safe and consistent access to National Forest System lands for recreation and industry uses (timber and concessionaire businesses operated on or nearby NFS lands) contribute to resilient communities.

Forest products resulting from restoration and management activities on National Forest System lands contribute to the local economy and to the sustainability of the local forest products industry. In addition to two lumber mills (Sierra Pacific Industries' Standard Mill and Chinese Camp), and Pacific Ultrapower Chinese Station biomass power plant, new markets and associated facilities have become or are in the process of becoming established in the area due to the proximity of potentially available material, coupled with the need to remove this material from National Forests and the surrounding communities. These industries provide jobs and contribute to the cashflow into the economy but are heavily dependent of the availability of forest products to keep their businesses running. Improved recreation opportunities and conservation and restoration of terrestrial habitats also sustain livelihoods and provide economic benefits to businesses and industries supporting recreation, hunting, fishing and other such uses on and nearby public lands.

Additionally, the National Forest's ability to efficiently perform mechanical thinning and fuel reduction treatments is often dependent on a viable, local forest products industry, which in turn is dependent on a reliable and predictable flow of wood products. Implementation of the actions proposed in this project will provide jobs, and the benefits to those workers contributes to social resilience.

1.03 Maintain Safe Access to Public Lands

Long-term closures, or limits to public access due to tree mortality, active wildfires, or unsafe post-fire conditions on the Stanislaus National Forest in recent years have closed or reduced tourist traffic for several months to popular destinations. These impacts weigh heavily on local business owners, make operating seasonal businesses in small towns more difficult, and have led directly to business closures. When trees pose a hazard, abatement is needed to maintain safe access and sustain multiple uses of National Forest System lands to best meet the needs of the American people (Public Law 86–517; Approved June 12, 1960).

Maintenance and/or reconstruction of National Forest System (NFS) Roads is needed to provide safe access to public lands. When roads are not properly maintained they hamper firefighter response times to wildfires, prevent efficient access to treatment units, can result in the complete dropping of treatment units, and may pose a safety risk to anyone driving them due to ruts, washouts, or lack of places to safely turn around. Maintaining or reconstructing roads with proper drainage features can minimize these hazards and allow for safe access to public lands.

1.04 Reduce the Spread of Invasive Non-Native Weeds

Invasive plants are species that are non-native, whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). The Stanislaus National Forest Land and Resource Management Plan incorporates the Forest Service Manual 2900 Invasive Species Management Goals and Strategies, stating, ... the overriding objective for managing invasive plants is to manage them using an integrated pest management approach prioritizing response actions as deemed necessary by the Forest within the following strategic objectives: 1) prevention, 2) early detection rapid response; 3) control and management; 4) restoration; and 5) organizational collaboration (USDA 2017). There are known infestations of invasive plants within the SERAL project area, and a likely risk of the establishment of new infestations if left uncontrolled. Annual rates of spread vary from 10 to 24 percent for many invasive plant species in the western United States (Asher and Dewy 2005). Since non-native plants have proliferate seeding rates that quickly colonize disturbed settings, major travel routes pose a risk for high rates of weed spread into areas where vegetation is being treated to reduce the risk of wildfire or to provide conditions supporting more natural fire regimes. Coordinating an invasive plant eradication and management plan to enable proactive response and treatment of weeds is needed to reduce the risk of spread from roadsides and into natural forest settings. Timely treatment of known infestations as well as small, newly discovered infestations before they have a chance to spread, is critical to maintaining an effective invasive plants control program. This approach is referred to as Early Detection Rapid Response. Once weeds establish in the natural setting, the costs and potential damages increase because weeds affect the natural successional response to disturbance and create large, infested areas too difficult to eradicate with existing control measures.

2. THE ALTERNATIVES

2.01 Alternatives Considered in Detail

A. *Alternative 1 (Preferred Alternative)*

i. Landscape Resilience Treatments

Forest Thinning (30,498 acres, Map 6¹⁰)

Forest thinning treatments are primarily located in dense conifer stands, where average diameters are greater than 6 inches and canopy covers are greater than 40% (WHR size and density classes 3, 4, and 5—M or D¹¹), with forest structure and densities at risk to high levels of bark beetle-caused tree mortality and also have a high likelihood of experiencing stand-replacing wildfire.

Forest thinning objectives will be achieved by either timber harvest operations (i.e., ground based or aerial yarding) or other mechanical methods such as mastication and machine piling and burning, or hand thinning. Timber harvest operations would typically be conducted using conventional logging equipment (including, but not limited to, feller bunchers and rubber-tired skidders) on slopes generally less than 35 percent. Use of ground-based mechanized equipment on slopes greater than 35 percent would require special precautions, such as the use of low ground pressure tracked equipment or tethered operations, to meet soil quality standards and to control erosion (See Chapter 2.03-E for more detail). Aerial-based treatment methods may also be used on slopes that exceed 35 percent, in which trees would be removed utilizing a skyline or yoader (i.e., a yarder and loader tool combined) or helicopter system. Where timber harvest operations are implemented, sawlogs, and biomass to the greatest extent possible, will be removed. In other areas treated predominantly by mastication or machine piling and burning, material will remain on site as mulch, in piles for burning, or made accessible for firewood. Once forest thinning is completed, follow-up prescribed fire is proposed to achieve and maintain desired conditions.

Timber harvest operations which remove biomass and sawlogs typically require a minimum product in order to mobilize equipment, operators, and staff to implement the treatment. Currently, volumes averaging greater than 7 CCF per acre best represent the common minimum product needed to ensure implementation of forest thinning requiring biomass and sawlog removal, occurs. To assess the area of proposed forest thinning that contains sufficient product to support a timber harvest operation, post-treatment estimates of combined total sawlog and biomass volumes were identified based on F3 derived data (Hogland and Anderson 2014, Huang et. al 2018,). Areas estimated to contain a combined total sawlog and biomass volume averaging greater than 7CCF per acre represent the areas where timber harvest operations are the likely implementation mechanism (26,728 acres, “Forest Thinning Timber Harvest” - Map 6). Additional forest thinning acres containing lower than 7 CCF average volumes per acre – due primarily to lower DBH limits – such as within CSO PACs, located directly adjacent to higher volume areas were also included in the acres presented as “Forest Thinning Timber Harvest” in Map 6. Due to their close proximity to other higher volume areas, it is reasonable to include these areas as part of a timber harvest contract without impacting the average volume per acre too greatly or implementation feasibility.

¹⁰ Map 6 identifies areas for treatment by primary treatment type. Implementation units may vary due to operability or other on-the-ground conditions which may differ from modeled outputs; however, acreage treated within each treatment type and SERAL stage proportions will not be exceeded.

¹¹ Appendix A, Table A.1 describes the size and density classes in more detail.

The remainder of the proposed forest thinning acres (3,770 acres, “Forest Thinning Other Mechanical” - Map 6) represent the areas that contain estimates of combined sawlog and biomass volumes averaging less than 7CCF per acre. Due to low volume estimates and separation from higher volume areas, the likely implementation mechanism in these areas would be limited to mastication or machine piling and burning. If the volume estimates for these 3,770 acres are proven low or it is determined some of these areas could be incorporated into a timber harvest operation, skidding and/or product removal may occur.

Forest thinning treatments are restricted by a suite of DBH limitations which vary according to certain land allocations, tree species, proximity to rust resistant sugar pines and live aspen stands, or whether occurring within a meadow (Table 12). Another important constraint included in Alternative 1 requires that mechanical treatments within CSO PACs do not exceed 100 acres and do not reduce habitat quality in the highest quality habitat. The 100-acre mechanical treatment limitation is not specific to forest thinning but the forest thinning contributes to the total acres mechanically treated —forest thinning plus any other mechanical fuel reduction treatment may not exceed 100 acres. To ensure mechanical thinning in CSO PACs does not exceed 100 acres, an additional pre-implementation PAC treatment area evaluation must occur as described in Chapter 2.03 F3 and Appendix F. To ensure that the landscape resilience forest thinning treatments within CSO PACs can occur, while at the same time ensuring that the existing CWHR classifications of the highest-quality nesting and roosting habitat are not lowered, silviculture prescriptions will be modified when necessary. Necessity may be determined based on modeled post-treatment CWHR classifications. Where CWHR classifications in the highest-quality CSO habitat are projected to be lowered, one potential modification would be to increase the canopy cover retention minimum threshold for those areas. Modeled estimates for the currently mapped PACs and proposed treatment in PACs indicate a shift from 5D to 5M on approximately 318 acres associated with 16 different CSO PACs. Based on the modeled PAC prescription which applied the 20” DBH limit and a 50% canopy cover retention, we know the shift from 5D to 5M is occurring over these 318 acres because the canopy cover is dropping below the 5D threshold of 60% (but is being retained above 50%). Ensuring that 5D is not lowered into a 5M classification, in this circumstance, for example, is easily remedied by applying a higher canopy cover minimum threshold (e.g., 60%). Because some additional CSO PAC remapping is expected to occur as updated survey information becomes available prior to implementation, the requirement to evaluate post-treatment estimated CWHR classifications and to modify silviculture prescriptions to ensure the CWHR classifications are maintained in the highest-quality habitat has been added to the CSO pre-implementation process described in FEIS Appendix F.

Table 12. Alternative 1 forest thinning DBH limits.

Land Allocation	Tree Type	DBH Limit
California Spotted Owl PAC	All Trees	20”
California Spotted Owl Territory	Shade-Intolerant ¹²	24”
	Shade-Tolerant ¹³	30”
Outside of California Spotted Owl PACs, Territory	Shade-Intolerant	30”
	Shade-Tolerant	34” ¹⁴
Within 66 feet of Rust Resistant Sugar Pine ¹⁵	All Conifers	40”
Within 66 feet of Live Aspen Stand ¹⁵	All Conifers	40”
Within a Meadow ^{15,16}	All Conifers	40”

Forest thinning treatments will reduce stand densities and promote heterogeneity both within individual stands and among stands on the landscape by creating a mosaic of individual trees, clumps of trees, and

¹² Pines

¹³ Firs, cedars;

¹⁴ Where at least one 30-inch DBH shade-intolerant tree is left within one tree height of tree removed

¹⁵ These exemptions may not be applied within California Spotted Owl PACs, Territories.

openings of various sizes. Residual stand density will be determined based on a combination of an individual unit's land allocation (i.e. PAC, Territory, General Forest, Fuelbreak), slope position (i.e. ridgetop, mid-slope, or drainage) as well as the existing condition (forest type, current density, forest health issues, etc.), and in accordance with the diameter limits in Table 12. Stand densities will be reduced to minimize the risk of drought- and insect-related mortality, as appropriate for a given forest type, while retaining large trees and snags. Fire-resistant and shade-intolerant species (ponderosa pine, Jeffrey pine, sugar pine, black oak) will be favored for retention, while shade-tolerant species (primarily white fir and incense cedar) will be favored for removal. Surface and ladder fuels will be reduced to meet fuels objectives. Hardwoods (e.g., oaks, aspens, maples) would be retained unless removal is necessary to facilitate treatment efficacy and/or safety.

Multiple publications on forest restoration emphasize “the importance of managing for wide and flexible ranges of variation at multiple scales rather than managing for one specific condition at any one scale” (Jeronimo et al., 2019; Larson and Churchill, 2012; Hessburg et al., 2015; Collins et al., 2016). Because one of the overarching goals of the SERAL project is to restore heterogeneity at multiple scales (from individual stands up to the landscape), stand-level averages—such as thinning-from-below to 40% or 50% canopy cover in every treated stand—are not ideal drivers of prescriptions, as strict application of narrow targets tends to result in homogenous conditions. As discussed in North et al. (2009): “Average’ stand conditions were rare in active-fire forests because the interaction of fuels and stochastic fire behavior produced highly heterogeneous forest conditions. Creating “average” stand characteristics replicated hundreds of times over a watershed will not produce a resilient forest, nor one that provides for biodiversity. Managers could strive to produce different forest conditions and use topography as a guide for varying treatments.”

Post-treatment density targets should be highly variable within treated units (Table 13), though in order to compare alternatives, general prescriptions (which varied by Alternative, land allocation, and forest type) were simulated across conifer forests proposed for treatment in the SERAL project area (Appendix E, Table 1). Treatments will create more open canopy conditions (single trees, small clumps) on upper slope positions and south-facing aspects, while denser canopy conditions (larger groups of trees) will be retained on lower slope positions (drainages) and on north-facing aspects (Table 14), as described by North et al. (2009).

Table 13: Desired structure within forested stands based on NRV.

Forest Type	Tree Basal Area (square feet per acre)	Tree Canopy Cover (percent overhead canopy)
Yellow Pine / Dry Mixed Conifer	20-200 (mostly less than 150)	10-50 (may exceed 50 in small patches)
Fir / Moist Mixed Conifer	50-300 (mostly less than 200)	20-75 (may exceed 75 in small patches)

Table 14. Approximate Stand Density Index (SDI) range by forest type and topographic position under Alternative 1.

Forest Type	Ridge SDI Range	Mid-Slope SDI Range	Drainage SDI Range
Pine	50-100	75-125	100-150
Dry-Mixed Conifer	100-150	125-175	150-200
Wet-Mixed Conifer	150-200	175-225	200-250

Openings will be located, where possible, adjacent to healthy, mature conifers and oaks to promote regeneration and to limit water and soil competition with immature trees nearby the crown of the mature trees (Hood et al. 2017).

During forest thinning harvest operations, encroaching conifers and shrubs may be removed from meadows or aspen stands where large numbers of conifers have not historically occurred. The objective is to reestablish the historic meadow edge and enhance meadow function, or to promote and/or stimulate aspen growth. All conifers up to 40 inches DBH growing within a meadow¹⁶ or within 66 feet of a live aspen stand may be marked and removed. Falling may be done manually or mechanically, and felled material may be removed or piled for later burning. Mechanical harvesters must remain 15 feet outside of meadow and reach in to fall or remove encroaching conifers. All encroaching conifers outside of reach of mechanical harvesters may be manually felled and left onsite where there are no fuels or other resource concerns.

A registered borate compound may be applied to freshly cut stumps to limit the spread of annosus root disease and to reduce the risk of new infection centers from developing. Borate stump treatments would follow regional guidance from Forest Health Protection, as summarized in the table ‘Priorities for borate stump treatments to prevent Heterobasidion Root Disease.’ Application of borate compound will also follow all state and federal rules and regulations as they apply to pesticides, including the label requirement.

If insect-, disease-, or drought-induced tree mortality occurs prior to implementation – forest thinning treatment modifications may be necessary (Table 14). When mortality occurs in small, isolated patches, with minimal impact to the existing forest canopy, the dead trees may be salvaged to create desired openings in the forest (Scenario 1 and Scenario 2). When mortality is widespread, treatments and constraints would convert to those proposed in section Salvage for NRV-based Restoration and Conservation Benefits.

Table 15. Potential forest thinning modifications when faced with insect-, disease-, or drought-mortality.

Scenario	Live Tree Thinning	Salvage (Dead / Dying Tree cutting and removal)
1: Mortality present but removal of dead trees will meet opening objectives	Implement variable density thinning without modification. Targeted thinning on live trees	Remove dead, salvageable trees to reduce fuel loading, meet individual tree, clumpiness, and opening objectives, and recover the economic value.
2: Moderate mortality present which has measurably reduced the proportion of live trees.	Implement a modified, more selective version of the forest thinning prescription. Both live and dead trees could be cut and removed, but the D x D would require the rate of live tree cutting and removal to be reduced in comparison to scenario 1.	Remove dead, salvageable trees to reduce fuel loading, meet individual tree, clumpiness, and opening objectives, and recover economic value.
3: Widespread, high mortality present and dead trees dominate the landscape. Forest thinning objectives can no longer be met.	None	See section Salvage for NRV-based Restoration and Conservation Benefits proposal below.

Mechanical Fuel Reduction (7,437 acres, Map 6)

Mechanical fuel reduction treatments are located within forested stands composed of small conifers with average diameters less than 6 inches DBH (WHR 1 and 2 in all densities), conifers with average diameter greater than 6 inches and canopy cover less than 40% (WHR 3-4-5, in densities S & P —sparse and open), or oaks, shrubs, or other herbaceous vegetation types occurring where average slopes are less than

¹⁶ There are at least 28 meadows located on FS lands within the forest thinning treatment areas totaling 35.9 acres.

35% either within the WUI defense zone or within 250 feet of a Level 2/3/4/5 road. Treatments will consist of mastication or machine piling and burning (Map 6). Prescribed fire would also be applied in these areas as a follow-up treatment to achieve and maintain desired conditions.

As presented in the forest thinning section, Alternative 1 does not allow more than 100 acres of mechanical treatments within any CSO PACs. This restriction is not specific to mechanical fuel reduction treatments. The total mechanical fuel reduction plus any forest thinning may not exceed 100 acres. To ensure mechanical thinning in CSO PACs does not exceed 100 acres, an additional pre-implementation PAC treatment area evaluation must occur as described in Chapter 2.03 F3 and in Appendix F.

Fuelbreaks (13,430 acres, Map 6)

Shaded fuelbreaks will be strategically located along strategic ridges and roads, adjacent to critical infrastructure (such as along power lines and water delivery systems such as the Tuolumne Main Canal's ditch and flume system), ownership boundaries, administrative sites, and recreation sites. The objective is to provide safe and effective locations to facilitate wildfire management strategies (e.g., emergency incident management actions) including fire containment and protection of values at risk, as well as facilitate increased use of prescribed fires. Some fuelbreak locations were developed via past wildfire planning and project implementation efforts (such as prescribed burns and wildfires), and additional ones were created or refined as part of the Forest's Wildfire Risk Assessment and Potential wildfire Operational Delineation (PODs) process (USDA Forest Service 2020, Dunn et al. 2020). When evaluating initial or maintenance treatment needs or timing, effective fuelbreaks are based on safe human conditions in terms of reduced amounts of live and dead surface and understory vegetation. These include increased fire vehicle maneuvering and parking; increased visibility during travel along roads to ease navigation and fire lookout observations; increased ability for firefighter movement across the landscape (e.g., limited amounts of: dead shrubs, large expanses of shrubs that are difficult to walk through, dead or hazardous trees, and large, numerous logs or piles of dead and down material); and reduced fire ember production and reception (e.g., reduce fire's ability to spread into and from tree crowns where embers are lofted, and reduce dead and downed woody fuel where embers can establish).

Fuelbreaks will be constructed to widths generally between 250 feet (e.g., along ownership boundaries adjacent to administration sites, recreation sites, infrastructure, and other buildings) to 500 feet wide (e.g., 250 feet from either side of strategic ridgelines, roads, powerlines, or water flumes). The 13,430-acre network of proposed fuelbreaks will require both new construction and maintenance (12,006 acres) or just maintenance for previously constructed fuelbreaks (1,427 acres). The construction and maintenance of the fuelbreak network will require a combination of treatments, including forest thinning (via traditional harvesting operations or other mechanical means), mechanical fuel reduction, and prescribed fire as described in Forest thinning, Mechanical Fuel Reduction, and Prescribed Fire sections. A breakdown of those treatment types and distribution are presented in Table 16.

Table 16: Summary of acres of proposed fuelbreak treatments.

Treatment Type	Where?	New Construction	Maintenance	Total Acres
Forest Thinning: Timber Harvest and Biomass Removal	In dense conifer stands where average diameters are greater than 6 inches and canopy covers are greater than 40% (CWHR 3, 4, 5) and are estimated to contain a combined total sawlog and biomass volume averaging greater than 7CCF per acre	6,022	751	6,773

Treatment Type	Where?	New Construction	Maintenance	Total Acres
Forest Thinning: Mastication or Machine Pile and Burning	In dense conifer stands where average diameters are greater than 6 inches and canopy covers are greater than 40% (CWHR 3, 4, 5) but contain an estimated combined total sawlog and biomass volume averaging less than 7CC per acre.	701	16	717
Mechanical Fuel Reduction: Mastication or Machine Pile and Burning	Forested stands composed of small conifers with average diameters less than 6 inches DBH (WHR 1 and 2 in all densities), conifers with average diameter greater than 6 inches and canopy cover less than 40% (WHR 3-4-5, in densities S & P —sparse and open), or oaks, shrubs, or other herbaceous vegetation types occurring where average slopes are less than 35%	4,348	660	5,007
Hand Thinning	Areas too steep or remote to access with mechanical means	933	0	933
Total		12,003	1,427	13,430

Fuelbreak treatment specifications and intensity are allocated into two zones: inner core and outer core (Table 17 and Figure 3). *Inner core* treatments are located within 150 feet of the centerline of a fuelbreak delineated along a ridgeline, powerline, or flume or bordering property or infrastructure. The remainder of the fuelbreak widths make up the *Outer Core* treatment areas. The two-zone approach allows the full desired width of a fuelbreak to be implemented while ensuring the habitat needs of other resources are met within close proximity without impacting the effectiveness of a fuelbreak as a two-zoned treatment area.

The retention of overstory trees, and some understory trees especially if no overstory trees exist at the time of first treatment, is key to creating shaded conditions that suppress understory vegetation re/growth. The objective of all vegetation conditions in shaded fuelbreaks is to create and maintain areas resistant to fire spread, both vertically and horizontally. Effective fuelbreaks divide up potential fire spread into discontinuous patches of surface fires (e.g., no fire spread to tree crowns) and facilitate safer work conditions for firefighters. Spacing for residual trees would vary depending on the level of stand mortality and healthy trees at implementation times. Where fuelbreaks occur in non-conifer dominated vegetation types, the desired conditions for understory vegetation and hardwood species described in Table 17 would generally be the same as they are in conifer-dominated fuelbreaks. Once fully implemented, fuelbreaks in conifer forests and oak woodland areas will look similar to the examples displayed in Figure 4 and Figure 5.

Fuelbreak treatment specifications (Table 17) include that any retained vegetation may be pruned up to half the height of trees or shrubs to achieve adequate height to live crown ratio to reduce the ladder fuel potential or fire spread during the next wildfire. In all fuelbreaks with overstory trees, some understory vegetation retention or growth is desired after treatment activities. Understory vegetation should be maintained in vertically and horizontally discontinuous clumps of grass/herb/shrub layers of multiple age classes. In order to create shaded fuelbreak conditions in areas dominated by oaks, shrubs, or areas with wide tree spacing, understory vegetation needs to be reduced to clumpy pattern and includes pruning of lower branches while retaining some larger, taller shrubs and overstory trees (if any present, or younger trees if that is all that is present) to slowly facilitate the development of shaded understory conditions. One example of the desired condition for a shrub-dominated fuelbreak is the largest, healthiest individual manzanita stems (e.g., larger than 6 inches at the base) would be retained, while smaller stems and other

vegetation underneath and between the driplines of the retained manzanitas would be removed. In the Inner Core, clumps of retained vegetation would be fewer and more widely spaced, with number and size of clumps increasing slightly in the Outer Core to blend in with the landscape adjacent to the fuelbreak.

Table 17: Fuelbreak treatment specifications.

Desired Condition	Inner Core	Outer Core
Average Crown Spacing for Dominant and Codominant Crown Classes	½ to 1 ½ crown width	½ to 1 crown width
Standing Dead Trees (i.e., snags)	All snags may be removed for hazard abatement or to meet fire and fuelbreak objectives.	Retain 2 of the largest snags per acre except as needed for hazard abatement.
Dead and Down Logs	All dead and down logs may be removed to meet fire and fuelbreaks objectives.	Retain 2 of the largest logs per acre where available (a log is defined as 20 inches in diameter at midpoint and 20 feet long at minimum). All additional dead and down material may be removed, burned, or piled and burned.
Understory Vegetation (e.g., shrubs)	Spatially connected or continuous vegetation under 10 inches DBH or 12 feet tall should be broken up into naturally appearing clumps in varied size and shape. Clump separation should reduce horizontal and vertical fuel continuity to limit vegetation's ability to perform as a fire ladder into the existing overstory.	Same as Inner Core.
Shrub-dominated areas (lacking oak and conifer overstory)	Retain some large, dominant live shrub stems where they exist to create isolated clumps of the largest, or healthiest vegetation (e.g., retain manzanita greater than 6-inches at the base, and remove smaller stems and vegetation over 1 foot in height between clumps).	Similar as Inner Core, but size and number of retained clumps of vegetation should increase to slowly transition into shrub-dominated area adjacent to the fuelbreak. Avoid mechanically created straight lines of changed vegetation.
Suppressed and Intermediate Crown Class Conifer Tree Removal	All suppressed and intermediate conifers (except for healthy sugar pines) may be removed or masticated.	Same as Inner Core.
Hazard Trees	Remove all.	Same as inner core.
Live Tree Removal DBH Limit	Except where necessary for equipment operability or to abate a safety hazard: Retain all trees greater than 30-inch DBH outside of CSO PACs. Retain all trees greater than 20-inch DBH in CSO PACs.	Same as inner core.
Oak and other Hardwood Tree Retention	Retain all hardwoods with a DBH of 12 inches or greater unless tree poses a threat to human life or property, or if removal is needed to maintain and enhance a hardwood stand. Retain all live blue oak and valley oak trees except where needed for safety. Where possible, create openings around retained oaks to stimulate natural regeneration (USDA Forest Service 2017 S & G 21 & 23).	Same as inner core
Sugar Pine Retention	Retain all healthy sugar pine.	Same as inner core
Small tree (3 inches to 10 inches DBH) spacing	Create up to 25 feet spacing of small trees in open areas where large trees are sparse.	Same as inner core

Desired Condition	Inner Core	Outer Core
Slash and other debris	All slash and other woody debris will be disposed of by piling and burning or removal.	Same as inner core.

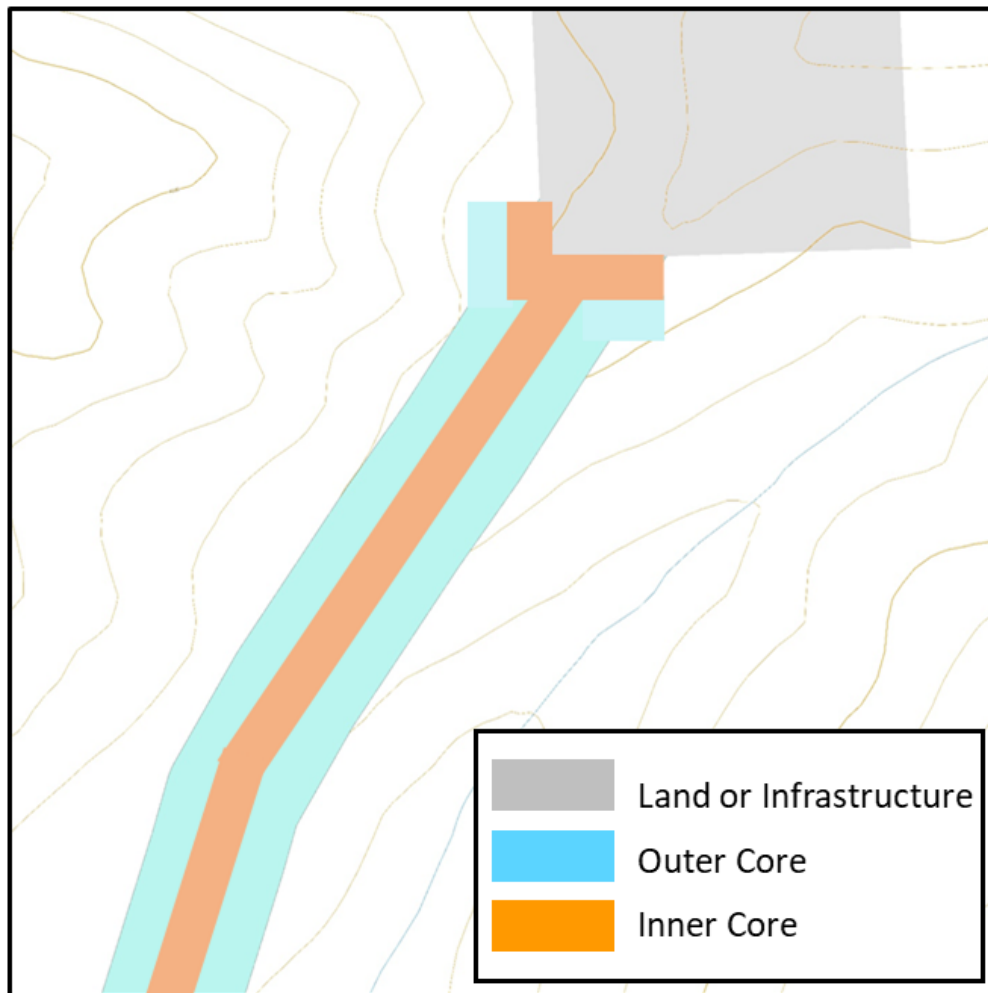


Figure 3: Schematic displaying the inner-core and outer-core fuelbreak zones.



Figure 4. Example of a shaded fuelbreak in a conifer forest (left) and young oak woodland (right).



Figure 5. Example fuelbreak conditions before (left) and after mastication (right; before understory has regrown)

Fuelbreaks overlapping CSO PAC and Territories:

As proposed project specific forest plan amendment SPEC-CSO-GDL-03 states, “To limit fragmentation and maintain connectivity of nesting, roosting, and foraging habitat, construction of fuelbreaks should avoid intersecting with California spotted owl protected activity centers. Where avoiding overlap with a protected activity center is not feasible, the PAC should be remapped to maintain acreage equivalent to the quantity of the treated PAC acres using adjacent acres of comparable quality wherever possible.”

At the time the DEIS was published there were 2,091 acres of CSO PACs that overlapped with the proposed fuelbreak network. Per guideline SPEC-CSO-GDL-03, the Forest’s intent was to remap the 2,091 acres of CSO PACs prior to implementation to avoid the proposed fuelbreaks. The decision to delay the remapping effort was intentional. The Forest wanted to apply updated survey information to the remapping effort, and the first cycle of current raptor surveys were conducted between March 2021 and October 2021. Although the surveys were completed prior to release of the DEIS, we are following the preferred two-year protocol before surveys are considered complete.

Since the DEIS, remapping has begun. Thus far, the remapping effort has been completed for all fuelbreaks located within or along the boundaries of priority PODS 1 and 2. The remainder of the remapping needs will be finalized prior to implementation after surveys are completed to protocol.

Separate Decision Consideration

Due to the imminent threat of wildfire across the landscape and the critical role that fuelbreaks play in both prescribed fire and unplanned wildfire response operations there is an urgent need to construct and maintain the proposed fuelbreak network as soon as possible. In response to this urgent need and best prepare the landscape for both prescribed fire and unplanned wildfire response, the Responsible Official will develop multiple Decisions. The first Decision (“Decision 1”) would authorize mechanical fuel reduction treatments within fuelbreaks located within the five highest priority Potential wildfire Operational Delineation units (PODs, Dunn et. al 2020; Map 7). PODs were assigned priorities based on the mission-oriented expected net value change metric (“DEIS Appendix E” – standalone document available on project website) created as part of a quantitative wildfire risk assessment (USDA Forest Service 2020, Dunn et. al 2020). Fuelbreaks occurring within or along the border of the top five priority PODs total 6,153 acres (Map 8). Mechanical fuel reduction treatments would be limited to mastication, biomass removal, or machine piling for burning. No harvest operations or timber removal would be authorized by Decision 1. The mechanical fuel reduction treatment needs account for a portion of the treatments needed to construct or maintain the entire fuelbreak network presented in Table 16, not in addition to. Separating this subset of actions into a standalone decision will allow expeditious implementation of the least controversial treatments in critical fuelbreaks, utilize available resources and funding, as well as provide jobs and income to the local community. All required surveys have already been completed and the work will be awarded and funded through the Tuolumne County Master Stewardship Agreement as soon as the treatments are authorized. The remainder of the proposed treatments not included in Decision 1 will be addressed in two additional separate Decisions (Draft ROD 2 and Draft ROD 3).

No specific written comments or concerns were received pertaining to authorizing the mechanical fuel reduction treatments in the five priority PODs, therefore these particular actions are not subject to objection. This is because issues raised in objections must be based on previously submitted specific written comments. Therefore, Decision 1 may be signed without being subject to the objection process. Decision 1 is however subject to the waiting period of 30-days after the NOA of the Final Environmental Impact Statement is published in the Federal Register. After 30-days, Decision 1 may be signed, and implementation of the authorized mechanical fuel reduction treatments could begin immediately. The remainder of the actions proposed in the FEIS, the analysis, and Draft Decisions 2 and 3 are subject to the administrative review process (36 CFR 218) and must be completed prior to finalizing Decision 2 and Decision 3.

Prescribed Fire (Map 9)

Prescribed fire will generally be conducted in operational units. The overall objective is to apply prescribed fire across all the vegetated parts of the landscape, regularly. It will take time to prepare the landscape conditions to safely apply regular, large-scale prescribed fire to reach desired objectives. To move toward that end goal, 43,859 acres of prescribed fire operational burn units have been initially delineated (“Operational Burn Units”, Map 9). These units represent areas on the landscape that are located where prescribed fire is expected to be most effective, needed, and/or feasible to implement. Collectively, these proposed operational burn units, forest thinning, mechanical fuel reduction, and fuelbreaks will provide the necessary framework to then apply fire to the landscape regularly to maintain low levels of accumulated fuels and to meet ecosystem management objectives (USDA Forest Service 2017 S & G 4A & 4B).

Where prescribed fire is applied, accumulated understory and surface fuels will be burned via broadcast, understory, jackpot, or piling and burning techniques. Yearly treated acres will vary depending on fire program staffing, budgets, weather conditions and air quality. Implementation of other proposed vegetation management actions (e.g., forest thinning and mechanical fuel reduction treatments) located

within operational burn units are often completed prior to applying prescribed fire. In these areas, the prescribed fire would often occur as a follow-up treatment (“Follow-up Burning” – Map 9). In the remainder of the operational burn unit, prescribed fire is the only proposed treatment (19,763 acres, “Prescribed Fire Only” – Map 9).

Fire control lines may be constructed wherever necessary to keep prescribed burns from spreading outside of treatment areas and for unit segmentation to facilitate sequenced burning of larger units. Fire control lines may consist of natural barriers of unburnable materials (e.g., rocky areas, rivers, or meadows), and existing management barriers like fuelbreaks (see Fuelbreaks section above), trails, and roads. Prescribed fire preparation may include falling trees for efficient burn tactics and firefighter safety and include the use of utility task vehicles, heavy equipment (e.g., dozers or excavators), chainsaws, hand tools, and past wildfire containment and contingency lines. Where new temporary control lines are constructed, they will be rehabilitated after use.

Air quality and Smoke Emissions

Prescribed burning will be conducted under the control of the Tuolumne County Air Pollution Control District (APCD). The APCD regulates smoke emissions to prevent exceedances of the air quality health standards in populated areas and in the context of regional smoke dispersion. The APCD designates burn day authorizations based on the capacity of the atmosphere to adequately disperse smoke away from smoke sensitive areas or in levels that do not cause exceedances. The 1990 Clean Air Act (see Section 6.15) amendments and the 1998 EPA Interim Policy on Wildland and Prescribed Fire form the federal requirements and guidance behind the California smoke management program. Authorizations are considered within a cumulative potential for the air basin by regulatory review of a unified reporting system, the Prescribed Fire Information Reporting System (PFIRS, [url https://ssl.arb.ca.gov/pfirs/index.php](https://ssl.arb.ca.gov/pfirs/index.php)), under regional coordination by California Air Resources Board.

Stanislaus N.F. burn bosses (e.g., each prescribed burn unit operational leader) works with national, state, and regional level smoke coordination through participation in daily conference calls and PFIRS, before, during, and after smoke events (e.g., unplanned wildfires or prescribed burns). Coordination includes approximate fuel loading (or emissions) estimates, acres to be burned each day, and smoke dispersion planning, such as avoiding negative visibility impacts to Class I airsheds (designated wilderness areas and Yosemite National Park), as well as emissions into local community centers. The objective of this system is to facilitate fuel treatments and minimize smoke exposures to the public. See section 2.03 (Management Requirements) for more steps to limit negative effects of prescribed fire and vehicle emissions. Additionally, public notification of prescribed burns will occur via email lists, Stanislaus NF website, and social media posts (which includes information to our local media outlets). People can request to be added to the email list; and people near prescribed burn units (or with limited electronic media access) can request to be on a phone call list. Nuisance smoke complaints would be tracked and mitigated by Forest staff through public outreach and in coordination with the APCD.

The Forest Service utilizes Best Available Control Measures (BACMs) and Best Smoke Management Practices to reduce particulate emissions. BACMs are a combination of practices intended to reduce emissions to the lowest practicable amount. BACMs are accomplished by diluting or dispersing emissions, or by preventing potential emission sources whenever possible. Examples of BACMs include: reducing pollutants by limiting the mass of material burned; burning under moist fuel conditions when broadcast burning; shortening the smoldering combustion period; increasing combustion efficiency by encouraging the flaming stage of fire when burning piles; diluting pollutant concentrations over time by reducing the rate of release of emissions per unit area; burning during optimum conditions; and coordinating daily and seasonally with other burn permittees in the area to prevent air quality standard exceedances.

Salvage for NRV-based Restoration and Conservation Benefits

Insect-, Disease-, or Drought-Killed Trees Based on CWE Analysis

Low levels of scattered individual tree mortality caused by insects and disease was historically natural in the Sierra Nevada and ecologically beneficial to forested ecosystems such as providing edge habitat for foraging owls (Fettig 2012; USDA 2019). Present day, episodic, large-scale mortality events, have become common due to current forest conditions and climate change driven drought and warmer temperatures. When mortality becomes chronic, occurring in large clusters with greater than 75% mortality (high severity), ecosystem resistance and resilience may be compromised (Fettig 2012). High severity (> 75% mortality) occurring across greater than 15 percent of a landscape (i.e., a HUC 6 Watershed) or in patch sizes exceeding 10 acres, is indicative of “high” levels of tree mortality outside the natural range of variation and poses a threat to landscape resilience.

At present mortality rates are low and sparse across the project area, but until the other suite of proposed actions are implemented, at least in part, the landscape will remain highly vulnerable to insect-, disease-, and drought mortality as stated in Purpose and Need 1.01 – H and reiterated here:

“...until SERAL treatments are fully implemented, the ability to respond to large scale mortality events would eliminate a degree of accumulated fuels and reduce the risk of further exacerbating wildfire risk on the landscape. Because the value of dead trees declines rapidly, especially that of insect-killed pines, the proposed salvage would allow for economic recovery of material to facilitate fuel reduction. A delayed response to the mortality creates the need for more costly, and more dangerous treatments as the trees weaken.”

To be clear, the proposed salvage is proposing an action to react to a potential future need that does not currently exist. For this reason, some refer to this type of proposed action as “condition-based”. Fair enough. Rather than attempting to categorize the proposed salvage or debate whether it is condition-based” we focused on providing more clarity regarding the intentionally limited salvage this project is proposing in response to multiple public comments received. The forest believed the DEIS addressed the concerns pertaining to a fully-conditional proposed action by including spatial, temporal, and conditional constraints, but we understand more clarification and better transparency is desired.

The updates made here better clarify the specific locations where the salvage is being proposed, when the salvage would occur, and under what constraints. The FEIS and specialist reports have also been updated to assess the site-specific environmental impacts of the proposed salvage (see FEIS Chapter 3.01 Issue 9).

The desired outcomes of the proposed salvage are 2-fold: (1) maintain a proportion of mortality pockets akin to what would have occurred naturally when regular fire regimes were intact; (2) To rapidly respond to high severity mortality events exceeding these “high” levels and patterns of tree mortality while minimizing potential effects and supporting a focused analysis. Salvage of insect-, disease-, and drought-killed trees may occur when each of the following spatial, temporal, and conditional constraints are met:

- Insect-, disease-, and drought-killed trees will be identified following current regional standards and direction. At present the current guidance is presented in USDA 2012. The proposed salvage applies to killed trees, or fully dead trees. The proposed salvage does not apply to green trees or trees that are judged to be at risk of dying.
- Area of Potential Salvage: Salvage of insect-, disease, or drought-killed trees may **only** occur within 0.25 miles of maintenance level 2, 3, 4, and 5 National Forest system (NFS) roads; composed of WHR size classes 3,4, and 5 in forest types mixed conifer/fir, mixed conifer/pine, and pine dominated; and located outside of PACs and the proposed W & S River corridors. This equates to an area of approximately 37,243 acres (minus the acres of PACs) where salvage may potentially occur if the other conditional constraints are met. Salvage of insect-, disease-, or

drought killed trees would not be authorized to occur outside of this defined area of potential salvage.

- Salvage of insect-, disease-, or drought-killed trees may occur when mortality rates exceed 75% (i.e., high severity) across greater than 15 percent of a HUC 6 watershed in a continuous pattern or across multiple patches, or in patch sizes exceeding 10 acres (USDA 2019, Approach 2, 7D)¹⁷.
- Salvage of insect-, disease-, or drought-killed trees may occur after a cumulative watershed effects (CWE) analysis is completed to determine whether the post-disturbance watershed condition exceeds the threshold of concern (TOC¹⁸) for each HUC 6 watershed affected. The CWE analysis must determine that the post-disturbance watershed condition is and would remain below the TOC if salvage occurs. If the watershed condition exceeds the TOC prior to a salvage action, or because of the salvage action, no salvage is authorized to occur.
- Temporary roads constructed to complete the salvage action must remain less than 500 feet and must ensure all sensitive resources are protected from harm.
- Salvage of insect-, disease-, or drought killed trees may not occur within ¼ mile of an eligible Wild and Scenic River, or within designated protected activity centers.
- Outside of fuelbreaks and the WUI Defense zone, four of the largest snags per acre (averaged across ten acres) should be retained. Retained snags should be larger than 15 inches DBH.
- Post-salvage desired conditions for dead and downed fuels and understory vegetation is similar to desired conditions described in the Purpose and Need (Section 1.01 E, F, and G), and Section 2.01Ai above. The remaining amount of understory vegetation or downed branches of salvaged or removed trees should be similar to the range from pre-disturbance (e.g., before the insects, disease, drought, or wildfire event) ranging to amounts that would be found post-prescribed fire (patchy mosaic). The goal is to create conditions for low fire behavior and flame lengths and mitigate overstory hazards (snags) for firefighters, that eventually decompose enough to heavy surface fuel loading. In other words, do not leave huge loads of woody material (e.g., limbs, bark, small trees, that would be equivalent to fuel models above 6 tons/acre in section 1.01E), nor the opposite (e.g., an area devoid of all woody material, litter, and duff and then vulnerable to soil erosion). If large amounts of downed woody material are generated from salvage activities, it should be chipped, removed, or piled for future burning.
- Salvage of insect-, disease-, or drought killed trees may not occur within PACs.

Additional Considerations and Updates:

- After a disturbance occurs and before any salvage action may occur, an evaluation and NEPA compliance clearance must occur. This process requires the forest to take a supplemental look once a disturbance occurs and prior to the proposed salvage occurring. The evaluation will include the following -
 - Identify the salvage action to be carried out
 - Determine each constraint / condition itemized above is met
 - Document a finding that the salvage action is consistent with and within the scope of the decision and associated analysis

¹⁷ See Appendix A; Table A.5.

¹⁸ The threshold of concern is a measure of watershed sensitivity. This method assumes that the potential for cumulative watershed effects increases with land-use intensity or natural processes, like wildfires in a watershed. TOC is calculated based on channel sensitivity, relief ration, geology, and precipitation regime of each watershed.

- This documentation should become part of the project record.
- If this evaluation indicates that the salvage action is unable to meet any of the constraints / conditions or additional salvage is necessary outside of or more broadly than the defined conditions and constraints, then additional or supplemental NEPA must be performed.

Wildfire-Killed Trees Based on CWE Analysis

Historically, regular, low-intensity fires would have commonly occurred across the landscape maintaining low levels of surface and ground fuels and less dense forests. Generally, historic fire effects would have produced high severity patches across 1 to 10 percent of the landscape, naturally (USDA 2019).

Therefore, to mimic the natural range of fire effects, retaining severely burned stands comprising 1 to 10 percent of the landscape is desirable, particularly in areas more likely to have experienced severe fire effects under NRV, such as upper portions of south-facing slopes (USDA 2019 Approach 1, 7C).

Generally, proportions of fire effects desired to mimic the NRV are approximately unburned (10 to 30 percent), low severity (30 to 60 percent), moderate severity (15 to 35 percent) and high severity (1 to 10 percent). Tree mortality is most common in areas burned at high severity. When high severity patches (i.e., tree mortality > 75%) exceed 10 acres, the wildfire related tree mortality is outside the natural range of variation and poses a threat to landscape resilience.

Salvaging wildfire killed trees located within areas exceeding the desired proportion of high severity fire patches would facilitate natural regeneration of trees the following spring by removing undesirable fuel loads prior to seedling establishment. To enable a rapid response to wildfire related tree mortality while minimizing potential effects and supporting a focused analysis, salvage of wildfire killed trees may occur when each of the following spatial, temporal, and conditional constraints met:

- Wildfire-killed and wildfire-injured trees will be assessed via the direction and guidelines presented in Smith and Cluck 2011 (R5 Marking guidelines for fire-injured trees in California) and the 2021 Addendum (Recommendations for extended post-fire designation by damage tree selection).
- Salvage of wildfire-killed trees may only occur within 7 years of the SERAL Decision.
- Salvage of wildfire-killed trees is limited to a maximum of 500 acres per HUC 6 watershed totaling approximately 3,000 acres within the project area.
- Salvage of wildfire-killed trees may occur when mortality rates exceed 75% (high severity) across greater than 10 percent of a HUC 6 watershed in a continuous pattern or across multiple patches, or in patch sizes exceeding 10 acres. Any dead or dying trees located in areas with greater than 75% mortality in excess of 10 percent of a HUC 6 watershed are eligible to be salvaged.
- Salvage of wildfire-killed trees may occur after a cumulative watershed effects (CWE) analysis is completed to determine whether the post-fire watershed condition exceeds the threshold of concern (TOC¹⁶) for each HUC 6 watershed affected by a wildfire. The CWE analysis must determine that the post-disturbance watershed condition is and would remain below the TOC if salvage occurs. If the watershed condition exceeds the TOC prior to a salvage action, or due to the proposed salvage action, no salvage is authorized to occur.
- During the salvage of wildfire killed trees, the largest standing snags must be retained to provide legacy large logs that then become incorporated into the future forest structure.
- No salvage of fire-killed trees requiring a temporary road greater than 500 feet, or those whose removal may harm cultural or other sensitive resources may occur.
- Salvage of wildfire-killed trees may not occur within ¼ mile of an eligible Wild and Scenic River, or within designated protected activity centers.

- Salvage of wildfire-killed trees may not occur within PACs.
- Post-salvage desired conditions for dead and downed fuels and understory vegetation is the same as described above under the insects, disease, drought salvage section.

Additional Considerations and Updates

- In an effort to promote CSO and other focal species conservation, where feasible, the salvage will be conducted within the interior portions of larger patches. This consideration is to reflect the findings presented in Jones et al. 2020 that found owls have a tendency to avoid large, but not necessarily small patches of severely burned forest and also avoid traversing into interior portions of larger patches. Therefore, intentionally located salvage within interior portions of larger patches would be less likely to affect spotted owls.
- After a disturbance occurs and before any salvage action may occur, an evaluation and NEPA compliance clearance must occur. This process requires the forest to take a supplemental look once a disturbance occurs and prior to the proposed salvage occurring. The evaluation should include the following -
 - Identify the salvage action to be carried out
 - Determine each constraint / condition itemized above is met
 - Document a finding that the salvage action is consistent with and within the scope of the decision and associated analysis
 - This documentation should become part of the project record.
 - If this evaluation indicates that the wildfire salvage action is unable to meet any of the constraints / conditions or additional salvage is necessary outside of or more broadly than the defined conditions and constraints, then additional or supplemental NEPA must be performed.

ii. Maintaining Safe Access Treatments (Map 10)

Hazard Tree Abatement

Disturbance related tree mortality may occur after the decision is signed and create hazards along public access roads. In order to rapidly respond and abate hazard trees within the project area, Alternative 1 proposes to authorize hazard tree removal where and when each of the following conditions are met:

- Hazard trees will be identified by Forest staff who have completed the regional hazard tree training program and who are able to identify hazard trees based on current direction for hazard tree identification and abatement presented in Smith and Cluck 2011, USDA 2012 – Angwin et al. 2012, and USDA 2021. Hazard tree identification will always follow current Regional standards and direction. If any or all of these guidance documents are updated or superseded Forest staff will be required to adhere to that updated direction for identifying hazard trees.
- A tree is identified as a hazard along maintenance level 2, 3, 4, and 5 roads which travel through NFS lands. This equals approximately 285 miles within the SERAL project area (Map 10).
 - Although there are circumstances where a tree may pose a hazard greater than one-tree length from a road, for the SERAL project, only hazard trees located within a default distance of one-tree length of the 285 miles of roads are authorized for removal.
- Hazard trees may only be removed where the action does not require the construction of temporary roads for access or removal.

- Hazard tree removal may not occur where cultural or other sensitive resources, such as nest stands may be harmed. In those circumstances, hazard trees may be felled to abate the immediate hazard but could remain on site in no mitigation measures such as temporary closures are able to safely or efficiently reduce the harm to sensitive resources.

In response to questions asked during the comment period we would like to note that the area of potential hazard tree removal (i.e., any area within a default zone of one-tree length along the 285 miles of ML 2, 3, 4, and 5 roads traversing forest service lands) is located completely within the area where potential insect, disease, drought killed tree salvage may occur when each conditional constraint is met and greater than 94% of those acres overlap with other treatment areas. Therefore, whatever acreage of hazard trees are removed would not be additive to the total acres proposed for treatment across the project area.

iii. Road Construction, Reconstruction, and Maintenance

Temporary Road Construction (Approximately 26 miles)

Temporary Road Construction includes the construction of a new “temp road” and/or the improvement of an old temp road (or other existing unauthorized roads) followed by decommissioning. Temporary roads are generally short, around 250 feet or less, and are intended to provide short-term access to landings where the existing system roads does not provide adequate access to a mechanical timber harvest treatment area. Areas needing temporary roads are located greater than 0.25 miles from an existing road. Temporary roads are used to provide safe, economically feasible, access and to shorten skidding distances during harvest operations. On occasion, a temporary road may also be needed to provide access to other mechanical treatment areas as well, although those instances are few. Wherever a temporary road is constructed, it is not intended to be a permanent part of the Forest Service road system (thus are not included in a Forest transportation atlas) and every temporary road will be decommissioned after its designated use period is over.

Temporary road construction is generally constructed on slopes less than 10% and may include clearing of trees and brush, stumps, rock, and other materials to allow for construction; surface blading, spot placement of gravel, improvement or installation of drainage structures (i.e., culverts and bridges are installed in specific locations to account for drainage and stream crossing requirements), and erosion control.

The temporary road needs for Alternative 1 are estimated to be approximately 26 miles, or 0.8 miles per 1,000 acres of proposed mechanical timber harvest. We estimate that approximately 6 miles would require new construction, approximately half (13 miles) of the temporary roads would be located over previously used logging roads or old skid trails, less than a mile would occur over existing foot trails, and the remainder would be located along the same route as existing motorized OHV trails.

As part of the forest’s commitment to fully implement the SERAL project as soon as possible, and to address concerns regarding temporary road construction and decommissioning assurances, all temporary roads constructed as part of the SERAL implementation will be decommissioned / closed within 10-years from the time they are constructed, or within 3 years after the temporary road is no longer needed, whichever is sooner.

Reconstruction and Maintenance of NFS Roads and Trails

Reconstruction generally includes work to improve and restore roads. This work would improve the road conditions as needed to provide access to treatment units, provide for safe and efficient haul of forest products, and enhance hydrologic function and stream protection in accordance with applicable BMPs. Actions may include surface improvement; construction of drainage dips, culverts, riprap fills or other drainage or stabilization features with potential disturbance outside the established roadway (toe of fill to

top of cut); realignment; and widening of curves as needed for log trucks and chip van passage. Reconstruction also includes the actions identified in the maintenance category, such as blading.

Roads within the project area that are in functioning condition would be maintained. Maintenance preserves the function of the road but generally does not include improvements. Maintenance activities generally include blading; brushing; removal of roadside hazard trees; repair and/or replacement of road surfaces; cleaning, repair, or installation of drainage structures such as culverts, ditches, and dips; dust abatement; removal and installation of closure barriers; and installation or repair of signs. Maintenance activities generally do not disturb ground outside the existing road prism (toe of fill to top of cut) other than removal of material around culvert inlets.

All National Forest System (NFS) Roads and Trails within the project area are subject to reconstruction or maintenance. No changes in allowed public uses would occur on any existing NFS Road or Trail. Any roads or motorized trails currently closed to public access that are necessary for project implementation would be re-closed following use. Reconstruction and maintenance would not only allow for implementation of the proposed actions but is necessary to maintain safe access to public lands.

iv. Non-Native Invasive Weed Control and Eradication (231 acres, Map 11)

Annual weed treatments designed to control or eradicate a portion of the non-native invasive plant occurrences within the project area will occur. The number of infestations and acreages treated each year will depend upon available funding. Treatments include integrated prescriptions that generally combine the use of herbicides with mechanical, manual, and cultural control methods applied over several years. Currently, there are approximately 231 acres of mapped known occurrences of 27 invasive plant species, (Table 18, Map 11) within the project area. Yellow star-thistle, Maltese star-thistle (tocalote), and bull thistle account for approximately 100 acres of the known, mapped occurrences. Occurrences are found across the project area, and more than 97 percent are less than one acre in size. Often, several years of treatment are required to eradicate or control an infestation.

An early detection rapid response approach will be used within the project area and newly discovered populations would be treated when they are small, so that the likelihood of adverse effects from treatments are minimized, and before the invasive plants cause measurable ecological damage. This approach assumes that new occurrences will be similar to current infestations and within the same variety of conditions. Thus, the impacts would be predictable. Although the precise location or timing of the treatment may be unpredictable; management requirements have been designed to keep potential effects limited to those disclosed for the current inventory.

Treatment Strategy

For each known non-native invasive plant infestation, and for future infestations that may be discovered, one of four treatment strategies is proposed:

1. Eradicate: Annually treat and monitor the infestation with the goal of complete elimination of the species.
2. Control: Treat and monitor a portion of the infestations each year, focusing on reducing the acreage and percent cover over time.
3. Contain: Treat leading edge or new satellite infestations, or where concurrent with high-value resources.
4. Limited/No treatment: Limited to site-specific restoration projects or no treatment efforts at this time.

Infestations would be prioritized for treatment based on the following four factors:

1. Early invaders with high environmental impacts (per California Department of Food and Agriculture (CDFA) and California Invasive Plants Council (Cal-IPC) ratings) and/or small or few isolated infestations on the forest.
2. Infestations in high value areas and associated points of access.
3. Infestations with a high potential for future spread – prolific species found in high traffic areas such as administrative or recreation sites, trailheads, major access points for the forest, and systems vulnerable to invasion (recent fires or fuelbreaks).
4. Leading edge or satellite occurrences of larger more established infestations.

The treatment strategy assigned to a particular species or infestation may change over time based on new information concerning changes in the occurrence and abundance of invasive plants, and the effectiveness of treatments. Table 18 presents the list of known invasive plant species in the SERAL project area.

Table 18. Non-native Invasive plants known to occur within the project area.

Scientific Name	Common Name	Rating (Cal-IPC/CDFA ¹⁹)	Number of populations	Acres
<i>Aegilops triuncialis</i>	barbed goatgrass	High / B	9	0.6
<i>Ailanthus altissima</i>	tree of heaven	Moderate / C	5	0.5
<i>Bromus tectorum</i>	cheatgrass	High / C	2	0.3
<i>Carduus acanthoides</i> ssp. <i>Acanthoides</i>	Italian plumeless thistle	Limited / A	77	2.7
<i>Centaurea melitensis</i>	Maltese star-thistle, tocalote	Moderate/C	77	29.4
<i>Centaurea solstitialis</i>	yellow star-thistle	High/C	249	32.9
<i>Chondrilla juncea</i>	rush skeletonweed	Moderate/A	3	0.1
<i>Cirsium arvense</i>	Canada thistle	Moderate/B	1	0.1
<i>Cirsium vulgare</i>	bull thistle	Moderate/C	272	111.4
<i>Convolvulus arvensis</i>	field bindweed	NL/C	2	0.1
<i>Cynodon dactylon</i>	Bermudagrass	Moderate/D	3	0.1
<i>Cytisus scoparius</i>	Scotch broom	High/C	33	1.6
<i>Elymus caput-medusae</i>	medusahead	High/C	51	4.8
<i>Euphorbia oblongata</i>	eggleaf spurge	Limited/B	5	0.7
<i>Foeniculum vulgare</i>	sweet fennel	Moderate/NL	1	0.1
<i>Genista monspessulana</i>	French broom	High/C	14	1.5
<i>Hypericum perforatum</i>	common St. Johnswort	Limited/C	106	9.5
<i>Lathyrus latifolius</i>	perennial pea	NL/NL	32	2.2
<i>Rubus armeniacus</i>	Himalayan blackberry	High/NL	218	15

¹⁹ **Cal-IPC:** High = These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically; Moderate = These species have substantial and apparent-but generally not severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.; Limited = These species are invasive, but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic; NL = Not Listed. **CDFA:** A = A pest of known economic or environmental detriment and is either not known to be established in California or it is present in a limited distribution that allows for the possibility of eradication or successful containment; B = A pest of known economic or environmental detriment and, if present in California, it is of limited distribution; C = A pest of known economic or environmental detriment and, if present in California, it is usually widespread; D = An organism known to be of little or no economic or environmental detriment, to have an extremely low likelihood of weediness, or is known to be a parasite or predator. There is no state enforced action; and – is Not Listed.

Scientific Name	Common Name	Rating (Cal-IPC/CDFA ¹⁹)	Number of populations	Acres
<i>Rubus laciniatus</i>	cutleaf blackberry	NL/NL	10	0.2
<i>Rumex</i>	dock	NL/NL	2	0.1
<i>Saponaria officinalis</i>	bouncingbet	Limited/NL	49	3.8
<i>Sisymbrium altissimum</i>	tall tumbledmustard	NL/NL	2	0.1
<i>Silybum marianum</i>	blessed milkthistle	Limited/NL	25	1.6
<i>Spartium junceum</i>	Spanish broom	High/C	14	2.8
<i>Verbascum thapsus</i>	common mullein	Limited/NL	59	8.9
<i>Centaurea stoebe</i>	Spotted knapweed	High/A		

Treatment Methods

The proposed Integrated Pest Management control approach will employ a combination of treatment methods. Successful treatments often require multiple years of treatment, and sometimes require multiple treatments per year. Treatments are tailored depending on the biology of the target invasive plant species, population size and density, site type, and prior treatment effectiveness. Complete eradications typically require annual treatment over 3-5 years or longer to ensure there is no regrowth or new seed germination. Treatments aimed at reducing numbers or preventing further spread may occur on a less frequent but ongoing schedule. Design features described in the proposed action would be implemented during all invasive plant treatments.

Assuming a treatment method complies with all management requirements and is effective, practical, and cost-efficient, treatment methods would be selected in the following order of preference:

1. Manual and mechanical methods such as hand pulling and cutting
2. Cultural methods, including tarping and flaming
3. Herbicide application (chemical methods)

Non-chemical methods are typically considered feasible when populations are smaller than a few hundred plants in size, and/or when woody species are still small enough to be hand-pulled, although many factors, such as the age of the plants and number of people available to participate in the control effort are also factors. Some biennial and perennial species, either those with deep or rhizomatous roots, or those that re-sprout or regrow from root fragments, can only be effectively controlled with herbicide.

Manual Methods

Hand Pulling: Uprooting plants by hand or pulling, removing as much of the root as possible while minimizing soil disturbance. Control by hand pulling is effective for some annual and tap-rooted plants, such as scotch broom seedlings; it is not effective against many perennial plants with deep underground roots and/or plants with easily broken roots that are left behind to re-sprout. Hand pulling is the preferred method of treatment where it is effective and efficient. This applies to small, young infestations of many species, as well as follow-up treatments for many larger infestations initially treated with other methods.

Pulling Using Tools: Most plant-pulling tools, such as the weed wrench, are designed to grip the plant stem and provide the leverage necessary to pull its roots out. Ground disturbance is localized but because of the larger stems and root systems that can be treated in this manner, use of pulling tools may result in greater ground disturbance than would occur through hand pulling. This approach has been successfully used for broom plants.

Clipping: Clipping refers to cutting or removing seed heads and/or fruiting bodies to prevent germination. This method is labor-intensive but can be effective for small and spotty infestations or as follow-up treatments to treat target plants missed by initial herbicide use. This method may also be used

in sensitive areas with resource concerns from other treatment methods. This approach does not involve ground disturbance or impacts; it is currently being used when small numbers of invasive plants are discovered with seed heads present. This method is appropriate for annual plants or for perennial plants that should not be pulled by hand.

Cutting: Cutting of woody stems when plants are drought stressed has been shown to be effective at eliminating or reducing mature scotch broom plants. This approach is labor-intensive but can be effective for treating small or sensitive areas.

Mulching and Tarping: Mulching involves covering plants with “weed free” and plastic free mulch as wood chips or rice straw to shade out weeds. Tarping places tarps to shade out weeds or to injure them through long exposure to heat from the sun. Tarping can be effective for controlling small infestations.

Mechanical Methods

Mowing or Cutting with a Hand-held String or Blade Trimmer Mowing or cutting with a gas-powered string or blade trimmer can reduce seed production and restrict invasive plant growth, especially in annuals cut before they flower and set seed. The timing of treatment should be appropriate to the species. Some species re-sprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. Mowing and cutting may be used as a primary treatment or a follow-up treatment to another initial treatment method. Mowing or cutting can also be used to promote vigorous growth in order to increase herbicide effectiveness.

Cultural Methods

Tarping: Tarping or solarization involves covering the infested area with a barrier, usually plastic, to raise soil temperature and block light. Mulch may be used to smother or shade out invasive plants. These methods can be effective for controlling small populations, especially in locations such as borrow pits or closed roads, where native vegetation is not yet established.

Flaming: Flaming using a hand-held propane torch raises the leaf temperature to the point of bursting cells and does not require igniting vegetation. This method is applied prior to seeds becoming viable in the late winter or early spring when fire danger is low. Fire personnel would be on site for the use of this method, to provide for human safety and to ensure there is no potential for fire spread from the treated area. This method would only be considered for herbaceous species.

Chemical Methods

Cut stump Herbicide is applied to cut stem surfaces (primarily the cambium) to eliminate or greatly reduce resprout. A backpack sprayer with a regulated nozzle, spray bottle, wicking apparatus, or paintbrush can be used to apply a 50-100% solution of herbicides soon after the cut is made. This treatment is applied to individual target plants thereby reducing drift from falling onto non-target plants, soil or water.

Wiping onto foliage A sponge or wick is used to wipe a 25-50% solution of herbicide onto foliage and stems of target plants. Wicking apparatus vary in design, but generally consists of a reservoir attached to a sponge or wick. Ball valves would be installed on the reservoir to control the flow of herbicides from the reservoir to the wick to prevent drips. Wicking would be used in sensitive areas to avoid effects from drift.

Drizzle The drizzle application method employs a backpack sprayer and a spray gun fitted with an orifice disk (0.5 mm). With a head of 20 psi, the spray gun shoots a fine stream that breaks into large droplets when it contacts the plant. Invasive plants would be treated from about 6 feet away using a “W” shape spray pattern that disperses the herbicide solution over the shrub canopy in a “drizzle” or sprinkled

fashion. The method uses a lower volume, but higher concentration of herbicide. A 10% solution of glyphosate would be used to treat areas with a dense cover of scotch broom.

Directed Foliar Spray A backpack sprayer or compressed air sprayer (holding 1-5 gallons) of dilute herbicide solution is used to apply herbicides to targeted plants. A backpack sprayer has a hand operated hydraulic pump that forces liquid herbicide through a spray wand with a regulated nozzle held near the application surface. Spray is typically controlled by using a wand to direct herbicides to target vegetation, regulating tank pressure, utilizing different nozzle types, and combining dyes with spray solution. Directed foliar spray concentrates spray upon the target plant with the intent of minimizing spray between target plants.

Spot Spray This method would be limited to areas heavily dominated (generally greater than 85% cover) by non- native species. In this analysis, “spot spray” refers to herbicide application that is targeted at an invasive plant and the area immediately surrounding the plant. Herbicide would be applied using a backpack sprayer with no boom. The spot spray method would be limited to aminopyralid and clopyralid, herbicides that can provide residual control in the soil for star thistles and knapweeds that germinate through the spring and early summer. The use of this method at disturbed sites reduces the need for re-treatment to capture target plants that germinate later in the season and would otherwise require re-treatment to implement effective control.

Proposed Herbicides

Herbicide use may be employed where necessary within the areas proposed to allow herbicide use described below. Herbicide use is **only** proposed to treat: (1) the 270 acres of known mapped infestations plus an additional 20% to account for potential spread that has occurred since initially discovery and mapping; and (2) potential new infestations discovered within the 13,430-acre fuelbreak network (Map 6). Fuelbreaks pose a higher risk of invasive weed spread because the desired condition of a fuelbreak provides conditions where invasive weeds could thrive. To mitigate this risk, having every tool available to control and prevent invasive weed spread, including herbicides will be most effective.

If and when a new infestation is discovered in a fuelbreak, an evaluation must occur prior to the use of herbicides. The evaluation must include the following:

- Identify the size and extent of the new infestation.
- Consider whether manual, mechanical, or cultural methods would be effective in controlling or eradicating the particular invasive weed. If not, document why.
- Identify which herbicide will be used from the suite considered in the FEIS.
- Seek resource specialist review to ensure the herbicide use is consistent with and within the scope of the decision and associated analysis.
- This documentation should become part of the project record.

Seven herbicides following label and national application rate standards may be used. This includes aminopyralid, chlorsulfuron, clethodim, clopyralid, glyphosate, indaziflam, and triclopyr. Each of the seven proposed herbicides have been approved for use in the state of California and have a label²⁰ certifying that the chemical has been approved for use by the Federal Environmental Protection Agency and the California Department of Pesticide Regulation. To reduce the risk of populations developing

²⁰ The label contains information about the product, including its relative toxicity, potential hazard to humans and the environment, directions for use, storage and disposal, and first aid treatment in case of exposure. Label directions provide for public and worker safety by requiring posting of treated areas, pre-designation of mixing, storage and filling sites, and transportation and handling practices in accordance with toxicity of each formulation.

herbicide tolerance from repeated application with the same herbicide, herbicides with different modes of action would be applied when appropriate.

Methylated seed oil surfactants, such as Hasten or equivalent product, may be added to herbicide solutions to enable herbicide penetration of the plant cuticle (a thick, waxy layer present on leaves and stems of most plants). Surfactants are materials that facilitate the activity of herbicides through emulsifying, wetting, spreading or otherwise modifying the properties of liquid chemicals. Water soluble dyes, such as Colorfast Purple or Hi-Light Blue, may also be added to the herbicide solution to assist targeted application of the herbicide and avoid over spraying plants which have already been treated.

Revegetation

Revegetation of gaps in vegetation or bare areas created by invasive plant treatments is a critical component of an integrated invasive plant management strategy. In some cases, re-colonization from the existing seedbank and propagules may be sufficient; in other situations, active restoration may be needed to provide competition with highly aggressive species. Revegetation of bare areas created by invasive plant treatments, particularly with perennial grass species, may suppress re-growth of invasive species. Site restoration and revegetation may be helpful in preventing re-infestation by the invasive plant that has been treated, or a new infestation by another invasive species. Revegetation will be implemented by spreading native seed, or by planting native plants, either as bare root stock or potted plants. Non-native species would not be used. Revegetation may include mulching with native litter or duff, or certified weed-free straw, raking to establish the seed bed, and treatment of invasive plants, as required, using the methods proposed above.

v. Project-Specific Forest Plan Amendments

The proposed project-specific forest plan amendments are itemized in detail in Appendix B, Table B.1 and are only considered in Alternative 1. The actions developed for Alternative 1 were developed in full compliance with the amended plan as proposed.

B. *Alternative 2 – No Action*

Alternative 2 is the no action alternative as required by 40 CFR 1502.14(c). No management activities will occur. The no action alternative provides the baseline for assessing the comparative impacts of the action alternatives (Alternatives 1, 3, and 4).

C. *Alternative 3 – Current Management (No Forest Plan Amendments)*

i. Landscape Resilience Treatments

Forest Thinning (26,471 acres, Map 12)

Alternative 3 forest thinning has the same objectives as described in Alternative 1 but the locations of the proposed treatments and DBH limits vary in compliance with the current, unamended forest plan (Table 19, Map 12). Overall, Alternative 3 proposes 4,028 acres less forest thinning than Alternative 1. This reduction stems primarily from the restricting forest thinning in CSO PACs to only WUI defense or threat zones (in limited circumstances).

An additional notable reduction occurs in the acres identified as favorable for traditional harvest operations. This reduction stems primarily from existing forest plan direction S&G 7 which limits canopy cover reductions of more than 30 percent from existing or less than 40 percent overall. These canopy cover retention requirements factored into the post-treatment modeled estimates of total volume per acre. The canopy cover constraints impacted estimated volume yields and impact the feasibility that traditional

harvest operations are a mechanism to achieve the desired conditions. Where estimated total volume yields fell below 7 CCF per acre, those areas identified as “Forest Thinning Other Mechanical” (Map 12).

Table 19: Alternative 3 DBH limitations.

Land Allocation	Tree Type	Alt. 3
CSO PAC	Shade-Intolerant	30" (only in WUI defense)
	Shade-Tolerant	30" (only in WUI defense)
CSO HRCA	Shade-Intolerant	30"
	Shade-Tolerant	30"
Other	Shade-Intolerant	30"
	Shade-Tolerant	30"
	Within 66 feet of rust Resistant Sugar Pine	40"
	Within 66 feet of Live Aspen Stand	40"
	Within a Meadow	40"

Mechanical Fuel Reduction (7,460 acres, Map 12)

The locations vary, but otherwise same as described in Alternative 1. Alternative 3 includes 23 more mechanical fuel reduction acres than Alternative 1.

Fuelbreaks (Map 12)

Same as Alternative 1.

Prescribed Fire (Map 13)

Similar to Alternative 1, prescribed fire will generally be applied in operational burn units with the same overall objective to apply prescribed fire across all vegetated parts of the landscape, regularly. To reach that end goal, Alternative 3 includes the same operational burn units as proposed in Alternative 1 (43,859 acres, “Operational Burn Units” – Map 13). However, the areas where prescribed fire is the only treatment and areas where prescribed fire would be applied as a follow-up treatment to achieve and maintain desired conditions differ in Alternative 3 as compared to Alternative 1. Alternative 3 would apply prescribed fire as the only treatment on 1,244 more acres than Alternative 1 (21,007 acres, “Prescribed Fire Only” – Map 13). Areas where prescribed fire would be applied as a follow-up treatment (“Follow-up Burning” – Map 13) are fewer than Alternative 1, because Alternative 3 proposes less acres of other vegetation management actions than Alternative 1. The greater proportion of prescribed fire only areas within Alternative 3 as compared to Alternative 1 are due primarily because mechanical treatments are prohibited within CSO PACS outside WUI zones in Alternative 3. In the absence of mechanical treatments, prescribed fire becomes the primary treatment on these acres.

Salvage for NRV-based Restoration and Conservation Benefits

Insect-, Disease-, or Drought-Killed Trees Based on CWE Analysis

Same as Alternative 1.

Wildfire-Killed Trees Based on CWE Analysis

Same as Alternative 1.

- ii. Maintaining Safe Access Treatments (Map 10)

Hazard Tree Abatement

Same as Alternative 1.

- iii. Road Construction, Reconstruction, and Maintenance

Temporary Road Construction (Approximately 14.6 miles)

Temporary road construction will occur as described in Alternative 1 and in compliance with the same management requirements as described in Section 2.03, but Alternative 3 requires less temporary road construction than Alternative 1 because the proposed acres of mechanical timber harvest are fewer.

As such, the temporary road needs for Alternative 3 are estimated to be approximately 14.6 miles, or 0.8 miles per 1,000 acres of proposed mechanical timber harvest. We estimate that approximately 3.5 miles would require new construction, approximately 6 miles of the temporary roads would be located over previously used logging roads or old skid trails, less than a quarter-mile would occur over existing foot trails, and the remainder would be located along the same route as existing motorized OHV trails.

Reconstruction and Maintenance of NFS Roads and Trails

Same as Alternative 1.

- iv. Invasive Weed Control and Eradication

Same as Alternative 1.

- v. Forest Plan Amendments

None. Alternative 3 was developed in compliance with the current forest plan (USDA Forest Service 2017).

D. Alternative 4 – Suggested Alternative Components

- i. Landscape Resilience Treatments

Forest Thinning (25,234 acres, Map 14)

Alternative 4 forest thinning has the same objectives as described in Alternative 1 but the locations of the proposed treatments and DBH limits vary in compliance with the current, unamended forest plan (Table 20, Map 14). Overall, Alternative 4 proposes 5,264 acres less forest thinning than Alternative 1 and 1,237 acres fewer than Alternative 3. This reduction stems primarily from prohibiting forest thinning in CSO PACs.

An additional notable reduction occurs in the acres identified as favorable for traditional harvest operations (Alternative 4 = 2,550 acres or 24,178 acres fewer than proposed in Alternative 1 and 9,130 acres fewer than proposed in Alternative 3). This reduction is two-fold: (1) Existing forest plan direction S&G 7 which limits canopy cover reductions of more than 30 percent from existing or less than 40 percent overall; and (2) the 20-inch DBH limit unique to Alternative 4. Both the canopy cover retention requirement and lower DBH limit lower the post-treatment estimates of total volume per acre for Alternative 4, and thus, reduce the acreage in which traditional harvest operations would be a feasible mechanism to achieve the desired conditions (as described in Alternative 1).

Table 20. Alternative 4 DBH limitations.

Land Allocation	Tree Type	Alt. 4
CSO PAC	Shade-Intolerant	0-inch – No Treatment
	Shade-Tolerant	0-inch – No Treatment
CSO HRCA	Shade-Intolerant	20-inch
	Shade-Tolerant	20-inch
Other	Shade-Intolerant	20-inch
	Shade-Tolerant	20-inch
	Within 66 feet of rust Resistant Sugar Pine	30-inch
	Within 66 feet of Live Aspen Stand	30-inch
	Within a Meadow	30-inch

Mechanical Fuel Reduction (7,448 acres, Map 14)

The locations vary, but otherwise same as described in Alternative 1. Alternative 4 includes 41 more acres than Alternative 1.

Fuelbreaks (Map 14)

Same as Alternative 1.

Prescribed Fire (Map 15)

Similar to Alternative 1 and Alternative 3, prescribed fire will generally be applied in operational burn units with the same overall objective to apply prescribed fire across all vegetated parts of the landscape, regularly. To reach that end goal, Alternative 4 includes the same operational burn units as proposed in Alternative 1 and Alternative 3 (43,859 acres, “Operational Burn Units” – Map 15). However, the areas where prescribed fire is the only treatment and areas where prescribed fire would be applied as a follow-up treatment to achieve and maintain desired conditions differ in Alternative 4 as compared to the other two action alternatives. Alternative 4 would apply prescribed fire as the only treatment on 1,541 more acres than Alternative 1, and 297 more acres than Alternative 3 (21,304 acres, “Prescribed Fire Only” – Map 15). Areas where prescribed fire would be applied as a follow-up treatment to achieve and maintain desired conditions (“Follow-up Burning” – Map 15) are fewer than both Alternative 1 and Alternative 3, because Alternative 4 proposes less acres of other vegetation management actions than either of the other action alternatives. The greatest proportion of prescribed fire only areas within Alternative 4 as compared to Alternative 1 and Alternative 3 is because mechanical treatments are prohibited within CSO PACS outside WUI zones in Alternative 4, and Alternative 4 proposes less acres of other vegetation management actions. In the absence of mechanical treatments, prescribed fire becomes the primary treatment on these acres.

Salvage for NRV-based Restoration and Conservation Benefits

None.

- ii. Maintaining Safe Access Treatments

Hazard Tree Treatments

None.

iii. Road Construction, Reconstruction, and Maintenance

Temporary Road Construction (Approximately 6 miles)

Temporary road construction will occur as described in Alternative 1 and in compliance with the same management requirements as described in Section 2.03 but Alternative 4 requires far less temporary road construction than Alternative 1 because the proposed acres of mechanical timber harvest are measurable fewer due to the imposed 20" DBH limit's impact on reducing the potential volume available and prohibiting treatments from occurring within PACs.

As such, the temporary road needs for Alternative 4 are estimated to be approximately 6.0 miles, or 0.6 miles per 1,000 acres of proposed mechanical timber harvest. We estimate that less than 1.5 miles would require new construction, approximately 3 miles of the temporary roads would be located over previously used logging roads or old skid trails, less than a quarter-mile would occur over existing foot trails, and the remainder would be located along the same route as existing motorized OHV trails.

Reconstruction and Maintenance of NFS Roads and Trails

Same as Alternative 1 description

iv. Invasive Weed Control and Eradication

No herbicides are proposed to control or eradicate weeds in Alternative 4, otherwise the proposed action is the same as described in Alternative 1.

v. Forest Plan Amendments

None. Alternative 4 was developed in compliance with the current forest plan (USDA Forest Service 2017).

2.02 Comparison of Alternatives

Table 21. Comparison of proposed treatments among action Alternatives (Alt. 1, 3, and 4).

Proposed Activity	How?	Where?	Restoration Needs	Alternative 1	Alternative 3	Alternative 4
Forest Thinning	Timber Harvest, Biomass Removal, or Mastication	In dense conifer stands where average diameters are greater than 6 inches and canopy covers are greater than 40%.	<ul style="list-style-type: none"> - Increase forest heterogeneity by restoring the proportion of different size and density classes across forested areas to within NRV - Reduce stand densities - Increase the relative abundance of fire-tolerant and shade-intolerant trees. -Provide wood products 	30,498	26,471	25,234
Fuel Reduction	Mastication, or piling and burning,	In areas with small conifers with average diameters less than 6 inches, conifers with diameters greater than 6 inches and canopy cover less than 40%, or oaks, shrubs, or other herbaceous vegetation types occurring on slopes less than 35% within WUI defense zones or within 250 feet of a level 2, 3, 4, or 5 road.	<ul style="list-style-type: none"> - Reduce and maintain low levels of surface and ladder fuels. 	7,437	7,460	7,448
Fuelbreak Construction and Maintenance.	Timber harvest, biomass removal, mastication, hand thinning, or piling and burning	Where fire and fuels staff delineated the linear feature.	To achieve the goal of returning fire to the entire landscape at regular intervals.	13,430	Same as Alt. 1	Same as Alt. 1

Proposed Activity	How?	Where?	Restoration Needs	Alternative 1	Alternative 3	Alternative 4
Follow-up Prescribed Fire	Prescribed Fire	Wherever forest thinning, fuel reduction, or fuelbreak work has occurred	-Reduce and maintain low levels of surface and ladder fuels. - Apply or reintroduce fire to the landscape at larger, more regular intervals to mimic the natural range of fire severity and frequency.	51,366	47,361	46,292
Prescribed fire	Prescribed Fire	Where no other treatments are proposed and therefore prescribed fire is the primary treatment.	- Reduce and maintain low levels of surface and ladder fuels. - Apply or reintroduce fire to the landscape at larger, more regular intervals to mimic the natural range of fire severity and frequency.	19,763	21,007	21,304
Forest Thinning, Mastication, Fuelbreak Network, and Prescribed Fire				71,121	68,307	67,518

Table 22. Upper diameter at breast height limits for mechanical treatments.

Land Allocation	Tree Type	Alt 1.	Alt. 3	Alt. 4
PAC	Shade-Intolerant	20"	30" (only in WUI defense)	0" – No Treatment
	Shade-Tolerant	20"	30" (only in WUI defense)	0" – No Treatment
Territory or HRCA	Shade-Intolerant	24"	30"	20"
	Shade-Tolerant	30"	30"	20"
Other	Shade-Intolerant	30"	30"	20"
	Shade-Tolerant	34" ²¹	30"	20"
	Within 66 feet of rust Resistant Sugar Pine ²²	40"	40"	30"
	Within 66 feet of Live Aspen Stand ²²	40"	40"	30"
	Within a Meadow ²²	40"	40"	30"

²¹ Where at least one 30-inch DBH shade-intolerant tree is left within one tree height of tree removed

²² These exemptions may not be applied within California Spotted Owl PACs, Territories, or HRCAs.

2.03 Management Requirements

SERAL management requirements have been included to ensure compliance with the Stanislaus National Forest Land and Resource Management Plan (Forest Plan) and Soil and Water Best Management Practices as outlined in USDA 2011b and USDA 2012b. Management requirements are additional measures or constraints that must be adhered to during implementation, and included to ensure compliance with laws, regulations, or policy is maintained. Management requirements are most often focused restrictions, constraints, or retention requirements rather than a proposed treatment and therefore do not present well within the body of a proposed action. The management requirements are mandatory components of the proposed actions and collectively ensure that Alternative 1 is compliant with the proposed project-specific amended Forest Plan (Appendix B) and Alternatives 3 and 4 are consistent with the current Forest Plan (USDA 1991, USDA 2017).

A. All Project Treatments

1. Follow the soil and water quality BMP checklists during project implementation (2021-1117_DRAFT_SERAL_BMP_checklist.pdf).
2. For all logging contract operations, implement the equipment cleaning requirements in the standard contract provision (FSM 2902(1); FSM 2903(6)).
3. For all non-logging operations and activities: all shredding equipment, road grading or construction equipment, clothing, particularly footwear, and other equipment, including the transport vehicle should be free of soil, mud (wet or dried), seeds, vegetative matter or other debris that could contain seeds in order to prevent new infestations of invasive weeds in the project area. Dust or very light dirt, which would not contain weed seed, is not a concern. (FSM 2902(1); FSM 2903(6); FSM 2903(7)).
4. Where possible, manually treat dense infestations of bull thistle and woolly mullein in landings and skid trails prior to using these facilities to prevent spread, if flowers or seeds are present on the plants. In the years following use of landings and skid trails, monitor for invasive weeds and manually treat dense infestations of bull thistle and woolly mullein. Manual treatment would entail hand pulling, digging, cutting and bagging of flower heads, or solarization with clear plastic. (FSM 2902(1); FSM 2902(2); FSM 2903(1)).
5. When needed for soil stabilization, use certified weed-free mulches where available, mulches with low risk of weed introduction where certified weed-free is not available, and certified weed-free seed mixes. When project-generated logging slash or chipped biomass is used for soil stabilization, it should be obtained from sites free of invasive weeds. Seed mixes must conform to the Region 5 Policy on the Use of Native Plant Material in Restoration or Revegetation Projects. (FSM 2902(1); FSM 2903(7)).
6. Crushed rock, drain rock, riprap and soil fill for road restoration, reconstruction and maintenance shall be obtained from weed-free sources. Do not stockpile or stage these or other construction materials in sites with invasive weeds.
7. Monitor the project area through time for invasive weeds to determine if existing weeds are being spread, or if weeds were accidentally introduced by project activities. Hand pull any small, newly discovered infestations of high priority weeds. Assess the need for a long-term eradication strategy, if needed.
8. To minimize impacts from emissions from heavy equipment utilized for removal and thinning of vegetation, idling trucks used for transportation, and dust generated during proposed activities the following requirements should be followed:
 - Limit idling of heavy equipment and transportation vehicles;

- Require USFS heavy diesel equipment to use cleanest available engines or retrofits with diesel particulate control technology in air quality sensitive areas (and request contractors to do so);
- Keep engines and vehicles well maintained;
- Use low-sulfur or alternative fuels (when available and when equipment specifications allow);
- Require dust abatement measures on haul roads or where activities will lead to excessive traffic contributing to abnormal levels of dust;
- Implement dust control plans particularly where dust is expected near occupied dwellings.

B. Cultural Resource Protection

1. Flag and avoid known historic properties during project implementation.
2. Follow specific protection measures as outlined in the Regional Programmatic Agreement compliance letter.
3. If cultural materials are encountered during the course of the project, cease all ground disturbing activities in the immediate vicinity of the discovery until the Forest Archeologist is notified, and the California State Historic Preservation Office and potentially affected Native American tribes are consulted.

C. Prescribed Fire and Smoke Emissions

1. Design and implement prescribed burn units following national rules and guidelines (e.g., NWCG [2020] Smoke Management Guide for Prescribed fire [PMS 420-3], NWCG [2019] Standards for Ground Ignition Equipment [PMS 443], NWCG [2019] Standards for Transporting Fuel [PMS 442], Interagency Prescribed Fire Planning and Implementation Procedures Guide [PMS 484] by NWCG [2017], and NWCG [2018] Prescribed Fire Plan Template [PMS 484-1]).
2. Consult with a Forest Archeologist prior to implementing any fire control line through potential cultural resource sites. Do not prescribed burn in a cultural resource site that cannot be protected from damage. Protect historic wood features by hand-constructing fire control lines, using foam wetting agents or fire shelter fabric.
3. Design fire treatments in occupied owl territories (e.g., territory or HRCA) to limit high severity patch sizes to generally less than 10 acres (potentially up to 100 acres) to minimize adverse impacts to occupied habitat (USDA 2019, Approach 2, 6.C.2).
4. Avoid vehicle use, parking, and fireline construction over volcanic openings that have limited vegetation (e.g., less than 50% vegetation) to protect existing sensitive plants and to discourage the invasion of non-native plants (e.g., cheatgrass) which can establish in a continuous pattern, and behave as a flashy fuel.
5. Do not place burn piles in volcanic (lava caps) or granitic openings and outcrops.
6. Avoid prescribed burning closer than 500 feet from active nests of all sensitive raptors during the breeding season.
7. Minimize impacts to known sensitive plant populations through prescribed fire planning. For planned spring (growing season) ignitions, the following must be met: prescribed fire can only be introduced to 20% of the known plant populations within the project area in any one year, and those same populations must not be burned in consecutive years. Avoid direct ignition in sensitive plant populations, but fire is allowed to back into populations. Some populations may require exclusion.

8. Actively plan, communicate, and manage burning operations and associated smoke emissions to limit negative effects to populated areas and Class I airsheds (designated wilderness areas and Yosemite National Park) in accordance with Tuolumne County Air Pollution Control District and regional or zone coordination efforts to prevent exceedances of the air quality health standards. Also see #C1 above (national rules and guidelines).

D. Fuelbreaks

1. Where necessary sparse understory shrubs will be retained or physical barriers installed to prevent motor vehicles from traveling cross-country or off designated routes, such as where fuelbreaks border roads or are near trailheads and designated trails. This is a common problem along treated roadsides especially over flat terrain with no natural barriers. The intent is to avoid the need for expensive, intensive installation of bollards (known examples of this issue e.g., Clark Fork Road, across from Camp Blue Road, across from Bumblebee cabin tract, many powerline rights of way, and many fuelbreaks with lava caps).

E. Vegetation Management (All)

1. Healthy sugar pine without evidence of white pine blister rust should be retained and protected from harm and damage during implementation.
2. Vegetative debris created through mastication shall not exceed 3 feet in length, and depth of material should not exceed 12 inches in more than 15% of a unit. Masticated debris exceeding this size or depth should be spread to a lesser depth, mulched into the soil, or piled for burning. 'Mulching-type mastication' is prohibited on shallow soils, less than 20 inches deep. Consult soil scientist to identify where thin soils are likely to occur.
3. On slopes less than 25%, maintain a well-distributed soil cover of 50% (except in fire salvage, maintain existing or increase cover if it is less than 50% before operations begin). Maintain 60% cover on steeper slopes. Soil cover consists of unburned or partially consumed duff, needle fall, basal live plant cover, fine woody debris, and downed logs.
4. Slope limitations:
 - a. Limit skidding with rubber-tired or fixed track equipment to slopes less than 35%; limit low ground pressure tracked equipment (e.g., traditional masticator or feller buncher) to less than 45%; and limit heel-boom loaders / shovel yarding to less than 40% unless otherwise approved by a soil scientist. Limit dozer piling to slopes less than 25% and mulching mastication treatments to less than 35% slope.
 - b. Tethered logging, or skyline hybrid: Consult soil scientist during unit layout to determine need for site-specific requirements. May be needed if Erosion Hazard Ratings are predicted to be higher than moderate, or displacement hazard is high in more than one third of a treatment unit.
5. Subsoil or decompact all landings and temporary roads to a depth of 24 inches, and all skid trails to a depth of 18 inches once no longer in use. Exceptions can be made in areas with high rock content; steep slopes; high moisture content; or where depth to restricting layer and/or erosion hazards would limit subsoiling feasibility.
6. Do not construct temporary roads within ¼ mile of an eligible Wild and Scenic River.
7. Effort will be made to avoid the need for temporary roads within PACs. Where temp roads are needed to treat in PACs, previously used temporary roads (as opposed to new temp road construction) will be used to the greatest extent possible. Temporary road decommissioning in PACs will occur soon after their use (<1 year).

8. White bark pine (*Pinus albicaulis*), if found, will be protected from harm and effects during implementation.
9. Retain all blue oak and valley oak trees except where tree removal is needed for public health and safety

F. Wildlife

1. Prior to implementation and before any habitat modification, route a site-specific Project Input Form (PIF) and conduct surveys in compliance with the USFS Pacific Southwest Region's survey protocols to establish or confirm current locations of sensitive species and sites, such as nest activity centers and roost sites for spotted owl, great gray owl, and goshawk.
2. Prior to implementing activities within PACs, the responsible Forest Service Line Officer, in consultation with the wildlife biologist, will approve treatment area layout to ensure current survey results are incorporated and that appropriate buffer distances are in place to avoid nest activity centers and roost sites, including alternate nests and roosts for California spotted owl, great gray owl, and goshawk. Activities will be reviewed and approved on an annual basis until treatments within the PACs are completed.
3. In Alternative 1, mechanical treatments may only occur in up to one-third (100 acres) of California spotted owl PACs. Because PAC boundaries will be kept current based on updated survey results and this updated information may, and often does, result in refining PAC boundaries to incorporate the best habitat associated with an activity center or to avoid areas not compatible with CSO desired conditions (e.g., fuelbreaks) additional pre-implementation PAC treatment evaluation must occur to ensure any and all mechanical treatments **do not** exceed 100 acres in any single PAC, but also that the 100 acres selected most closely represent the treatment area selection rules applied in the development of the CSO Departure index.
4. Maintain a limited operating period (LOP) prohibiting mechanical operations within 0.25 mile of activity center points during the breeding season for California spotted owls (March 1 through August 15), northern goshawks (February 15 through September 15), great gray owls (March 1 through August 15), marten den sites (May 1 through July 31), and within the specified distance of the known bald eagle nest (January 1 through August 31) as per the National Bald Eagle Management Guidelines. LOPs may be lifted by a Forest Service biologist based on non-nesting status or if a biologist determines that a particular action is not likely to cause breeding disturbance given the intensity, duration, timing, or specific location of the activity.
5. Retain the largest snags and down logs available at the rates listed in Table MR 1. Snag retention should be prioritized by size as follows (from highest to lowest priority): (1) very large snags (>36-inch DBH); (2) large snags (> 24-inch DBH); (3) medium snags (>15inch DBH). A snag is defined as a dead tree greater than 20 feet in height. Large down log retention should prioritize the largest size classes of logs with a minimum of 20 inches diameter at midpoint and decay classes 1, 2, and 3 (Figure 6, USDA 2017, S&G 10).

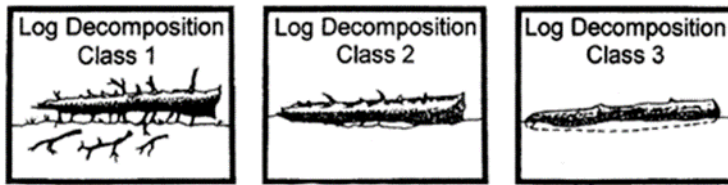


Figure 6. Log decay classes.

Table MR 1. Snag and down log retention rates.

Location		Snag Retention Rate	Down Log Retention Rate
Within Fuelbreaks	Inner Core	No retention required	No retention required
	Outer Core	2 of the largest per acre	2 of the largest per acre
Outside of Fuelbreaks	Mixed Conifer and Pine Forest Type	4 of the largest per acre	4 of the largest per acre
	Hardwood Forest Type	4 of the largest per acre	4 of the largest per acre
	Red Fir Forest Type	6 of the largest per acre	4 of the largest per acre

6. Notify a US Forest Service Wildlife Biologist if any Federally listed or Region 5 Forest Service Sensitive species are discovered during project implementation so that LOPs or other protective measures can be applied, if needed. Include necessary clauses in agreements and contracts to require notification.
7. Ensure PAC, Territory, or HRCA DBH limits are met as defined in Summary Table 22.
8. If any PAC is retired, a post-retirement evaluation of the proposed treatments within that area must be conducted prior to any adjustments are made pertaining to treatment type (i.e., PAC treatment DBH limit and habitat quality retention requirements vs. general forest requirements) or acres of treatment (i.e., relaxing the 100-acre PAC treatment limit). Ensure that treatments comply with the requirements presented in the FEIS for the new management area (e.g., see TERR-SERAL-STD-01 or SPEC-CSO-STD-05) and included in the Decision.
9. Effort will be made to avoid the need for temporary roads within PACs. Where temp roads are needed to treat in PACs, previously used temporary roads (as opposed to new temp road construction) will be used to the greatest extent possible. Temporary road decommissioning in PACs will occur soon after their use (<1 year).

G. Salvage and Hazard Tree Abatement

- For hazard tree abatement where nest stands occur within 250 feet of roadsides, consider alternatives to felling such as temporary road closure or nest structure creation by topping the hazard.
- For fire salvage and post-fire hazard tree abatement only: In high erosion hazard areas (Map 16): On main skidtrails with gradient steeper than 15 percent, apply organic mulch cover (slash, weed-free straw mulch, etc.) to the skid trail footprint and waterbar outlets. Achieve at least 50 percent cover on skidtrail footprint
- If soil cover is less than 50% before operations begin, maintain existing or increase well-distributed soil cover.
- Subsoil or decompact all landings and temporary roads to a depth of 24 inches except where high rock content, slope, moisture content, depth to restricting layer, and erosion hazard would limit subsoiling feasibility (skid trail subsoiling requirement waived in salvage).

H. Sensitive Plants

1. Prior to implementing activities, complete appropriate sensitive plant surveys based on current Regional direction.
2. Forest Service botanist will identify necessary protective measures based on sensitive plant surveys prior to implementation to ensure viable populations remain intact. Avoidance areas, limited operating periods, or other appropriate measures will be mapped and administered during implementation. R5 Sensitive and local concern plant species will be subject to treatment buffers (typically 10 feet), in which heavy equipment will be prohibited and other treatment activities may be limited, unless otherwise agreed upon by the botanist and deciding official. Specific buffer distances will depend on plant and habitat characteristics and will be determined at time of discovery.

I. Invasive Non-Native Weed Treatment

1. Herbicide label directions, as well as all laws and regulations governing the use of pesticides, as required by the U.S. Environmental Protection Agency, the California Department of Pesticide Regulation, and Forest Service policy pertaining to pesticide use, would be followed.
2. Herbicides would be applied in accordance with 1) product label directions; 2) California Department of Pesticide Regulation requirements; 3) Forest Service best management practices for water quality (USDA Forest Service 2011); and 4) Forest Service direction (FSM 2080, 2150 and 2200) and Handbook (FSH 2109.14). This project includes a Pesticide Use Spill Plan that is prepared and reviewed prior to herbicide use each year. In addition, prior to any herbicide use, a Pesticide Use Proposal (FS-2100-2) and safety plan (FS-6700-7) would be completed by the project lead and approved by the Forest Supervisor.
3. Coordination with the appropriate County Agricultural Commissioners must occur.
4. All required licenses and permits should be obtained prior to any pesticide application.
5. Where herbicide treatments are proposed, the lowest effective label rates would be used.
6. Inspect sites prior to herbicide application to ensure that no one is present who is not officially participating in the application process.
7. Post signs after application, identifying the date and chemical used, adjacent to common entry points. Posted information includes the type of herbicide applied, date of treatment, and contact name and phone number.
8. Restrict access into the treated areas until the liquid herbicide solution has dried.
9. Follow all label requirements for personal protective equipment (PPE).
10. Use minimum protective clothing, unless specified otherwise on the label. This includes coveralls over shirt and pants, socks, boots, safety glasses or goggles, hardhats, and chemical resistant gloves. All clothing will be clean at the start of the day. Change clothing and clean the skin with soap and water if the herbicide mixture penetrates the clothing.
11. Provide soap and clean water at the work site. Wash with soap and water immediately after contact with the herbicide mixture. Wash with soap and water before eating, smoking, or going to the bathroom.
12. Apply herbicides only when meteorological conditions are suitable (heat, wind speed and direction, humidity, and precipitation), as defined on the label.

J. Infrastructure Protection (Forest Service Owned / Permitted Uses)

Throughout the SERAL project area, both Forest Service owned and permitted infrastructure exists. Examples include Forest Service administrative sties and recreation facilities (campgrounds, day use areas, system roads and trails) and other infrastructure authorized through a variety of permits (special use authorizations or grazing permits, etc. Examples of authorized improvements include communication sites, powerlines, roads, water system infrastructure, recreation residences, etc.)

1. For any action Alternative, existing improvements will be protected during project implementation. Protection measures to be taken will depend on specific treatments and distance to infrastructure.
2. Protect range resources:
 - a. Avoid damage to rangeland infrastructure (fences, water developments, cattleguards) during project implementation.
 - b. Any serviceable or intact infrastructure that is damaged during implementation must be repaired to Forest Service standards.
 - c. Avoid snag retention adjacent to critical range infrastructure.
3. Infrastructure damage sustained during project implementation will be the responsibility of project contractors to repair, returning improvements to pre-implementation status.
4. Infrastructure removed to accommodate project implementation shall be replaced / returned to pre-implementation locations (signs, boulders, barriers, fences).
5. Should staging areas or trail head parking facilities be used during implementation, such sites will be rehabilitated immediately following their use. Pre & post photographs to document conditions are required.
6. Visitors / permittees can expect short term facility / area closures to ensure the safety of contractors and the general public during project implementation.
7. Public notification / project implementation progress will be provided at routine intervals. Methods may include news releases; website and Facebook updates; area newsletters.
8. If designated system off highway vehicle routes (roads and trails) are used during project implementation, routes will be rehabilitated immediately following their use to ensure OHV use is able to continue. This may include cleaning tread, drainage structures, placement of barriers, replacing / installing signs, etc.

2.04 Alternatives Considered but Eliminated from Detailed Study

A. Create a new California Spotted Owl Conservation Strategy that seeks to conserve the CSO

The Forest Service completed the Conservation Strategy for the California spotted owl (CSO) in the Sierra Nevada in 2019 (USDA 2019). The Strategy was developed to help conserve and sustain CSO populations into the future. The Strategy was meant to be a living document that can be modified as new information becomes available. A great deal of scientific information and management experience were synthesized in the Strategy to present the best means of conserving the CSO. The intent of the Strategy was to help guide future management direction in the Sierra Nevada. Creating a new CSO Conservation Strategy would require a very deliberate, focused effort by a collection of wildlife ecologists and CSO experts. Updating the content of the CSO Strategy is beyond the scope of the purpose and needs of the SERAL project which are to (1) Increase landscape resilience to natural disturbances by restoring resilient

forest conditions as guided by the NRV; (2) Provide economic opportunities to local communities; (3) Maintain safe access to public lands; and (4) Reduce the spread of invasive non-native weeds.

B. Creating a managed wildfire program rather than a logging program

The purpose and need of the SERAL project are multi-faceted. The restoration needs across the landscape cannot be addressed with prescribed fire alone, and the uncertainty and extreme risk of catastrophic losses from wildfire is far too great to remain idle. Prescribed fire is proposed as one component of the actions proposed to meet SERAL objectives. However, due to unsafe existing conditions, weather, personnel availability, and uncertain funding — opportunities to burn or manage fire are very limited. Achieving the desired conditions across the project area with fire alone would take far more years and resources than we can afford as stewards of the lands (financially, reliably, responsibly).

In the past few years alone, we have witnessed massive fires burning to the north and south of the SERAL project area – leaving destruction and devastation in their paths (Terrestrial Wildlife Biological Evaluation Figure CSO3). The Caldor Fire located on the Eldorado National Forest, the neighboring National Forest to the north of the Stanislaus National Forest ignited on August 14, 2021 and burned 221,835 acres, including an estimated 863 structures and homes that were damaged or destroyed (as of Oct. 24, 2021 at 100% contained). The SERAL project area has become one of the last remaining unburned islands of public lands in the Sierra Nevada and sits adjacent to communities who rely on an intact, resilient, forest for their well-being and livelihood. The visitors and community to the SERAL project area are no more important than the thousands of people and families who have been impacted by the other fires, but the Stanislaus National Forest has an opportunity to act quickly to prevent SERAL from experiencing the same fate.

The primary overarching objective of SERAL is to increase landscape resilience to natural disturbances (drought, insects, disease, wildfire) by restoring resilient forest conditions as guided by the natural range of variation (Purpose and Need 1.01). To meet this objective, SERAL recognizes the critical role fire plays at promoting and maintaining a healthy landscape. SERAL includes increased management by fire to maintain dynamic ecosystem structure and function as part of the proposed action.

The proposed actions included in SERAL will prepare the landscape for regular, broadscale prescribed fire. Some areas are ready to receive prescribed fire now, largely due to control lines, fuelbreaks, and prior mechanical treatments (e.g., South Beardsley). However, most of the landscape is vulnerable to fire, including prescribed fire, due to high fuel loading, overly dense forests, lack of precipitation, and narrow burn windows. In order to most expeditiously restore the landscape to a more resilient desired condition less susceptible to large scale high severity wildfires, active vegetation management, other than prescribed fire alone, is critical.

Restoring the landscape with fire alone is not possible without “prepping” the landscape by constructing the proposed fuelbreak network reducing high-density surface and ladder fuels, and thinning the forests to increase heterogeneity, reduce stand densities, and restore a mosaic forest pattern of individual trees, clumps of trees, and openings similar to reference conditions. While achieving the restoration objectives of SERAL, the treatments will also provide economic opportunities to the local and regional communities and maintain safe access to public lands.

If or when an unplanned wildfire occurs, including unplanned ignitions caused by lightning or accidental human-caused actions, management of those incidents are not subject to NEPA planning regulations. Unplanned wildfire incident management, rather, is assessed as an emergency using the Wildland Fire Decision Support System. This system assists fire managers and analysts in making strategic and tactical decisions for fire incidents and follows an analytic deliberative process for decision making when a wildfire ignites. Any management of a potential future wildfire is outside the scope of the SERAL project.

3. THE ENVIRONMENTAL CONSEQUENCES

3.01 Issues Related to the Alternatives

Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to compare trade-offs for the decisionmaker and public to understand. Issues were identified during scoping and informed the refinement of the proposed action, development of alternatives, and which effects related to the proposed action to analyze in detail (40 CFR 1501.7). Each issue is written as a cause-effect statement to describe a specific action and the environmental effect(s) expected to result from that action (Table 23). The cause-and-effect statements provide a way to focus and structure the issues analyzed in detail. Issues addressed via refinement of the proposed action or through a developed alternative are not included in the environmental consequences analysis. Table 23 also provides a summary column of how each issue was addressed.

Table 23. Issues.

Topic	Cause and Effect	Addressed
Forest Thinning	A. Forest thinning will reduce habitat quality of CSO habitat.	Analysis Issue 1A
	B. Forest thinning within CSO PACs is not necessary to increase landscape resilience.	Analysis Issue 1B
	C. Forest thinning DBH limits will impact the project's ability to effectively reduce stand densities.	Analysis Issue 3A
	D. Allowing trees greater than 30-inches DBH to be cut and removed is not necessary to increase landscape resilience.	Analysis Issue 3B
	E. Forest thinning DBH limits will impact the project's ability to provide timber (wood product) to local and regional communities and the ability to implement the proposed treatments.	Analysis Issue 4
	F. Forest thinning and fuel reduction treatments may impact the characteristics of eligible wild and scenic river segments and diminish their eligibility for future designation.	Analysis Issue 5
Project-Specific Forest Plan Amendments	A. Delineating a circular territory rather than home range core areas could result in an insufficient quantity and quality of owl habitat conserved and protected	Analysis Issue 6A
	B. Retiring owl PACs based on lack of occupancy will lessen protections for owls compared to current management direction.	Analysis Issue 6B
	C. Allowing habitat quality reduction in up to 1/3 of a PAC will lessen protections for owls compared to current management direction.	Analysis Issue 6C
Herbicides	The use of herbicides to treat non-native invasive weeds may affect human health and the health and diversity of other native species.	Analysis Issue 8
Salvage	The proposed salvage of insect-, disease-, drought-, and wildfire-killed trees lacks the site-specificity necessary to assess the potential impacts to the environment.	Alternative Modifications ²³ and Analysis Issue 9
Temporary Roads	The construction of temporary roads that are not properly decommissioned lead to erosion, unauthorized cross-country travel by wheeled motor vehicles, and introduction of noxious weeds.	Alternative Modifications ²⁴ and Analysis Issue 10

²³ To address Issue 2, the salvage proposed in Alternative 1 and Alternative 3 was refined to include specific spatial, temporal, and quantitative constraints to bound the potential impacts of the action, and salvage was not included in Alternative 4.

²⁴ To address Issue 7, the temporary road needs in Alternative 1 and Alternative 3 were better defined: including estimated quantity and better-defined constraints related to temporary road construction and decommissioning (Chapter 2.01-Aiii and 2.01-Ciii).

Issue 1A. Forest thinning will reduce habitat quality of the highest-quality California spotted owl habitat

Affected Environment

Providing highest-quality nesting and roosting habitat (as defined in Appendix B) is critical to successful reproduction of California spotted owls and viability of owl populations. Providing highest-quality habitat long-term to support long-term viability and persistence of owl populations takes precedence over calculated and minimized short-term impacts.

Currently approximately 9% of lands within the SERAL project area contain structural habitat characteristics associated with the highest-quality CSO habitat while an additional 58% contain structural habitat characteristics associated with best-available CSO habitat (Table 24). At face-value, these proportions are can easily be interpreted as CSO quality habitat is significantly limited in the project area. And some may even conclude that great efforts should be made to avoid management actions in these areas – to no end. However, assessments of the desired distribution and proportion of late-seral closed forests at the landscape scale demonstrate that the goal is not for every acre of forested land to be homogeneously composed of trees classified as CWHR 6, 5D, 5M, 4D, and 4M. And further assessments of what the desired forest conditions are for other attributes indicative of forest health and resilience, demonstrate that vegetation across the landscape, even the forested areas composed of CWHR 5D, 5M, 4D, and 4M are in conditions that put them at an elevated risk to natural disturbance (FEIS Table 26, Wildlife BE Table CSO-09). It is important to understand that a forest, PAC, Territory, or HRCA containing large trees and high canopy covers can also be overly dense, lack forest openings, contain lush understory vegetation which act as ladder fuels, and experience the same climate related stressors (lack of precipitation, warmer temperatures, higher winds) as the rest of the landscape across the Sierra Nevada. All of these stressors must be considered when analyzing the potential for forest thinning to eliminate high-quality owl habitat and impact both short-term and long-term viability of owl populations (USDA 2019; insert other citations which support owl vulnerability to natural disturbances).

Table 24. Acres of existing high-quality and best-available CSO habitat.

Land Allocation	Total Acres	High Quality	Best Available
PAC	15,722	3,157	10,697
Territory (does not include PAC acres)	33,987	3,422	19,080
HRCA	18,768	3,308	13,509
All Other Lands (Break out Private vs. NFS lands)	69,098/84,318	3,887/4,001	39,531/45,103
Total	118,808	10,466	69,308

Indicators and Measures

The concern represented by Issue 1A is that the proposed forest thinning will eliminate the existing high-quality CSO nesting and roosting habitat. The SERAL proposed actions, including forest thinning, were developed and located to maintain and promote high-quality, or where lacking, best-available CSO nesting and roosting habitat. The indicators and measures selected enable an assessment of how effectively that objective is met.

Acres of Forest Thinning Proposed: The habitat needs of the CSO were considered during alternative development and constraints were identified and included among the alternatives to maintain or promote future CSO habitat. The constraints varied to differing degrees among the alternatives, including specifications for where and how much CSO habitat was proposed for treatment within CSO PACs,

territories, or HRCAs. As a result of these constraints, the acres of proposed forest thinning treatments vary among alternatives.

High-Quality and Best-Available CSO Nesting and Roosting Habitat: Special considerations were made to ensure high-quality CSO nesting and roosting habitat are maintained and promoted to varying degrees among the alternatives. Reporting the existing and estimated post-treatment high-quality and best-available habitat enable a comparative assessment of how effectively SERAL maintains high-quality and best-available CSO habitat.

Not all high-quality habitat occurs within designated PAC, Territory, or HRCA areas. Thus, the analysis presents the results at four scales: PACs, Territories, HRCAs, and other lands outside of these designated land allocations. For this analysis, habitat quality is measured solely based on WHR size and density classes: high-quality (WHR 5M, 5D, and 6); and best-available (WHR 4D, 4M) (Table 3).

Direct and Indirect Effects

Table 25. Issue 1A direct and indirect effects. PAC acres are mutually exclusive in this table.

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Forest Thinning	PAC	3,609	0	849	0
	Territory	10,366	0		
	HRCA		0	9,575	9,517
	Project Area	30,498	0	26,471	25,414
Forest Thinning in Fuelbreaks	PAC	0	0	0	0
	Territory	2,458	0		
	HRCA		0	2,301	2,301
	Project Area	7,490	0	Same as Alt 1	Same as Alt 1
Highest-Quality Habitat (6, 5D, 5M)	PAC	3,373	3,157	3,162	3,157
	Territory	2,395	3,422		
	HRCA		3,308	3,488	3,076
	Other Lands	2,053	3,887/4,001	3,852	3,656
Best-Available Habitat (4D, 4M)	PAC	10,177	10,696	10,686	10,696
	Territory	11,814	19,080		
	HRCA		13,509	10,277	11,249
	Other Lands	29,993	39,532/45,103	39,232	40,130

None of the alternatives eliminate, or even reduce, high-quality habitat within CSO PACs. Both Alternative 1 and 3 increase the acres of highest-quality habitat within CSO PACs, while the quantity of high-quality habitat remains unchanged in Alternative 4 because no forest thinning is proposed within PACs in that alternative. The slight increase in high-quality habitat acres in PACs in Alternatives 1, and to a lesser degree in, Alternative 3, occurs because our proposed forest thinning treatments in PACs target smaller trees akin to a thin-from-below silviculture prescription and intentionally retain larger old-growth trees. Applying this treatment converts WHR 4D forests to WHR 5M because by thinning smaller trees and retaining older trees the QMD is increased.

The effectiveness of Alternative 1 in maintaining and creating new high-quality habitat within CSO PACs is attributed to three factors: a 20-inch DBH limit, a 100-acre treatment limit per PAC, and the deliberate PAC treatment area selection process. PAC treatment area selection was informed by a metric developed by Stine et. al 2020 (“CSO Departure Index”) which essentially rates CSO habitat conditions on a scale of highest to lowest quality and thus identify locations which would benefit from treatment while ensuring critical habitat needs of the owl were considered and preserved (see “DEIS Appendix E” – standalone document on project website for more details). This metric was calculated from desired CSO habitat as defined by a reference condition of forest density and patchiness, represented by data in Ng et. al (2020).

These departed-conditions are primarily made up of only small trees – with no or very few large trees greater than 30” DBH, and/or an excess proportion of dense tree clumps with too few openings. For a selection unit to be available for treatment, the CSO departure index needed to have a rating of greater than 0.5, meaning greater than 50% of a treatment selection unit contained departed-conditions.

The intended use of this metric was to allow managers to target limited treatments in PACs to areas of a lower quality habitat — areas containing small trees in dense stands with few openings — in order to most effectively reduce the threat of high severity fire and promote faster recruitment of large trees, while ensuring portions of PACs already containing higher quality habitat — large, old, closed-canopy structure — would be maintained. The slightly greater increase in high-quality habitat created within PACs in Alternative 1 demonstrates the effectiveness of the 20-inch DBH limit, the 100-acre treatment cap, and the CSO departure index in the treatment area selection process in maintaining and promoting high-quality CSO habitat in PACs. Particularly because Alternative 1 treats 2,860 more acres within CSO PACs than Alternative 3 (Table 25).

The CSO departure index was also applied during treatment area selection for Alternative 3, however, treatments in Alternative 3 have a different set of factors which reduces the effectiveness of maintaining high-quality habitat: The DBH limit is increased to 30 inches but includes a 50% canopy cover retention constraint, and treatments within PACs may occur wherever the area is located within a wild urban interface (WUI) defense zone. The later significantly reduces the number of acres treatment within PACs compared to Alternative 1. Therefore, coupled with a 30-inch DBH limit there is very little change in the acres of high-quality habitat within PACs in Alternative 3. Later in subsequent analysis sections, the DEIS will demonstrate limiting treatment acres in PACs impacts the ability of Alternative 3 to meet various aspects of the purpose and need, including reducing the landscapes susceptibility to disturbances (Issue 1B, Issue 3A, Issue 3B, and Need 1).

Treatment area selection within territories (Alt. 1) and HRCAs (Alt. 3 and Alt. 4) was not informed by the CSO departure index described above. Treatment area selection within these areas were predominantly selected to best meet the overall objectives of the project: (1) to correct the landscape’s departure from NRV in order to support a more resilient landscape and (2) reduce the landscape’s susceptibility to resource and asset losses due to large scale and high severity wildfire. Locating treatments to achieve these objectives was based on two landscape condition metrics developed for the SERAL project: Resilience Departure Index and mission-oriented net value change (see “DEIS Appendix E” – standalone document available on project website). No acreage or location constraints were applied to territory or HRCA treatment area selection in any alternative. The only differentiation between the alternatives when assessing how well high-quality habitat is maintained in territories or HRCAs are the DBH limits. Alternatives 1 and 4 both would reduce the acres of high-quality habitat in territories (Alt. 1) and HRCA (Alt. 4) respectively. However, the reduced presence of high-quality habitat is expected to be short-lived. The applied treatments in both of these Alternatives will reduce resource competition and promote tree vigor and growth. An increase in high-quality habitat will occur as trees grow and thrive. Despite a higher DBH limit within HRCAs in Alternative 3, Table 25 shows highest-quality habitat in HRCAs would increase. This occurs because the Alternative 3 treatments apply a strict “thin from below” and a 50% canopy cover threshold. Combined this limits WHR cover classes from dropping into the S or P categories from M and D.. For these reasons, the post-treatment QMD increases, and thus the WHR size class in some cases. Conversely, the Alternative 1 territory prescriptions do not adhere to a strict “thin from below” prescription and do not apply a canopy cover restriction. Therefore, a shift in post-treatment cover values is expected, however, the large trees would remain. Since highest-quality habitat is categorized based on CWHR size and density classes based modeled estimates of QMD and canopy cover, the reduction in highest quality habitat acres is a reflection of the reduction in canopy cover rather than a loss of large trees. This, according to recent literature, would be comparable to a minor short term or “weak” habitat alteration that will ultimately result in long term benefits to owl occupancy (Jones et al.

2021). This is a reasonable trade-off and the short term “costs” are offset by the cumulative benefits of immediately reducing wildfire risk and susceptibility to other natural disturbances.

As for Alternative 4, we speculate that the 20” DBH limit maintains enough small DBH material so as to limit the post-treatment QMD from increasing into the next WHR size class, resulting in a marginal decrease in acres of high-quality habitat within HRCAs.

A similar summary explains why the acres of best-available habitat are reduced among each action alternative in comparison to the existing condition (Alt. 2). Best-available habitat represents areas containing lower quality habitat (e.g., WHR 4D, 4M) which contain smaller and often overly dense stands with few openings. Forested areas composed of smaller trees in high densities are the most vulnerable to high severity fire and inter-tree competition and are the areas the proposed treatments were intentionally targeted. These areas most often represented the area most in need of treatment and most departed from the natural range of variation. Treatments applied in these areas will promote faster recruitment or growth of large trees to provide future high-quality habitat.

The proposed forest thinning thus, maintains and promotes high-quality habitat in PACs while concentrating additional treatments within territories, HRCAs, and beyond to help promote a larger proportion of high-quality habitat is available across the project area into the future. Allowing a reduction in the quantity of high-quality habitat across the landscape outside of PACs is critical to reducing the landscape’s susceptibility to large scale disturbances and loss of habitat. It is a tradeoff made acceptable by the preservation and promotion of high-quality habitat within PACs.

Project-Specific Forest Plan Amendments:

The effectiveness of Alternative 1 in maintaining and even promoting high-quality CSO habitat is in part, attributed to proposed project-specific forest plan amendment SPEC-CSO-STD-04 (Table B.1) which enable Alternative 1 to treat more acres within each CSO PAC than Alternative 3 (current forest plan). better support the ability of the proposed forest thinning to maintain and promote high-quality CSO habitat within PACs into the future.

Cumulative Effects

Will the proposed forest thinning treatments when added to other reasonably foreseeable future actions cumulatively impact the availability and maintenance of high-quality CSO habitat across the project area?

As demonstrated above, the proposed forest thinning treatments to not eliminate or even reduce high-quality CSO habitat in CSO PACs. Therefore, when added to other reasonably foreseeable future actions (Table A.4) the SERAL proposed forest thinning would not cause any measurable negative cumulative effects to the availability of high-quality CSO habitat in PACs. Outside of CSO PACs, Forest thinning actions proposed on private lands have the most potential to impact California spotted owl habitat because those actions may include clearcutting of private parcels of land adjacent to federal lands. Presently, timber harvest plans indicate plans to clear cut a very small proportion of lands located within the project area. In addition, when implementing forest thinning on private lands, the spotted owl is specially managed as per the California Forest Practice Rules (Title 14, California Code of Regulations chapters 4, 4.5, and 10) which govern the regulation of timber harvesting on state and private lands in California. If it is determined that a proposed plan has the potential to harm owls directly or significantly disturb occupied nesting habitat, CDFW works with Cal Fire and the entity who submitted the timber harvest plan to find alternatives and mitigation measures to prevent significant impacts to the species. In the SERAL project area, private lands account for very little high-quality habitat. Therefore, actions on private lands are not likely to measurably impact the maintenance of high-quality habitat across the landscape. Other planned forest thinning on federal lands in the project area will adhere to mitigation measures designed to prevent significant impacts as per direction for Regional Forester Sensitive species and the Stanislaus National

Forest Plan (USDA 2017). Assuming all policy and laws are followed cumulative effects are not expected.

Issue 1B. Forest thinning and removal of trees within California Spotted Owl PACs is not necessary to effectively reduce the landscape's susceptibility to wildfire-, drought-, and insect and disease- related mortality.

Affected Environment

California spotted owl PACs make up just over 13% of the project area or 16.5% of the NFS lands. Survey results indicate that the SERAL project area is at or near carrying capacity for CSO where carrying capacity is the maximum number of animals that can be sustained over the long-term on a specified land area (Verner et al. 1992). A gap analysis indicates potential space for only two or three additional CSO sites in the SERAL project boundary. Gap areas will be included in protocol surveys prior to implementation to identify any unknown territories. Currently, there are 53 CSO PACs totaling 15,702 acres and 57 CSO territories totaling 51,268 acres that overlap with the project area. This represents about 1/3 of the CSO sites on the Stanislaus National Forest and about 5% of CSO sites in the Sierra Nevada.

In the SERAL project area, most CSO PACs are lacking high quality nesting and roosting habitat and greater than half of the PACs consist of dense, disturbance-prone stands (Terrestrial Wildlife Biological Evaluation – p. 32 and Table CSO3).

The characteristics of the forest structure and composition across the project area, both within and outside of PACs that are conducive to high severity wildfire (e.g., overly dense, homogenous stands, with high vertical and horizon fuel continuity), also increase the forests' susceptibility to drought, insect, and disease mortality because they are stressed for limited resources.

Indicators and Measures

Issue 1B is assessed by comparing the current susceptibility of the landscape to disturbance related mortality with the estimated susceptibility post treatment among the alternatives: Alternatives 1 and 3 includes forest thinning within CSO PACs, Alternative 4 does not include forest thinning within CSO PACs. This issue is addressed at two scales: (1) project Area (all lands); and (2) CSO PACs

If forest thinning and removal of trees within CSO PACs is not necessary to effectively reduce the landscape's susceptibility to natural disturbances, the modeled post-treatment estimates of SDI, estimated flame length probabilities, and predicted vegetation burn severity for Alternatives 1 and 3 (treatments within CSO PACs included) should not be measurably more favorable than the modeled estimates for the same metrics for Alternative 4 (no treatment within CSO PACs).

Acres of Proposed Forest Thinning and Removal of Trees within CSO PACs: The acres of proposed forest thinning and removal of trees within PACs varies among the alternatives. Presenting the different values will help to assess the scale of the proposed forest thinning and tree removal for each alternative and as related to the below indicators. The proposed forest thinning and removal of tree acres will be presented as (1) acres of forest thinning via traditional harvest operations and (2) acres of mechanical fuel reduction such as mastication or machine piling and burning.

Stand Density Index (SDI): This indicator provides a measure to compare and contrast alternatives in relation to the risk factor of large-scale tree mortality related to drought, insects, and disease. SDI is a measure of stand density and competition, which is based on the number of trees per unit area (i.e., trees per acre) and the size of those trees (the quadratic mean diameter, or QMD, which is the diameter at breast height of the tree of mean basal area). SDI can be thought of as a measure of stem crowding: the higher the SDI, the more crowded the stand. As tree stands become more crowded, tree mortality often

increases, especially during drought periods because trees are water-stressed. Lack of precipitation and resulting water stress increases susceptibility of a forest to insect colonization and attack. Any insect infestation or disease may be exacerbated by a lack of precipitation. During a drought, when trees are moisture stressed, they cannot produce sufficient resin flow to resist attack. Any condition that results in excessive demand for moisture (such as tree crowding) or dense understory vegetation, can increase the tree's susceptibility to drought, insects, and disease. High stand densities are contributing toward a reduction in tree and stand health and decreased growth rates. Increased growth rates are necessary to recruit large and very large trees and snags as described in the CSO Conservation Strategy (USDA Forest Service 2019). Strategically planned thinning will reduce the SDI and inter-tree competition for resources, allowing the tree's natural defenses to properly function and enhance tree growth and health.

SDI thresholds have been identified to indicate forested stands' susceptibility to mortality from drought, bark beetle attacks and disease (Table 2). For example, a pine or dry mixed conifer stand with an SDI value greater than 220 would indicate significant inter-tree competition and stress, making the trees' susceptible to mortality from drought, bark beetle attacks and disease. SDIs greater than 220 for pine-dominant forests, or 330 for fir-dominant stands, enter the "zone of imminent mortality" where trees are likely to start dying due to stress from competition over limited resources (Oliver and Uzoh 1997). Thus, if the proposed treatments reduce the estimated SDIs to below 220 or 330—depending on the forest type—in treated stands, the landscape would be more resilient to drought and insect outbreaks. If post-treatment modeled estimates of SDI remain above 220 or 330 or are unchanged, the proposed forest thinning treatments may not reduce the landscape's susceptibility to mortality from drought, bark beetle attacks and disease to ideal target levels. However, any progress made to reduce SDI also reduces susceptibility to overstory loss.

Post-treatment modeled estimates of SDI (product of F3 – Huang et. al 2018) calculated total acres with SDIs less than 130 for pine-dominant stands and 200 for fir-dominant stands ("low risk", which indicate low competition stress); between 130 and 220 for pine-dominant stands and 200 and 330 for fir-dominant stands ("moderate risk", moderate levels of competition); and greater than 220 for pine-dominant stands and 330 for fir-dominant stands ("high risk" of tree mortality) of (1) CSO PACs and (2) the total project area.

Conditional Flame Lengths: Conditional flame length is an estimate of the probability distribution of flame length at a pixel, given the condition that a wildfire burns the pixel under different simulated wildfire conditions (i.e., 10,000 simulations). A correlation exists between flame lengths and wildfire severity: high severity (stand-replacing) fire is greatest when flame lengths exceed 8 feet, as these flame lengths are commonly associated with tree torching and crown fire initiation (Collins et al. 2013; Stephens et al. 2016). Assessing the landscape proportion expected to burn at varying flame lengths indicates the landscape's or vegetation's susceptibility to wildfire damage or effects. Post-treatment modeled estimates of conditional flame length are calculated for the full suite of proposed treatments for each alternative. That includes the forest thinning, fuel reduction, and prescribed fire treatments. Forest thinning and removal of trees does not shift the predicted flame lengths alone. However, because the proposed prescribed fire is the same across alternatives, the modeling outcomes of conditional flame length generally highlights the effects of the forest thinning and other mechanical fuel reduction treatments.

As part of the assessment of Issue 1B, post-treatment predicted conditional flame lengths (product of FSim, Finney et al. 2011, Scott et al. 2018) are presented as total acres with flame lengths of less than 4 feet, between 4 and 8 feet, and greater than 8 feet at two spatial scales: (1) CSO PACs; and (2) project area (all lands).

Annual Burn Probability: PACs have the similar risks of wildfire damage as other forested areas of this project, and currently 15,702 acres of designated CSO PACs comprise just over 13% of the total project area. Annual burn probability provides an indicator of the landscape's susceptibility to wildfire based on

the probability of burning. Annual burn probability is calculated by FSim. FSim calculates the annual burn probability for each pixel on the landscape as the number of iterations that resulted in the pixel burning divided by the total number of fire simulation iterations run (i.e., 10,000).

We expect the proposed forest thinning and tree removal will contribute to reducing the modeled estimates of annual burn probability including within CSO PACs, which is critical to the project's effectiveness at reducing the threat of habitat loss due to wildfire within CSO PACs, across the project area, and nearby areas outside the project area. Since no mechanical forest thinning or removal of trees would occur under Alternative 4 in CSO PACs, we expect Alternative 4 to be the least effective in reducing annual burn probabilities.

Post-treatment modeled estimates of annual burn probability (product of FSim, Finney et al. 2011, Scott et al. 2018) are presented at two spatial scales: (1) project area (all lands); and (2) CSO PACs. Values are reported as the number of acres at each scale with annual burn probabilities of less than 1%; 1 to 2%; and greater than 2% to 5%.

Predicted Vegetation Burn Severity: As stated above, CSO PACs have similar risks of wildfire damage as other forested areas and CSO PACs comprise just over 13% of the total project area. In general, the most vulnerable lands are those predicted to burn with high severity effects. Historically, most lands burned at regular intervals and at low to mixed severity. Vegetation burn severity in this context is defined as fire effects primarily to vegetation. High severity represents areas where vegetation has high to complete mortality. Moderate severity is a mixture of effects ranging from unchanged to high severity. While low severity represents areas where a small change in vegetation cover and a small amount of mortality of the dominant vegetation occurs (Miller and Thode 2007).

We expect the proposed forest thinning, removal of trees, and prescribed burn actions will contribute to reducing the modeled predictions of vegetation burn severity, and that the proposed forest thinning in PACs is critical to the project's effectiveness at lowering subsequent wildfire severity effects.

The Northern California Fire Severity Prediction System (NCFS) was used to assess fire severity probabilities to the existing condition of CSO habitat in the SERAL project area (Drury et al. 2021; Taylor et al. 2021). NCFS is a sophisticated cutting-edge model that uses the latest best available science to produce spatially explicit fire severity prediction maps. To support the assessment of Issue 1B, post-treatment predicted vegetation burn severity as modeled by Drury et. al 2021 at 90th percentile weather is presented as total acres expected to burn at high, moderate, or low severity at two spatial scales: (1) CSO PACs and (2) project area (all lands).

Direct and Indirect Effects

Table 26: Issue 1B acres of direct and indirect effects.

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Forest Thinning in PACS		3,609	0	849	0
Mechanical Fuel Reduction in PACs		287	0	187	0
Pine-dominant stands: SDI less than 130	Project Area	12,614	5,043	12,059	10,432
	CSO PAC	425	147	196	147
Pine-dominant stands: SDI between 130-220	Project Area	39,693	20,066	31,831	28,324
	CSO PAC	3,561	1,178	1,517	1,178
Pine-dominant stands: SDI greater than 220	Project Area	20,665	47,863	29,082	34,216
	CSO PAC	7,745	10,407	10,019	10,407
Fir-dominant stands: SDI less than 200	Project Area	3,335	873	2,190	1,786
	CSO PAC	145	26	32	26
Fir-dominant stands: SDI between 200-330	Project Area	3,070	5,310	4,159	4,566
	CSO PAC	929	995	990	995
Fir-dominant stands: SDI greater than 330	Project Area	348	570	403	401
	CSO PAC	165	218	217	218
Annual Burn Probability: Less than 1%	Project Area	87,436	10,813	84,893	79,900
	CSO PAC	12,494	358	11,802	10,920
Annual Burn Probability: 1% to 2%	Project Area	31,371	79,599	33,914	38,869
	CSO PAC	3,228	9,572	3,920	4,802
Annual Burn Probability: between 2% to 5%	Project Area	0	28,395	0	39
	CSO PAC	0	5,791	0	0
Conditional flame lengths less than 4 feet	Project Area	72,388	30,888	69,231	68,047
	CSO PAC	9,718	2,421	8,350	7,726
Conditional flame lengths between 4 and 8 feet	Project Area	26,420	39,748	27,469	27,859
	CSO PAC	3,207	4,997	3,450	3,659
Conditional flame lengths greater than 8 feet	Project Area	20,000	48,172	22,107	22,902
	CSO PAC	2,797	8,304	3,922	4,337
Predicted high vegetation burn severity	Project Area	33,254	64,981	36,783	37,453
	CSO PAC	5,116	10,794	5,561	5,647
Predicted moderate vegetation burn severity	Project Area	31,699	34,639	31,426	31,272
	CSO PAC	3,534	3,802	3,217	3,103
Predicted low vegetation burn severity	Project Area	51,152	16,486	47,897	47,381
	CSO PAC	7,015	1,069	6,886	6,914

Acres of Forest Thinning and Removal of Trees within CSO PACs: The total area of forest thinning and removal of trees within CSO PACs varies among the alternatives. Alternative 1 would apply forest thinning and removal of trees over the largest proportion of CSO PACs while Alternative 4 includes no forest thinning or removal of trees within CSO PACs (Table 26).

SDI: Existing SDI values in the SERAL project area indicate that the majority of the conifer forest stands (61%, or more than 48,000 acres) are currently at high-risk to density-related mortality. Proposed actions would result in reduced tree densities and competition throughout treated stands. The resulting improvement in tree vigor and health would increase stand resilience to disturbances such as insects, disease, drought, and wildfire, and would help facilitate the development of larger trees and future high quality wildlife habitat. Each action alternative (Alts. 1, 3, & 4) reduce the amount of forest in the “High-risk” category (Figure 7 and Figure 8). However, Alternative 1—which treats the largest proportion of

CSO PACs among the alternatives—is clearly the most effective at reducing both the total acreage (Figure 8) and the proportion of conifer forest in the “High-risk” category (from 61% to 26%) (Figure 7).

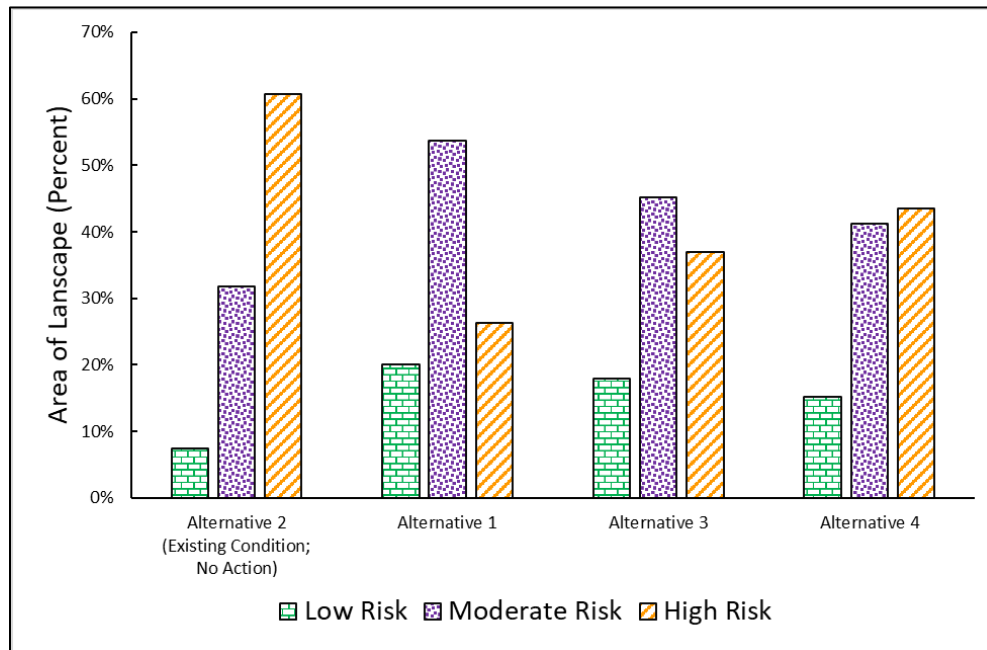


Figure 7. Percentage of conifer forests within the SERAL project area at risk of density-related mortality.

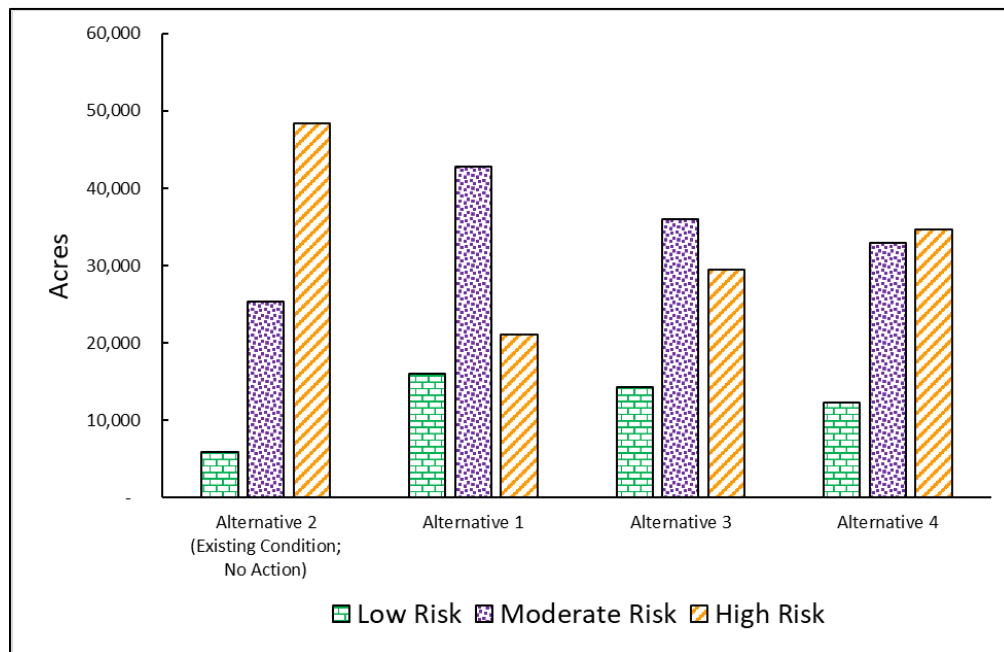


Figure 8: Acres of conifer forests within the SERAL project area at varying risk levels of density-related mortality.

Despite this, Alternative 1 would still maintain nearly a quarter of conifer forest acreage (>20,000 acres) at densities classified as “High Risk” immediately post-treatment. This is partly due to access issues (lack of roads, steep slopes), but also to leaving the vast majority of PACs at very high stand densities,

including the acres of PACs that would be treated, as proposed treatments within PACs are intentionally designed to have a very light touch. PACs account for approximately 16% of the conifer forest in the project area, and 82% of these PAC acres fall into the “High-risk” category for density-related mortality. Not treating any acreage within PACs—as in the cases of Alternatives 2 and 4—would leave thousands of additional acres at extremely high densities, which would not be consistent with the SERAL purpose and need of increasing landscape resilience to natural disturbance.

Annual Burn Probability: Under existing conditions (Alt. 2), the project area and CSO PACs contain areas that have the highest probability of burning annually (greater than 2% to 5% chance). After treatments are “applied” or modeled, the annual burn probability for essentially every acre in this category (except 39 acres in Alternative 4) is reduced. Overall, this demonstrates that our treatments are effective in reducing annual burn probabilities, even in Alternative 4 which does not include forest thinning or removal of trees within PACs.

Shifting to the next annual burn probability category (1% to 2%) a similar pattern is observed. After treatments are applied, the acres in this category are measurably reduced across the project area and within CSO PACs: project area - 60% reduction (Alt. 1); 57% reduction (Alt. 3); and 51% reduction (Alt. 4); and CSO PACs — 66% reduction (Alt. 1); 59% reduction (Alt. 3); and 49% reduction (Alt. 4). At both scales, Alternative 1 reduces the 1% to 2% annual burn probability the greatest, most likely because Alternative 1 conducts forest thinning within the most acres of PACs of all the alternatives.

Annual burn probabilities of less than 1% are the most desirable. After treatments are applied, the proportion of the project area with lower than 1% annual burn probability is significantly increased for each alternative, but once again, Alternative 1 does so most measurably.

In sum, these burn probability simulations demonstrate that although each alternative reduces the wildfire annual burn probability across the project area and within CSO PACs, Alternative 1 is the most effective of the action alternatives due to the greatest shift in acreage to the lowest probability category. Since each action alternative incorporates the same prescribed fire spatial units, the difference in alternative effectiveness is related to the variations in forest thinning among the alternatives, including where those treatments occur and how much forest thinning is applied within CSO PACs.

Conditional Flame Lengths: Similar to annual burn probability, under existing conditions (Alt. 2) the project area and CSO PACs have the greatest acreage with predicted flame lengths in the two highest flame length categories of 4 feet or more. After treatments are applied, the acreage with predicted flame lengths in these two categories are reduced under each alternative. Overall, this demonstrates that our treatments are indicating some effectiveness in reducing predicted flame lengths as intended, even in Alternative 4 which does not include mechanical forest thinning or removal of trees within CSO PACs.

The most apparent indication of the proposed treatment effectiveness is demonstrated by the increase in acreage of predicted flame lengths in the lowest category, below 4 feet, coupled with a decrease in acreage in the highest category, greater than 8 feet, across the project area and within CSO PACs under each alternative. The intermediate flame length category (4 to 8 ft) can be misleading, as it is an improvement than higher flame lengths, but has the ability to quickly transition to higher flame lengths in alignment with topography or wind, spreading through ladder fuels (e.g., understory vegetation and lower tree branches), and into crown fire behavior. The most positive outcome for both the project area and CSO PACs for reducing overstory tree death and increasing resiliency for forest ecosystems, including wildlife habitat is having the highest acreage of less than 4 feet predicted flame lengths and lowest proportion of greater than 8 feet flame lengths as listed for Alternative 1.

Predicted Vegetation Burn Severity: The Northern California Fire Severity model (Drury et. al 2021) predicts nearly 90% of CSO PACs in the SERAL project area would experience more than 75% vegetation mortality over more than 50% of the PAC (Terrestrial Wildlife Biological Evaluation, 2021). All of the remaining 10% of CSO PACs, except for one (PAC TUO0221), are foothill riparian sites so

while vegetation loss would be a relatively low percentage, the vegetation burn severity in the surrounding uplands would still be high. PAC TUO0221 is a mixed conifer site that has previously been treated by mechanical thinning, and the model shows that treatment was indeed effective in reducing high severity fire effects to that CSO PAC.

This risk of high severity fire effects and forest mortality is mirrored at the landscape scale as well. The NCFS predicts nearly 55% of the project area would experience high vegetation mortality under the existing condition (Alt. 2) at moderate dry, hot summer weather conditions (i.e., 90th percentile weather), but that reduces to 28% (Alt. 1), 31% (Alt. 3), and 32% (Alt. 4) respectively. Similar to the intermediate flame length significance mentioned above, the moderate severity predictions also indicate a transitional category, that may total to larger amounts of vegetation mortality than desired (though not as much as high severity); and moderate severity should also be reduced when possible, often through incremental treatments, like maintenance treatments over time. As mentioned, the Sierra Nevada Range evolved under a mixed severity fire regime, so all severity levels are expected to occur on the landscape over time. The most positive outcome for both the project area and PACs for reducing overstory tree death and increasing resiliency for forest ecosystems including wildlife habitat is having the highest acreage prediction in the low severity category, and lowest proportion in the high severity category as listed for Alternative 1. Maintaining or reducing this ratio to ideally even less severity categories is a long-term goal, especially during a time of changing climate, and the proposed maintenance treatments are a positive pathway towards this, especially in CSO PACs.

Cumulative Effects

CSO PACs are only delineated on NFS lands and therefore, no forest thinning, and removal of trees will occur on private lands. The past and reasonably foreseeable future projects identified in Table A.4 under Forest Service control (Tuolumne Main Canal, Cedar Ridge, Cold Springs, and the prescribed burning) were planned and analyzed in compliance with the Stanislaus National Forest current forest plan which includes specific constraints and standards and guidelines which limit where and when forest thinning may occur, as well as limit the size of the tree (DBH limit) and require canopy cover retention thresholds. As the analysis in Issue 1B presents, these current forest plan limitations contribute to a reduced effectiveness of the treatments in comparison to Alternative 1. The modeled estimates presented in Table 26 do not include post-treatment estimates for the treatments presented in Table A.4. However, we anticipate they will contribute to reducing the landscape's susceptibility to disturbances.

We foresee long term use of maintenance treatments (e.g., second or third entry treatments), such as understory tree thinning and regular cycles of prescribed fire to improve the modeled flame lengths, burn severity, and burn probability in incremental, but favorable ways for increasing resiliency across the landscape and in PACs. This includes some maintenance treatments in PACs, similar to other NFS lands, which slowly accumulate surface fuels and have tree growth and death cycles (e.g., SDI, as mentioned above and NRV that is mentioned starting in section 1.01A). Without maintenance treatments continuing over the long term, the landscape conditions will slowly 'regress' or devolve to poorer conditions in terms of resiliency to disturbances and habitat health.

There are almost 24,000 acres of non-federal lands throughout the project area. Although opportunities may occur to work collaboratively through authorities, like Good Neighbor or others of its kind, to treat the non-federal lands for the same purpose and needs as the SERAL project, currently those agreements are not in place. Other than the suite of reasonably foreseeable actions identified in Table A.4, the planned actions of the non-federal lands are unknown. This uncertainty about the ability or feasibility of vegetation treatments that could be conducted on the almost 24,000 acres of non-federal lands supports the necessity to plan to treat those lands that are under Forest Service authority. As demonstrated in Map 17, the SERAL proposed treatments affect change beyond the acres treated. The annual burn probability and predicted flame lengths are reduced in areas adjacent to those treated across the project area and nearby areas outside the project boundary.

Issue 3A. The proposed DBH limits will leave stand densities too dense and structurally homogenous to effectively reduce the landscape's susceptibility to wildfire-, drought-, and insect and disease- related mortality.

Affected Environment

The condition of the landscape across the project area is highly susceptible to wildfire, drought, insect attacks, and disease (Chapter 1.01). The SERAL project proposes varying DBH limits among the action alternatives (Table 27) designed to ensure compliance with the proposed amended and current Land and Resource Management Plan (USDA 2017) which includes ensuring critical habitat needs of sensitive species are maintained. The concern represented by Issue 3A is that the proposed DBH limits will impact the effectiveness of the proposed treatments in meeting the project's objectives, including the need to reduce stand densities (Chapter 1.01-B) and increase forest heterogeneity (Chapter 1.01-A).

Table 27: Comparison of DBH limits among action alternatives.

Land Allocation	Tree Type	Alt 1.	Alt. 3	Alt. 4
PAC	Shade-Intolerant	20"	30" – in WUI defense	No Treatment
	Shade-Tolerant	20"	30" – in WUI defense	No Treatment
Territory or HRCA	Shade-Intolerant	24"	30"	20"
	Shade-Tolerant	30"	30"	20"
Other	Shade-Intolerant	30"	30"	20"
	Shade-Tolerant	34" ²⁵	30"	20"
Within 66 feet of Rust Resistant Sugar Pine	All Conifers	40"	40"	30"
Within 66 feet of Live Aspen Stand	All Conifers	40"	40"	30"
Within a Meadow	All Conifers	40"	40"	30"

Indicators and Measures

The landscape's resilience to disturbances such as insect outbreaks, disease, drought, and wildfire is correlated with low stand densities and high structural heterogeneity at stand and landscape scales. The SERAL proposed actions were developed to reduce stand densities and to increase landscape structural heterogeneity, thus reducing susceptibility to stand replacing disturbances. Post treatment modeled estimates of SDI, basal area, flame length probabilities, fire type, and predicted vegetation burn severity enable a comparative assessment of the impacts of the proposed DBH limits on treatment effectiveness. Each metric provides a different insight into the effectiveness of the proposed treatments (and DBH limits) in reducing the landscape's susceptibility to disturbances.

Stand Density Index (SDI): As discussed in Issue 1B (**SDI**), assessing the proportion of conifer forests with SDIs above or below certain thresholds can help to quantify a landscape's susceptibility to mortality from drought, bark beetle attacks and disease.

For Issue 3A, post-treatment modeled estimates of SDI (F3, Huang et. al 2018) are presented as total acres within the project area (all lands) for pine-dominant stands and fir-dominant stands within vegetation type specific threshold categories (Table 28).

²⁵ Where at least one 30 in. DBH shade-intolerant tree is left within one tree height of tree removed

Table 28. SDI threshold categories.

Forest Type	Stand Density Index (SDI)	Threat Zone
Pine-Dominant	>220	High risk of density-related mortality
	130-220	Moderate risk of density-related mortality
	Less than 130	Low risk of density-related mortality
Fir-Dominant	>330	High risk of density-related mortality
	200-330	Moderate risk of density-related mortality
	Less than 200	Low risk of density-related mortality

Basal Area (BA): Basal area is another common measure of stand density and also an important indicator of forest health. It is determined from the sum of cross-sectional areas of all stems in a stand measured at breast height and expressed in unit of land area (square feet per acre, for example). Estimates of pre-European settlement basal areas are generally less than 150 ft²/acre in pine and mixed conifer forests and less than 200 ft²/acre in more fir-dominant stands, though was highly variable (Safford and Stevens 2017, Meyer and North 2019) (Table 14). Bark beetles and disease agents are often more damaging at high stand densities. Sartwell and Stevens (1975) found that infestations were likely to occur in ponderosa pine stands with densities ranging between 140 to 260 ft²/acre. Therefore, they recommended a target basal area of <150 ft²/acre. Research conducted in even-aged ponderosa pine stands in the Sierra Nevada suggested a thinning target of 100 ft²/acre (Oliver 1997). Landscapes with large, contiguous areas of high basal areas are generally more stressed (due to inter-tree competition for resources) and thus more susceptible to mortality. Tree mortality often increases during drought periods because trees are water-stressed leading to an inability to resist insect colonization during an attack or fight off disease due to poor resin production and flow. Any condition that results in excessive demand for moisture (such as tree crowding) or dense understory vegetation, can increase the tree's susceptibility to drought, insects, and disease. The proposed forest thinning, and understory fuel reduction treatments are expected to reduce stand basal areas.

To assess Issue 3A, we compare how well the proposed treatments reduce basal area. We assume that if too great an area has basal areas remaining above 150 ft²/acre and 200 ft²/acre respectively, that the forest thinning treatment may not be sufficient to reduce the landscape's susceptibility to mortality from drought, bark beetle attacks and disease, and that the proposed DBH limits would be one factor impacting effectiveness.

Post-treatment modeled estimates of basal area are presented for pine-dominant and fir-dominant stands as total acres within the project area (all lands) less than and greater than 150 ft²/acre and 200 ft²/acre respectively.

Conditional Flame Length Probabilities: As discussed in Issue 1B above, assessing the proportion of the landscape with vary degrees of predicted conditional flame lengths informs how susceptible the landscape is to mortality from unplanned wildfire events.

For Issue 3A, post-treatment modeled estimates of conditional flame lengths (product of FSim, Finney et al. 2011, Scott et al. 2018) are presented as total acres within the project area (all lands) within the conditional flame length categories of: less than 4 feet; between 4 and 8 feet; and greater than 8 feet.

Expected Fire Type: In Sierran Mixed Conifer ecosystems and most of its associated vegetative communities, the expected type of fire is a good indicator of the health and resilience of the ecosystem. Currently, a far greater proportion of the project area is expected to experience crown fire than is desired (as described in Section 1.01 F above). Crown fires are when flames move through the crowns of trees, usually killing most conifer trees, and many hardwood trees. Surface fire estimates are in a similar category as the conditional flame lengths (mentioned above) of less than 4 feet. No singular treatment will easily or efficiently achieve the full desired condition, so a suite of treatments including forest thinning and prescribed fire are needed. The suite of proposed treatments among the alternatives were designed to

reduce and/or maintain vegetation and fuel loads with the goal of supporting mostly surface fires, rather than crown fires, during most weather scenarios. It is difficult to plan for extreme weather events, so promoting forest openings, reducing ladder fuels, and limiting connectivity in the forest canopy and surface fuels (e.g., creating a mosaic, as mentioned in the NRV section in 1.01A and 3.02) helps to lower the risk of crown fires. DBH limits have the potential to impact the proposed treatments effectiveness at reducing crown fire potential.

Nexus (Pyrologix LLC 2021, Scott 1999, USFS Enterprise Program 2021) was used to model expected active, conditional, passive, or surface fire type for forested vegetation for each alternative. As part of the assessment of Issue 3A, fire type is presented as total acres of project area (all lands) expected within each category.

Predicted Vegetation Burn Severity: As discussed in Issue 1B above, assessing the proportion of the landscape predicted to burn at varying severities informs how susceptible the landscape's vegetation is to mortality from unplanned wildfire.

For Issue 3A, predicted vegetation wildfire burn severity is presented as acres of the project area (all lands) expected to burn at high, moderate, or low severity (Drury et. al 2021, Taylor et al. 2021) for each alternative.

Direct and Indirect Effects

Table 29. Issue 3A direct and indirect effects (acres, all lands combined).

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Pine-dominant stands:	SDI: Less than 130	12,632	5,052	12,080	10,451
	SDI: 130 - 220	39,723	20,086	31,852	28,345
	SDI: Greater than 220	20,675	47,892	29,098	34,234
Fir-dominant stands:	SDI: Less than <200	3,335	873	2,190	1,786
	SDI: 200 to 330	3,070	5,310	4,159	4,566
	SDI: Greater than 330	348	570	403	401
Pine-dominant stands:	BA: Less than 150 ft ² /acre	56,687	32,789	45,781	43,010
	BA: Greater than 150 ft ² /acre	16,343	40,241	27,249	30,020
Fir-dominant stands:	BA: Less than 200 ft ² /acre	5,412	3,655	5,251	5,197
	BA: greater than 200 ft ² /acre	1,341	3,098	1,502	1,555
Conditional flame lengths < 4 feet		72,388	30,888	69,231	68,047
Conditional flame lengths between 4 – 8 feet		26,420	39,748	27,469	27,859
Conditional flame lengths > 8 feet		20,000	48,172	22,107	22,902
Expected active crown fire		1,726	7,130	1,918	1,952
Expected passive or conditional crown fire		45,197	74,573	47,919	48,915
Expected surface fire		58,260	23,479	55,346	54,316
Predicted high vegetation burn severity		33,254	64,981	36,783	37,453
Predicted moderate vegetation burn severity		31,699	34,639	31,426	31,272
Predicted low vegetation burn severity		51,152	16,486	47,897	47,381

SDI: The existing condition of conifer forests within the SERAL project area can generally be characterized as much denser and more structurally homogenous as compared to the natural range of variation and, as such, are currently highly susceptible to largescale mortality events from drought, insects, disease, and wildfire. Current basal area values average approximately 155 ft²/acre in pine-dominant stands and 190 ft²/acre in fir-dominant stands within the SERAL project area, with more than 43,000 total acres of conifer forest stands having basal area values considered to be at high-risk to density-related mortality (>150 ft²/acre for pine-dominant stands or >200 ft²/acre for fir-dominant stands). As discussed in Issue 1B, each action alternative (Alts. 1,3, & 4) would reduce the amount of conifer

forest acreage at high-risk to competition-related mortality via mechanical thinning, as measured by stand density index (Figure 8), with Alternative 1 moving the largest number of acres toward desired conditions, followed by Alternative 3, and then 4.

Similarly, when quantified using basal area, Alternative 1 is also the most effective at reducing the risk of density-related mortality over the largest acreage (Figure 9 & Figure 10). Alternative 1 would shift approximately 23,900 acres of pine-dominated acres and 1,800 acres of fir-dominated acres to lower risk densities, as measured by basal area. Alternative 3 would shift approximately 13,000 acres of pine-dominated acres and 1,600 acres of fir-dominated acres to lower risk densities, and Alternative 4 would shift approximately 10,200 acres of pine-dominated acres and 1,500 acres of fir-dominated acres to lower risk densities.

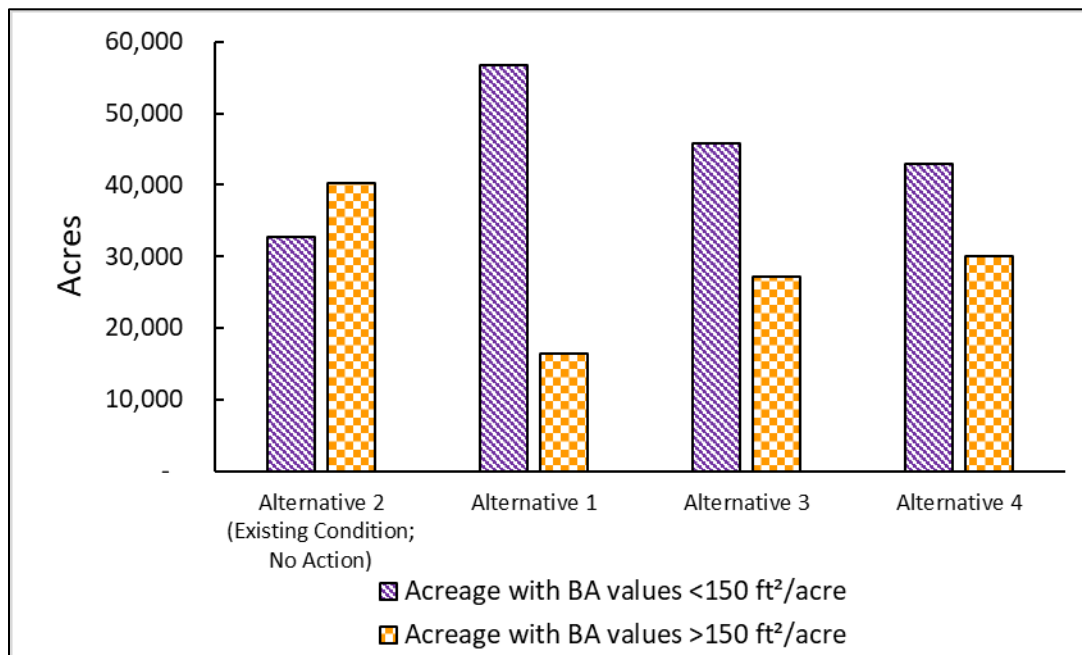


Figure 9: Acres of pine-dominant forests in the SERAL project area above and below thresholds associated with density-related mortality.

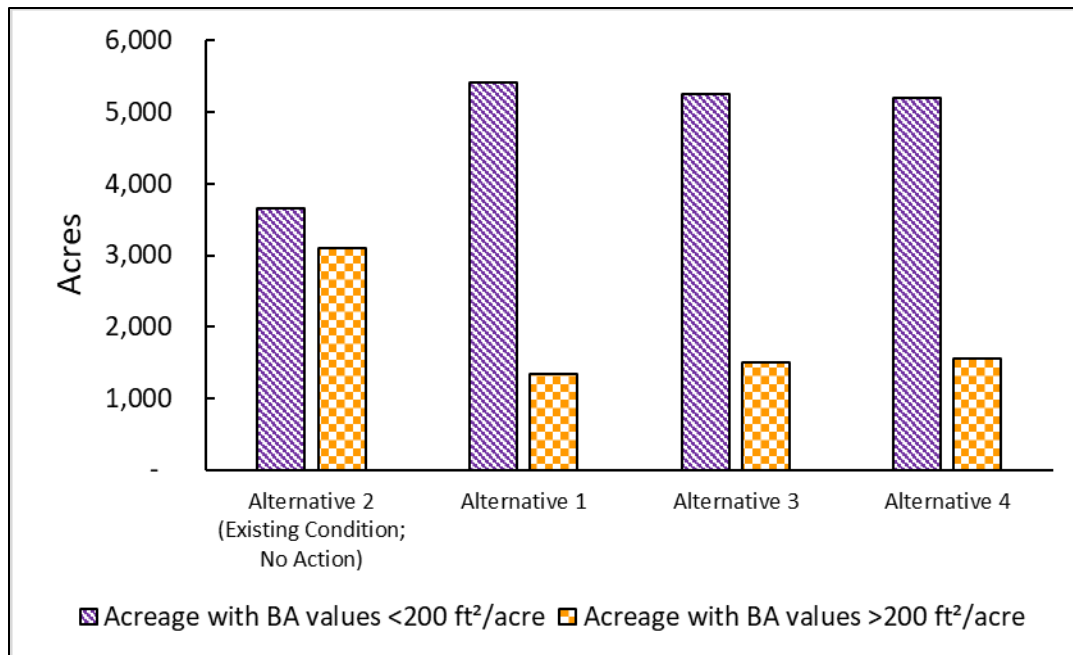


Figure 10 Acres of fir-dominant forests in the SERAL project area above and below thresholds associated with density-related mortality.

Not coincidentally, 1, 3, 4 is also the order of alternatives in terms of least- to most-restrictive diameter limits. While there is more to the story than just diameter limits (logging feasibility and canopy cover restrictions, for example), DBH limits can certainly influence the degree to which stand density can be reduced and, thus, limit the ability to move them towards desired conditions. While each of the action alternatives would be a step in the right direction, there will still be large areas left at densities considered “high-risk” to density-related mortality, even under Alternative 1. While this is due to a number of factors, diameter limits are certainly one of them. Regardless of these potential limitations, each of the action alternatives—Alternative 1 in particular—would be a massive step forward to making the SERAL project area more resilient.

Fire Modeling Results (Conditional Flame Length, Fire Type, and Vegetation Burn Severity): As mentioned above in Issue 1B, the ratio of acreage in the lowest flame length category (less than 4 ft) and the low vegetation burn severity category are greatest in Alternative 1. Likewise, the ratio of acreage in the highest flame length category (greater than 8 ft) and high vegetation burn severity category is lowest in Alternative 1, which has the widest range of DBH limits. This is an important correlation as forest canopy cover, canopy bulk density (crown mass or loading), canopy base heights (height of ladder fuels or branches), and total canopy height make up 4/8ths of the spatial layers that go into spatial fire modeling. Increased reductions in these canopy layers correlate with milder flame lengths and generally lower severity effects as well. The use of the same prescribed fire units across all the action alternatives confounds this comparison because of the dominant role that fuel model (see section 1.01 E) layer fills as 1/8th of spatial layer modeling framework. Generally, safer and more efficient prescribed fire implementation is done after some forest thinning or other mechanical work is completed, especially in areas with high fire return interval departure (see section 1.01 F) or lack of recent forest thinning actions. The use of DBH limits or tree thinning and removal guidelines means more live and dead fuel or vegetation remains on site which limits the safe and effective pace and scale of prescribed fires each year, especially in comparison to the pace and scale of the existing and still accumulating wildfire hazards in this landscape. Post-wildfire impacts to watersheds increase when a greater proportion of a watershed burns at moderate to high severity fire (Cannon 2010; Neary 2011). Under Alternative 1, the lowest

proportion of the project area is expected to burn with active crown fire under extreme weather conditions. Areas that experience active crown fire would experience high severity effects. When active crown fires occur in greater than 50% of a watershed, detrimental post-wildfire effects, such as debris flows, are expected. Landscapes with little to no active crown fire potential are expected to have less damaging post-wildfire effects.

Active crown fire potential is greatest under existing conditions (Alt. 2). Without management intervention, 70% of the project area is expected to experience crown fire behavior during a wildfire. After treatments are applied, the expected crown fire potential is reduced for each alternative. Overall, this demonstrates that each alternative is at least partially effective in reducing crown fire potential, even in Alternative 4 which includes the most restrictive DBH limits. Alternative 1 is most effective at reducing the active crown fire potential.

Increasing the ratio of expected surface fire behavior is another priority to create resilient conditions. The modeled fire type results demonstrate that the proposed treatments for each alternative will improve and increase the surface fire expected acreage during an unplanned wildfire. Alternative 1 is the largest increase (over double the amount) in acres of surface fire compared to the existing conditions, with similar but less acres of surface fire predicted for in Alternatives 3 and 4. Alternatives 3 and 4 have very similar acres expected to have passive and conditional crown fire, but Alternative 1 has the best project area ratio for this fire type category, as well as surface and active crown fire mentioned above. Alternative 1 is most effective at reducing and improving all fire type categories, which is most likely attributed to the larger quantity of acres treated, higher DBH limits and more aggressive treatment prescription applied outside of CSO PACs compared to Alternatives 3 and 4.

Cumulative Effects

While the assessment of the proposed DBH limits impacts on stand densities demonstrated that each of the action alternatives would reduce stand densities, large areas of the project area will be left at densities considered “high-risk” to density-related mortality, even under Alternative 1 (the most effective alternative). Although this is due to several factors, the proposed DBH limits are certainly one of them. Despite the acknowledgement that stand densities could be reduced further, each of the action alternatives—Alternative 1 in particular—would be a massive step forward to making the SERAL project area more resilient. Therefore, the SERAL proposed forest thinning, including the DBH limits, when added to other reasonably foreseeable future action (Table A.4) would not cumulatively impact the ability to reduce stand densities, and would contribute to a cumulative reduction in reducing the landscapes risk to disturbances.

Issue 3B. The cutting and removal of trees greater than 30-inch DBH is not necessary to effectively treat the landscape.

Affected Environment

As presented in Chapter 1.01, the current forest structure in the SERAL project area is considerably departed from the reference conditions described in GTR-256 and GTR-263 (Figure 2): yellow pine/dry mixed conifer and fir/moist mixed conifer forest types are composed of developmental stages contain much more mid- and late-closed canopy and much less open canopy than would have occurred historically.

Restoring forest composition, structure, and processes based on NRV conditions has been linked to greater resilience to wildfire, climate change, and other stressors. The concept of restoring the landscape into closer alignment with historic reference conditions is rooted in the assumption that the structural composition of forests occurring in pre-settlement times, were, and would still be, more resilient to disturbances such as insects, disease, drought, and climate change, and less susceptible to large, high

severity burn areas from wildfires. Based on the NRV assessment of the SERAL project area, restorative treatments, including the thinning and removal of trees greater than 30" DBH is necessary to rebalance the distribution and structure heterogeneity across the landscape. Therefore, the cutting and removal of trees greater than 30 inches DBH has the potential to affect resilience or the susceptibility to disturbance of the entire project area.

On a 2019 field trip to the Stanislaus-Tuolumne Experimental Forest, Dr. Eric Knapp mentioned that trees in the 30- to 36-inch diameter class were actually over-represented in the Experimental Forest compared to historic conditions, while trees >36" are the ones that are significantly under-represented. Thus, he supported the ecological justification for occasionally removing trees greater than 30 inches DBH to sufficiently reduce densities and meet other objectives such as increasing forest health or NRV restoration.

Further justification for the need to cut and remove trees greater than 30 inches DBH is provided in USDA 2019(b). In this FAQ document it states *"Due to over a century of fire suppression and changing climate, removal of trees larger than 30" may be ecologically necessary in some locations to promote more fire resilient and shade intolerant pines and hardwood trees that are being outcompeted for resources by large trees of other less resilient species, to increase the resilience of existing larger trees, and/or to restore heterogeneity and resilience to the landscape. Given that larger trees are both disproportionately important to CSO and also disproportionately at risk due to stress and competition, there may be instances where trees above 30" must be removed to perpetuate the availability of large live trees on the landscape in the future. This may be particularly true in older plantations, or other stands lacking age-class diversity, where trees are both relatively large and crowded."*

Based on the NRV assessment, Knapp's experience within the local Experimental Forest, and the justification presented in USDA 2019(b), it is reasonable to assume the cutting and removal of trees greater than 30 inches DBH has the potential to affect resilience or the susceptibility to disturbance of the entire project area.

Indicators and Measures

The same indicators presented for Issue 3A (Table 29) can be used to analyze Issue 3B. Issue 3B is assessed by comparing the current susceptibility of the landscape to disturbance related mortality with the estimated susceptibility post treatment among the alternatives: Alternative 1 includes the cutting and removal of shade-tolerant trees greater than 30 inches DBH —up to 34 inches to be exact when one 30" shade-intolerant is left within one tree height of tree removed and up to 40 inches within 66 feet of a rust-resistant sugar pine or live aspen stand or encroaching conifers located within a meadow; Alternative 3 only permits trees greater than 30 inches DBH (but less than 40 inches DBH within 66 feet of rust resistant sugar pine or live aspen stand or within a meadow); and Alternative 4 does not include the cutting and removal of trees greater than 30" DBH under any circumstances (limited to less than 20 inches DBH, Table 27).

If forest thinning and removal of trees greater than 30 inches DBH is not necessary to effectively reduce the landscape's susceptibility to natural disturbances, the modeled post-treatment estimates of SDI, basal area, estimated flame length probabilities, and predicted vegetation burn severity for Alternatives 1, should not be more favorable than the modeled estimates for the same metrics for Alternative 3 and to a greater degree Alternative 4.

Direct and Indirect Effects

The presentation of effects is supported by values presented in Table 29 (Issue 3A).

As discussed to Issue 3A, each action alternative (Alts. 1,3, & 4) would help shift the landscape towards the desired condition, in terms of resilience to drought, insects, and disease.

- Alternative 4 would reduce the proportion of conifer forest acres in the high-risk SDI category from 61% to 43% and would increase the proportion of low-risk acreage from 7% to 15%.
- Alternative 3 would reduce the proportion of conifer forest acres in the high-risk SDI category from 61% to 37% and would increase the proportion of low-risk acreage from 7% to 18%.
- Alternative 1 would reduce the proportion of conifer forest acres in the high-risk SDI category from 61% to 26% and would increase the proportion of low-risk acreage from 7% to 20%.

In terms of forest health and increasing resilience to insects, disease, drought, and competition-related mortality, Alternative 1 is clearly the most effective alternative, followed by Alternative 3 and then 4. Alternative 1 would allow the removal of trees greater than 30 inches DBH in certain rare situations, such as near aspen clones and meadows, unlike Alternative 4, which would not allow for the cutting of trees greater than 30 inches. While this difference in effectiveness cannot be 100% attributed to different diameter limits, it is one of the primary differences between the alternatives and certainly impacts modeled results.

Cumulative Effects

Does the cutting and removal of trees greater than 30 inches DBH in Alternative 1, when added to other reasonably foreseeable future actions, cumulatively impact SERAL's ability to effectively treat the landscape?

Results have demonstrated that although stand densities are reduced by each of the action alternatives, large areas of the project area will be left at densities considered "high-risk" to density-related mortality, even under Alternative 1- the only alternative which allows forest thinning to cut and remove trees greater than 30 inches DBH (other than the rust resistant sugar pine, aspen, and meadow exemptions). Is it possible that cutting and removal of tree greater than 30 inches DBH in Alternative 1 that stand densities would be more effectively reduced? Yes. Although, similarly there are likely other ways to achieve a greater reduction in stand densities than cutting more large trees.

Therefore, it is hard to measure whether cutting and removing trees greater than 30 inches when added to other reasonably foreseeable future action (Table A.4) would cumulatively impact treatment effectiveness across the landscape.

Issue 4. The proposed DBH limits will impact the Forest's ability to provide timber (wood product) to local and regional communities and the likelihood of treatment implementation

Affected Environment

Two sawmills in Tuolumne County are within the analysis area:

1. The Sierra Pacific Industries Standard Mill just east of Sonora, and
2. The smaller Sierra Pacific Industries mill near Chinese Camp.

Two other sawmills are potentially able to haul logs from the SERAL project area to their facilities economically:

1. The Sierra Pacific Industries mill in Lincoln, Placer County, 104 miles north of Sonora, and
2. The Sierra Forest Products mill in Terra Bella, Tulare County, 188 miles south of Sonora.

In addition, three other facilities in Tuolumne County are within the region of impact that can process smaller trees and/or byproducts:

1. Pacific Ultrapower Chinese Station – a 25 gross mega-watt biomass plant located in Chinese Camp,
2. The Sierra Pacific Industries Bark Plant in Keystone, and
3. The American Wood Fibers plant (formerly California Wood Shavings) just south of Jamestown off Highway 108.

And lastly, there are two biomass utilization facilities that are currently under development:

1. The 44,000 BDT / year pellet facility in the Camage Industrial Park
2. 300,000 tonne/year export wood pellet facility being developed GSNR in Jamestown.

Indicators and Measures

The objective of the SERAL project is multi-faceted. Providing economic opportunities to local communities is one aspect of SERAL's purpose and need (Chapter 1.02) and treatments were proposed, in part, to meet this objective. Volume estimates were considered when selecting and locating treatment areas, however, they did not explicitly eliminate or select any particular area. Volume estimates rather helped to inform the likely treatment mechanism that would be employed to implement the forest thinning objectives. For example, a combined average volume of timber and biomass greater than 7 CCF per acre best represents a common, real-world, minimum product needed in order to mobilize equipment, operators, and staff to implement a traditional timber harvest operation which provides wood products. Areas with an estimated total volume of 7 CCF or greater therefore represent, for this analysis, the areas that would provide wood products.

Mechanical forest thinning acres with wood product *and* DBH limits vary among the alternatives. Additionally, the proposed forest thinning among the alternatives would be applied over a range of density or canopy cover targets. These variations may impact the ability to directly measure the proposed DBH limit's impacts on wood product availability. To account for multiple variations among alternatives, analysis indicators to address Issue 4 will be measured at two scales for each alternative: (1) total; and (2) average per acre.

Post treatment modeled estimates of volume, cost, delivered market value, and net-value were calculated by Dr. John Hogland (2021).

Estimated acres which will provide wood products: This acreage is presented as the total treatment acres with wood products (generally areas with an estimated combined average of 7 CCF per acre or greater plus additional lower volume areas that are adjacent to high volume treatment areas)

Volume: Sawlogs and biomass both contribute to volume removed from the landscape, minus leakage. Volume is measured in hundred cubic feet (CCF). Volume estimates were broken down into sawlog and biomass components for the analysis because there are measurable differences between the two.

Post treatment modeled estimates of volume are presented as total CCF and average CCF per acre for both biomass and sawlog product.

Cost: The cost, in dollars, of the proposed forest thinning to move material from the forest to the relevant sawmill or biomass processing facilities. It is a combination of multiple factors that include: (1) the travel time to move woody materials from a landing to a facility along a road network, 2) the travel time to move woody materials from the forest to landings for in forest processing, and 3) various machine rates and operation costs given harvesting, processing, and hauling systems. Road maintenance or reconstruction needs were not considered in the modeling to estimate costs. Costs would be elevated proportionally with road reconstruction and maintenance needs.

Post treatment modeled estimates of cost are presented as total dollars and average dollars per acre to move both biomass and sawlogs to processing facilities.

Delivered Market Value: Delivered market value is the market value of the product removed. In this context, the delivered market value refers to the total dollar amount paid for woody biomass and sawtimber products. It is derived by the amount of removed volume measured in CCF with the proposed forest thinning prescription applied and the market price. Market values vary by species of tree and are variable. Market values for this analysis were based on the estimated values as of August 14, 2020.

DMVs were calculated for each raster by silviculture prescription assigned to that particular raster across the project area.

Post-treatment modeled estimates of delivered market value are presented as total dollars and average dollars per acre for both biomass and sawlog product.

Net-Value: The net-value is the difference between the delivered market value and the cost to implement the proposed forest thinning.

Post-treatment modeled estimates of net-value are presented as total gains or losses in dollars and average gains or losses per acre to move and remove both biomass and sawlogs.

Direct and Indirect Effects

DBH limits are a common treatment constraint included to ensure critical habitat needs of sensitive species are met and are a universal way of complying with management direction aimed at habitat retention and conservation. DBH limits are included in both the current forest plan and the proposed project-specific forest plan amendments presented in Table B.1. The proposed DBH limits included in the alternatives were included in compliance with the current forest plan for Alternatives 3 and 4 and the forest plan as amended by the project-specific forest plan amendment (Table B.1) for Alternative 1. Both Alternative 1 and Alternative 4 include more restrictive DBH limits than either the current forest plan (USDA 2017) or the forest plan as amended by the project specific forest plan amendments require (displayed in Table 27). These more restrictive DBH limits were included to address comments and concerns received during scoping pertaining, most generally, to the conservation of the California spotted owl.

Although the use of DBH limits is required, meaningful and purposeful, it is assuredly true that greater volumes of wood products would be available if the proposed treatments were free from DBH constraints. Similarly, if providing wood products was the project's sole objective, with no additional competing resource objectives or land and resource management plan requirements, then it is also assuredly true that greater volumes of wood products would be provided. However, as stated previously, the objective of the SERAL project is multi-faceted and providing wood product to local communities is only one aspect of SERAL's purpose and need (Chapter 1.02). Despite the fact that greater volumes of wood products could be provided than will be produced by the SERAL proposed actions – the results presented in (Table 30) demonstrate that wood product is provided by each alternative to varying degrees.

The proposed forest thinning in Alternative 1 translates to significantly more acres that would provide wood product than either Alternative 3 or 4 (45% and 72% more, respectively) (Table 30). Alternative 1 is the most effective at providing wood product because Alternative 1 has the least restrictive DBH limits and includes silviculture prescriptions which thin the forest to lower stand densities than either of the other action alternatives. Alternative 4 is the least effective at providing wood product because Alternative 4 includes a static 20" DBH limit across the project area coupled with not allowing forest thinning to occur within PACs. These two factors greatly limit the estimated volume of material that may be removed, and subsequently, the net-value to move and remove the product.

Regardless of funding opportunities, the greater the volume removed, the lower the cost to remove the volume and the more positive the net-value of the wood product removed is directly related to implementation feasibility and the likelihood of implementation. Based on that assumption, because Alternative 1 provides the greatest volume of wood product and has the highest net-value for both

biomass and sawlogs, we expect that Alternative 1 provides a better ability to implement the proposed treatments.

Table 30: Issue 4 direct and indirect effects.

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of Forest Thinning with Wood Product	Biomass	30,403	0	17,305	8,742
	Sawlogs	33,502	0	18,453	9,323
Total Volume Removed (CCF)	Biomass	84,522	0	47,565	26,061
	Sawlogs	316,942	0	140,396	82,911
Volume Removed per Acre (CCF / Acre)	Biomass	2.78	0	2.75	2.98
	Sawlogs	9.46	0	7.61	8.89
Total Cost to Remove Volume (Dollars)	Biomass	\$11,597,649	0	\$6,202,738	\$3,184,087
	Sawlogs	\$45,728,455	0	\$18,200,012	\$9,176,582
Cost Per Acre to Remove Volume (Dollars / Acre)	Biomass	\$381	0	\$358	\$364
	Sawlogs	\$1,365	0	\$986	\$984
Total Delivered Market Value of Volume Removed (Dollars)	Biomass	\$2,933,757	0	\$1,634,576	\$878,509
	Sawlogs	\$58,409,400	0	\$26,510,826	\$14,960,144
Delivered Market Value Per Acre of Volume Removed (Dollars / Acre)	Biomass	\$96	0	\$94	\$100
	Sawlogs	\$1,743	0	\$1,437	\$1,605
Total Net Value (Dollars)	Biomass	-\$8,663,892	0	-\$4,568,162	-\$2,305,578
	Sawlogs	\$12,680,945	0	\$8,310,814	\$5,783,562
Net Value per Acre (Dollars / Acre)	Biomass	-\$285	0	-\$264	-\$264
	Sawlogs	\$379	0	\$450	\$620

Cumulative Effects

As always, sawmill and biomass processing facility capacity is limited locally and regionally due to their limited existence and distribution. Capacity issues have become more limiting due to the more frequent regularity of large-scale wildfires and the urgency of post-fire response needs across the Sierra Nevada. Hazard tree abatement in response to wildfires alone provides a steady stream of wood product to the local and regional facilities. Post-wildfire response to the 2021 Caldor Fire which occurred on the Eldorado National Forest, the neighboring national forest to the north, has diverted all local and regional resources to focus on salvage actions until 2023. This response effort will post-pone any wood product removal in the SERAL project area until 2023. Once wood product removal begins in the SERAL project area, the wood product produced will contribute complementary to any other wood product producing actions to keep the sawmills and biomass facilities operating with a steady flow of product and to meeting the Forest's volume targets for Fiscal Years 23 and beyond. Additionally, there are currently at least 2 new pellet facilities in expected to come online in the next couple years that could potentially utilize up to a combined 344,000 Bone Dry Tons (BDT) (~688,000 green tons) annually of small diameter wood, limbs and tops and cull logs, and whose demand may improve the financial feasibility of thinning and fuels reduction treatments. The wood product that would be provided as a result of the SERAL forest thinning would never take priority over wildfire response actions in the region. The wood products that would be provided as a result of the SERAL forest thinning is, however, a Forest priority and has been factored into the USFS zones' program of work over at least the next 7 years and will be the largest contributor of wood product from the Stanislaus National Forest during that time.

Issue 5. The proposed vegetation treatments have the potential to impact the characteristics of eligible wild river segments and diminish their eligibility for future designation.

Affected Environment

Two eligible Wild and Scenic River segments lie within the SERAL project area. To be eligible for inclusion in the National Wild and Scenic Rivers System pursuant the Wild and Scenic Rivers Act, a river segment must be free-flowing and, in combination with its adjacent land area, possess one or more outstandingly remarkable values (ORVs). “Free-flowing” as applied to any river or section of a river means existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. Categories of ORVs, as defined in the Act, include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (Wild and Scenic Rivers Act, Section 1(b)). Suitability assessments are completed on eligible segments to determine if the segments are suitable for designation as a Wild and Scenic River. Both eligible segments in SERAL are suitable.

The eligible and suitable Wild and Scenic Rivers (WSRs) in the SERAL project area include 1.5 miles of the North/Middle Stanislaus-Clark Flat segment and 10.5 miles of the Sand Bar – North Fork Stanislaus segment (Table 31). Each of these segments are free-flowing and have one or more ORVs identified which make them unique among rivers of the United States (USDA 2017). The noticeable or distinctive ORVs identified for the two segments located in the SERAL project area are scenic and recreation for the North/Middle Stanislaus – Clark Flat segment and scenic, recreation, and wildlife for the Sand Bar-North Fork Stanislaus segment (Table 31).

Table 31. WSR segments and ORVs potentially affected by the SERAL proposed actions.

Eligible Wild and Scenic Segment	Preliminary Classification	ORVs	Length (miles)	Project Area within 0.25-mile Buffer (acres)
Stanislaus Segment: North/Middle Stanislaus-Clark Flat	Wild	Scenic; Recreation	1.5	190
Middle Fork Stanislaus Segment 12: Sand Bar – North Fork Stanislaus	Wild	Scenic; Recreation; Wildlife	10.5	3,937

The Stanislaus National Forest Wild and Scenic River Study (USDA, 1991) defines the ORVs for both segments as follows:

Scenic: Outstanding landscape includes a broad, deep and rugged, V-shaped, river-cut canyon through granitics with some meta-sedimentary rocks exposed. The river provides a variety of water forms including rapids, cascades and pools. Vegetation patterns include scattered ponderosa pine and oak woodland.

Recreation: Hiking and fishing are the popular dispersed activities. Access is limited, resulting in a rare opportunity for solitude and non-motorized recreation experiences, below the snow and available all year.

Wildlife (Bald Eagle): Bald eagle winter and potential nesting habitat exists between the river and the rim of the canyon. One of the four nest territories on the Forest. Bald eagles use the river for feeding during winter and early spring and roost on trees along the river.

All eligible WSRs are also assigned a preliminary classification. The preliminary classification of a river found to be eligible is based on the condition of the river and the development level of adjacent lands as they exist at the time of the study. Section 2(b) of the Wild and Scenic Rivers Act specifies and defines three classification categories for eligible rivers: Wild; Scenic; or Recreational. Both of the eligible/suitable WSR segments within the SERAL project area are preliminarily classified as Wild.

Indicators and Measures

Acres of Proposed Treatment within ¼ miles buffer of WSR Corridor: In order to assess the potential for the proposed treatments to impact the characteristics of the eligible/suitable wild river segments located within the SERAL project area and diminish their eligibility for future designation, determining the type and quantity of treatments proposed within a quarter-mile buffer of the WSR corridor must be calculated. Doing so will enable a qualitative assessment of the proposed treatments on the ORVs of each WSR segment.

The acres of proposed treatments within ¼ mile of the WSR corridors are calculated for each treatment type: forest thinning: harvest (sawlog and/or biomass removal via helicopter, skyline, or tractor), understory and surface fuel reduction (mastication or machine piling; this encompasses both forest thinning: other mechanical and fuel reduction, as described in Chapter 2), and prescribed fire only. The construction and maintenance of the fuelbreak network requires a combination of treatments, most of which overlap with other timber/fuels treatments (i.e., forest thinning: harvest). Therefore, for this analysis, the fuelbreak treatment acres are combined with the other like timber/fuels treatments. The exception is the addition of the hand pile and burn treatment for areas of steep slopes on fuelbreaks, which is calculated and reported separately, as it is not proposed as part of the other treatment types.

No salvage of insect-, disease-, or drought-killed trees (within ¼ mile of maintenance level 2-5 roads) or fire salvage (up to 500 acres/watershed) would occur within the ¼-mile WSR buffer. Of all existing maintenance level 2-5 roads, Forest Road 4N85 gets the closest to the ¼-mile WSR buffer. This road is approximately 430 feet outside of the buffer. Any insect-, disease-, drought-, or fire-killed trees within the WSR ¼-mile buffer would not pose a safety hazard to this road or any other road that is located even further away. Therefore, no future roadside hazard tree abatement would occur within the WSR ¼-mile buffer.

Water Quality Assessment: A qualitative assessment of water quality is needed to determine if water quality in the eligible/suitable Wild and Scenic River segments can be maintained under the action alternatives.

Qualitative Assessment of the Impacts of the ORVs of each WSR Segment: A qualitative assessment of treatments proposed within each eligible/suitable WSR segment is needed to determine the impacts to the ORVs and if any of the action alternatives would diminish the eligibility/suitability of the segment to be designated in the future.

Free-Flowing Condition Assessment: A qualitative assessment of the free-flowing condition is needed to determine if any of the action alternatives would impact the free-flowing condition of the river segments.

Direct and Indirect Effects

Table 32. Issue 5 direct and indirect effects.

Proposed Treatment Within WSR		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of Proposed Treatment within ¼ mile buffer of W&S River Corridor-North/Middle Fork Stanislaus – Clark Flat	Forest Thinning - Helicopter	0	0	0	0
	Forest Thinning - Skyline	0	0	0	0
	Forest Thinning - Tractor	0	0	0	0
	Understory and Surface Fuel Reduction	8	0	8	8
	Prescribed Fire Only	166	0	166	166
	Hand Pile and Burn	11	0	11	11
	Salvage	0	0	0	0
	Hazard Tree Abatement	0	0	0	0
Acres of Proposed Treatment within ¼ mile buffer of W&S River Corridor – Middle Fork Stanislaus – Sand Bar – North Fork Stanislaus	Forest Thinning - Helicopter	144	0	6	6
	Forest Thinning - Skyline	3	0	0	0
	Forest Thinning - Tractor	6	0	0	0
	Understory and Surface Fuel Reduction	14	0	19	14
	Prescribed Fire Only	2,167	0	2,310	2,315
	Hand Pile and Burn	5	0	5	5
	Salvage	0	0	0	0
	Hazard Tree Abatement	0	0	0	0

Water Quality

Maintaining high water quality is needed to maintain the WSR values of the North/Middle Stanislaus-Clark Flat segment and the Sand Bar – North Fork Stanislaus segment. As seen in Table 32, proposed treatments within the ¼ mile buffer of both eligible WSR segments are dominated by prescribed fire, with 90-99% of treatment acres proposed as prescribed fire only. While some erosion and sedimentation are anticipated to occur as a result of prescribed fire, one of the goals of these treatments is to reduce fuels, and subsequently reduce the likelihood of future stand-replacing wildfire. Stand-replacing wildfire would have much larger water quality impacts than prescribed fire, as prescribed fires do not consume extensive areas of organic matter. Management requirements are anticipated to further minimize impacts of prescribed fire on water quality.

Forest thinning treatments are proposed in the Sand Bar – North Fork Stanislaus segment only. Much of the proposed acreage is helicopter logging, which involves hand felling and lifting of trees and is anticipated to result in negligible soil displacement and subsequent sedimentation. While skyline and tractor logging systems are anticipated to have greater ground disturbance than helicopter logging, the small acreage proposed (less than 10 acres combined), as well as implementation of management requirements, are anticipated to minimize water quality impacts to the river.

Understory and surface fuel reduction treatments (mastication and piling) are also minimal, with the largest amount proposed under Alternative 3 in the Sand Bar – North Fork Stanislaus segment. The small acreage proposed, as well as implementation of management requirements, are anticipated to minimize water quality impacts to the river.

Hand piling and burning is proposed on steeper slopes along fuelbreaks. A total of only 16 acres combined is proposed in both eligible/suitable WSR segments. Ground disturbance from hand pile and burn is minimal and, when implemented following management requirements, is anticipated to have minimal water quality impacts.

While some sedimentation could occur as a result of the action alternatives, it is anticipated to be minimal and of short duration and is not expected to affect the long-term beneficial uses and purposes for which these river segments were made eligible.

ORV: Scenic

Proposed activities in the action alternatives would not alter the broad, deep and rugged, V-shaped river or the variety of water forms such as rapids, cascades, and pools. The primary treatment in the ¼-mile buffers is prescribed fire. Prescribed fire is being used to return areas where fires have historically been suppressed to their natural fire recurrence intervals. One of the goals of prescribed fire is to reduce fuel loading, which could help prevent large stand-replacing wildfire. Future stand-replacing wildfire could impact the vegetations patterns for which the WSR segments were made eligible – scattered ponderosa pine and oak woodland. This reintroduction of fire is therefore anticipated to protect scenic values.

ORV: Recreation

Proposed activities in the action alternatives would not affect hunting and fishing opportunities. No temporary road construction would be authorized by the decision, so the opportunity for solitude and non-motorized recreation experiences would not be impacted.

ORV: Wildlife (Bald Eagle)

Proposed activities in the action alternatives would not affect the outstandingly remarkable values (ORVs) to Wildlife: Bald eagles for the eligible and suitable Wild and Scenic Segment: Middle Fork Stanislaus Segment 12: Sand Bar – North Fork Stanislaus. All operations will closely follow the habitat management guidelines established for bald eagles by the National Bald Eagle Management Guidelines. These guidelines limit what types of activities may occur within specific buffer distances in bald eagle territories. Treatment areas will maintain a Limited Operating Period (LOP) prohibiting mechanical operations within 0.25 mile of activity center points during the breeding season of any known bald eagle nest (January 1 through August 31) as advised following the National Bald Eagle Management Guidelines. Bald eagle winter and potential nesting habitat between the river and the rim of the canyon has a higher probability of existing into the future under the action alternatives (see Terrestrial Wildlife Biological Evaluation) and bald eagles may be expected to continue to use the river for feeding during winter and early spring and roost on trees along the river. Under No Action, there is an increased risk of habitat loss in the long term (see Terrestrial Wildlife Biological Evaluation).

Free-Flowing Condition

Maintaining the free-flowing condition of the North/Middle Stanislaus-Clark Flat segment and the Sand Bar – North Fork Stanislaus segment is necessary to maintain their WSR values. The treatments proposed under any of the action alternatives (Alternatives 1, 3, and 4) would not affect the existing flow regimes of these rivers, as these actions would not impound, divert, straighten, riprap, or in any way modify the waterway. Constriction of flow is not anticipated as a result of stream crossings, as no temporary roads or stream crossings are proposed within the ¼ mile buffers.

Cumulative Effects

Past activities within the WSR ¼-mile buffers are limited. The Rose Creek Helicopter Insect Salvage occurred in 1992 and the Sand Bar Flat Prescribed Burn occurred in 2012. Past wildfires include the 1965 Middle Fork Fire, 2001 Darby Fire, and 2009 Knight Fire. Recovery timeframes for these activities/occurrences are such that there are currently no measurable effects from these past activities.

Outside of those proposed in SERAL, future proposed activities are limited to those needed to maintain the FERC facilities in the area. This could include treatments such as thinning, biomass removal, pile burning, mastication, salvage, hazard tree removal, and treatment of noxious weeds on up to 22 acres.

Maintaining the free-flowing condition of the eligible/suitable WSR segments is necessary to maintain the WSR values. The past activities described above have not affected the free-flowing condition of the WSR segments. The treatments proposed under Alternatives 1, 3, and 4, as well as other future activities (FERC), would not affect the free-flowing condition of the rivers. Naturally occurring events, such as landslides or trees falling into the river could affect the free-flowing condition, but these natural events would not affect the eligibility or suitability of the WSR segments.

Maintaining high water quality is also needed to maintain WSR values. Management requirements have been designed to minimize water quality impacts. This includes requirements such as retaining ground cover during prescribed fires and restoring fire lines following prescribed fires. While some sedimentation could occur as a result of the action alternatives and other future activities (FERC), it is anticipated to be minimal and of short duration and is not expected to affect the long-term beneficial uses and purposes for which the river was made eligible and suitable.

The activities proposed in SERAL, in combination with past activities and other future activities (FERC) are not anticipated to impact the ORVs for which the WSR segments were determined to be eligible and suitable.

Issue 6A. Delineating a circular territory could result in an insufficient quantity and quality of habitat conserved and protected for CSO as compared to home range core areas (HRCA).

Affected Environment

The existing Stanislaus National Forest Land and Resource Management Plan (Forest Plan) directs that HRCAs are to be delineated within 1.5 miles of a CSO activity center encompassing 1,000 acres (including the 300-acre PAC acres) of the best available CSO habitat in as compact arrangement as possible in closest proximity to the owl activity center in descending order of priority. Additional standards and guidelines are included in the existing Forest Plan to retain large trees (S&G 6) and closed-canopy cover (S&G 7) while implementing fuel reduction and other mechanical thinning treatments (USDA Forest Service 2017).

Conversely, Alternative 1 includes the project-specific forest plan amendment component LAND-SERAL-WILDLIFE-02 which changes management direction from HRCA to territory. As such, rather than HRCA delineations, LAND-SERAL-WILDLIFE-02 would direct that a California spotted owl territory be delineated as 1,000-acre circles centered on documented CSO nest sites or roost sites if nest locations are unknown. LAND-SERAL-WILDLIFE-02 also stipulates that territory boundaries may be adjusted to be non-circular, as needed, to include the entire protected activity center and the most sustainable areas of high-quality habitat and exclude areas less likely to support suitable habitat (Appendix B, Table B.1). Similar to the existing Forest Plan direction, Alternative 1 also proposes to adopt standards and guidelines (SPEC-CSO-STD-01, SPEC-CSO-STD-05, SPEC-CSO-STD-06) intended to maintain and promote sustainable and resilient owl territories and to foster the development of high-quality habitat and habitat connectivity (Appendix B, Table B.1).

Indicators and Measures

This issue focuses solely on the proposal to shift from HRCA delineation to circular territory delineations in Alternative 1.

Change in Total Acres Delineated: Assessing the change in total acres delineated as a result of shifting from HRCA to territory provides context to the magnitude of the change, if any. Those concerned about the shift and delineation believe that HRCAs cover more acres than territories. This indicator assesses that assertion.

The change in total acres delineated will be calculated as territory acres minus HRCA acres (current). Positive values indicate that territories represent a larger area than HRCAs and negative values indicate that HRCAs cover a larger area than territories.

Change in Acres of High-Quality Habitat Protected: Assessing the change in high-quality habitat *protected* (emphasis added) requires the assumption that high-quality habitat is only *protected* (emphasis added) when the high-quality habitat is located within a HRCA or territory.

The change in total acres of high-quality habitat *protected* (emphasis added) is calculated as acres of high-quality habitat located within territories delineated as 1,000-acre circles around activity centers minus the acres of high-quality habitat located within HRCAs (current). Positive values indicate a greater quantity of high-quality habitat is *protected* (emphasis added) within territories and negative values indicate that a greater quantity of high-quality habitat is *protected* (emphasis added) within HRCAs.

Change in Acres of Best-Available Habitat Protected: Assessing the change in best-available habitat *protected* (emphasis added) requires the assumption that best-available habitat is only *protected* (emphasis added) when the best-available habitat is located within a HRCA or territory.

The change in total acres of best-available habitat *protected* (emphasis added) is calculated as acres of best-available habitat located within territories minus the acres of best-available habitat located within HRCAs (current). Positive values indicate a greater quantity of best-available habitat is *protected* (emphasis added) within territories and negative values indicate that a greater quantity of best-available habitat is *protected* (emphasis added) within HRCAs.

Desired Condition: SPEC-CSO-DC-07 describes the desired condition of a CSO Territory (FEIS Appendix B, Table B.1). Assessing the conditions of each territory and determining whether the habitat available within the territory meets the desired condition is important when proposing treatments within a territory. Equally as important is evaluating the post-treatment condition to assess whether the desired condition is maintained or promoted by the simulated treatments.

Land ownership assessment: Assessing the proportion of each territory that falls on NFS land versus other ownership is an important aspect when evaluating the status of habitat within a CSO territory and when determining the location, amount, and types of treatments.

Direct and Indirect Effects

Owls benefit from mature forests with a mosaic of vegetation types and seral stages. A mosaic condition of small open areas or gaps and edges interspersed with high-quality nesting/roosting habitat is considered an important predictor for owl occupancy and reproduction. Circular territories rather than Home Range Core Areas (HRCA) better recognize the need to manage toward NRV and fine scale habitat heterogeneity that recent research shows owls prefer for nesting, roosting, and foraging. In contrast, HRCA focus mainly on canopy cover over a large area which may result in homogenization, densification, and continuous fuel profiles that increase the risk of sustained crown fire. Circular territories also better recognize how owls are central place foragers (i.e., tend to focus activities in a circular pattern). In contrast, HRCA delineation in practice, often result in more “amoeba” like or long linear features that may not actually be defended by owls (an owl territory is the area defended by a resident pair).

The quantity and quality of the CSO habitat currently encompassed by existing HRCAs and the quantity and quality of CSO habitat encompassed by the would be 1,000-acre territory circles as proposed in Alternative 1, are presented in Table 33. The acres reported, are inclusive of the PAC acres which occur within both territories and HRCAs. Where acres overlapped within a single category (territory or HRCA) those acres were not counted twice. For example, it is common, particularly in HRCAs, for multiple individual HRCAs to share many of the same acres. Overlap occurs among individual territories when delineating 1,000 acres territories as well, but not to the same degree.

Delineating 1,000-acre territory circles around activity centers *protects* more acres than HRCAs based on existing delineations and approximately 67% of the existing HRCAs would become part of the new territories in Alternative 1 (Table 33). Comparatively, territories contain almost 5,000 acres more total “quality” habitat than HRCAs but most of the acres of quality habitat fall into the best-available category as opposed to high-quality. This assessment demonstrates broadly that shifting to circular territories from HRCAs does not fundamentally result in an insufficient quantity or quality of California spotted owl habitat protected. The unmodified shift to circular territories, would however, include a slightly lower quantity of high-quality habitat (186 acres less) than the currently delineated HRCAs. We address circular territories including less of the highest-quality habitat in more detail below.

Table 33. Issue 6A effects – Acres reported for territories include the overlapping PAC acres.

Indicator	Territory All Lands	Territory FS Land	Territory Private	HRCAs FS Lands	Change All Lands (Terr - HRCAs)	Change FS Land	Change Private	Shared
Total Delineated	47,958	40,057	7,901	33,548	14,410	6,509	7,901	22,501
Highest-Quality Habitat	6,154	5,842	311	6,340	-186	-497	311	4,446
Best-Available Habitat	28,559	24,323	4,236	23,649	4,911	675	4,236	15,505

Territories encompass a greater number of acres than HRCAs (14,410 acres more) and share approximately 67% of the same acres as HRCAs. Greater than 84% of circular territory delineations are located on FS land, but an additional 16% of circular territories overlap private lands.

Concerns were expressed regarding circular territories overlapping private lands due to the forest inability to control management of the forests on those lands. Those are valid concerns, particularly because the circular territories are composed of 186 less acres of highest-quality habitat than HRCAs and the lack of highest-quality habitat on private lands contributes to this reduction. Those who expressed those concerns recommended that the forest should or was required to (per SERAL-CSO-WILDLIFE-02 which states, *Territory boundaries may be adjusted to be non-circular, as needed, to include the entire protected activity center and the most sustainable areas of high-quality habitat and exclude areas less likely to support suitable habitat*) modify the boundary of the territories to avoid private lands and to ensure 1,000 acres of territory are located on FS lands to ensure adequate protections for the owl are maintained. However, it is important to note that SERAL-CSO-WILDLIFE-02 does not make any reference to modifying PAC boundaries based solely on administrative ownership and that is intentional and in alignment with the CSO Strategy of which SERAL-CSO-WILDLIFE-02 was based on.

A HRCAs, as used by the 2004 SNFPA, 1000 acres, includes the PAC acres, and is drawn as an irregular polygon around existing high canopy cover habitat. HRCAs are designated based on current vegetation conditions, and all HRCAs acres are managed uniformly for suitable habitat of at least 50% canopy cover. Territories, on the other hand, are drawn as a circle, regardless of current vegetation conditions or administrative boundaries, and are managed for vegetative diversity, a portion of which is managed for nest/roost habitat (40-60% of the area). The Strategy recommends using territories instead of HRCAs because: (1) the scientific community uses the territory scale (not HRCAs) in their analyses of owl habitat and population dynamics; (2) CSOs are central place foragers, so a circle is an appropriate shape for an area to capture owl behavior and habitat use; and (3) territory desired conditions are meant to foster habitat diversity as well as high-quality habitat in sustainable locations, rather than being based solely on where habitat exists today.

The desired conservation outcomes recommended for a CSO territory area are ecological, not administrative, and do not depend on land ownership or designation. Therefore, in considering how to

manage the portion of a territory subject to Forest Service management, agency staff should consider the ecological conditions of all land within the territory (as well as the management plans for non-Forest Service areas, if known). This may mean that a large proportion of the NFS acres in any given territory will be more homogenous, if there is a high level of ecological diversity on non-Forest Service lands (or vice-versa). For example, if a significant proportion of a territory is in open or young forest conditions on another ownership, the proportion of the territory on NFS land would need to be disproportionately made up of closed or older forest conditions to reach the overall desired conditions for the territory (Appendix F).

Cumulative Effects

In light of the conclusion drawn above, that shifting to territories from HRCAs would not fundamentally result in an insufficient quantity or quality of California spotted owl habitat protected, but rather lead to an increase in the quantity of California spotted owl habitat protected, including quality habitat, this shift has the potential to contribute, cumulatively to California spotted owl preservation across the landscape. Conversely, because the analysis demonstrated that territory delineations would not result in an insufficient quantity of California spotted owl habitat protected, included quality habitat, the shift to territories would not cause any detrimental or negative cumulative effects when added to other current or reasonably foreseeable future actions. The more acres of California spotted owl habitat that are maintained and protected on NFS lands in the SERAL project area, the more likely spotted owl persistence, reproduction, and population growth may occur, including onto neighboring non-federal lands and into areas outside of the project area.

Issue 6B. PAC retirement based on lack of occupancy will lessen protections for CSO compared to current management direction.

Affected Environment

The current Stanislaus National Forest Land and Resource Management Plan stipulates that PACs are maintained regardless of California spotted owl occupancy status and only allow PAC remapping or removal from the network after a disturbance event impacts or eliminates suitable habitat (USDA 2017, p. 180). Alternative 1 includes a proposed project-specific amendment to add a plan standard which would allow PAC retirement based on lack of occupancy in accordance with criteria stipulated in the 2019 CSO Strategy or more current guidance for the region if it becomes available (Table B.1, SPEC-CSO-STD-03). Currently, there are 53 CSO PACs overlapping the SERAL project area in whole or in part, excluding slivers or small mapping errata. Of the 53 CSO PACs, 36 have reproductive status, 13 have pair status, and 4 have territorial single status. These 4 PACs with territorial single status are known to lack nest structures and contain no (0%) or very little (21%) high-quality habitat (Terrestrial Wildlife Biological Evaluation at pp. 32-33). The local expert wildlife biologist speculates that 2 to 3 of these 4 PACs would be eligible for retirement under Alternative 1 based on lack of occupancy of territorial pairs. Comparatively, based on a gap analysis which indicates space for only two or three additional California spotted owl PACs in the SERAL project area, the local expert wildlife biologist speculates that an additional one to two PACs will be designated based on updated survey information when it becomes available.

Indicators and Measures

Acres of PACs potentially retired: Local experts have a keen grasp on owl occupancy and habitat across the project area. Their collective knowledge assessed past occupancy information and the existing conditions within those areas. Using local knowledge to estimate the potential to retire PACs enables the impact of the project-specific forest plan amendment to be quantified. Updated survey information will not be completed and available for use in this DEIS analysis. However, the retirement estimate has been

inflated to ensure we account for the largest potential impacts of the change in PAC retirement standards. Information will be updated prior to the Final Environmental Impact Statement.

Acres of PACs potentially retired are presented as a sum of the acres of the PACs likely to be retired as identified by the local Stanislaus National Forest wildlife biologists.

Acres of high-quality habitat within potentially retired PACs: Assessing the quantity of high-quality habitat within the potentially retired PACs measures the quality of these PACs and may inform the reason for the non-reproductive status of the PAC and contribute to an assessment of whether or not those PACs should be retired.

Annual burn probability, conditional flame length, and estimated vegetation burn severity: Assessing the annual burn probability, predicted conditional flame lengths, and estimated vegetation burn severity of the potentially retired PACs informs the vulnerability of these particular PACs and assesses whether retiring these PACs would lessen protections for the owl. If these PACs are at an elevated risk of wildfire effects, retiring the PAC and treating a larger portion of the area may promote longer term protections for the CSO and be more beneficial to CSO conservation than maintaining the existing PAC delineations.

Direct and Indirect Effects

The four potentially retired PACs total approximately 1,167, but habitat quality in these 4 PACs²⁶ is lacking (Table 34). Less than 5.5% of these PACs contain high-quality habitat. The majority of these PACs are comprised of best-available habitat (70%). Best-available habitat equates to lesser quality habitat made up of smaller trees in the WHR 4D and 4M classifications, but when high-quality habitat is lacking, represent the ‘best-available’ and are occasionally (but rarely) utilized by spotted owl for nesting and roosting. The remaining 25% of these PACs lack any nesting and roosting habitat.

The majority of the area of these PACs fall into the moderate annual burn probability category in the project area (76%), have predicted conditional flame lengths of greater than 4 feet (80%), and are predicted to burn at moderate or high severity (85%) (Table 34). Collectively these estimates of the risk of these four PACs to experience detrimental effects from wildfire demonstrates the fate of these particular PACs are grim without treatment.

Because management actions are limited within PACs, including in Alternative 1, maintaining PAC delineations despite occupancy status and regardless of an assessment of their vulnerability to disturbances such as wildfire or an assessment of their habitat quality, is poor management and detrimental to the owl. This assessment demonstrates that enabling the ability to retire a PAC based on lack of occupancy due to poor habitat quality would broaden management’s the ability to conduct landscape restoration and better promote resiliency and long-term California spotted owl persistence. Perpetually retaining a PAC regardless of PAC occupancy status diminishes the effectiveness of forest management actions because at least a portion of the perpetually delineated, yet unoccupied PACs containing poor habitat quality, would be left untreatable due to management constraints.

²⁶ 0093, 0117, 0137, and 0189.

Table 34. Issue 6B effects.

Indicator	Acres
Area of PACs potentially retired based on lack of occupancy	1167
High-quality habitat within potentially retired PACs	53
Best-available habitat within potentially retired PACs	825
Other – Poor Habitat	289
Low Relative Annual Burn Probability (<1%)	285
Moderate Relative Annual Burn Probability (1-2%)	883
Conditional flame length < 4 feet	234
Conditional flame length between 4 – 8 feet	413
Conditional flame length > 8 feet	519
High Vegetation Burn Severity	570
Moderate Vegetation Burn Severity	420
Low Vegetation Burn Severity	173

Cumulative Effects

In light of the conclusion drawn above, PAC retirement is not expected to lessen protections for California spotted owls compared to current management and therefore would not cause any negative or detrimental cumulative effects when added to other current or reasonably foreseeable future actions. Conversely, the conclusions drawn above, demonstrate that PAC retirement may actually promote better protections for the spotted owl, including increasing the quality and resilience of the habitat in the longer term by allowing more management flexibility to treat within those areas. The more acres of California spotted owl habitat that are maintained and protected on NFS lands in the SERAL project area, the more likely spotted owl persistence, reproduction, and population growth may occur, including onto neighboring non-federal lands and into areas outside of the project area.

Issue 6C. Allowing habitat quality reduction in up to 1/3 of a PAC will lessen protections for CSO compared to current management direction.

Affected Environment

The current Stanislaus National Forest Land and Resource Management Plan (USDA 2017) generally stipulates that mechanical vegetation treatments should avoid PACs to the greatest extent feasible / possible (USDA Forest Service 2017, pp. 14, 33, 180), or when necessary should focus only on the removal of surface and ladder fuels within WUI defense zones, and in some cases in WUI threat zones (USDA Forest Service 2017, S&G 7, p. 34 and S&G 72, p. 181).

The project-specific forest plan amendments proposed in Alternative 1 eliminate this PAC avoidance direction and propose new plan content that promotes active management within PACs where necessary to increase resiliency and sustainability (Appendix B, Table B.1; USDA 2019, p. 28). Issue 6C specifically addresses concerns with proposed project-specific plan amendment component SPEC-CSO-STD-04 (Appendix B, Table B.1).

The proposed component SPEC-CSO-STD-04 applies only to the SERAL project and constrains the Agency from authorizing or carrying out treatments within a PAC that would reduce habitat quality on greater than 100 acres (1/3rd of the PAC). A forest plan does not authorize projects or activities or commit the Forest Service to take action (36 CFR 219.2(b)(2)). Rather, a forest plan provides a framework for integrated resource management and for guiding project and activity decision-making (36 CFR 219.2(b)(1)). The proposed treatments included in Alternative 1 were designed to ensure compliance with

the proposed amended plan as presented in Appendix B, Table B.1, including SPEC-CSO-STD-04. Component SPEC-CSO-STD-04, for Alternative 1, was applied conservatively, constraining mechanical treatments within PACs to only *up to* (emphasis added) 100 acres — as opposed to allowing every acre of the PACs to be treated as long as habitat quality was not reduced on greater than 100 acres. This conservative application of SPEC-CSO-STD-04 was intentional and deliberate. This avoids subjective interpretation and debate as to whether treatments are reducing habitat quality on a greater number of acres than component SPEC-CSO-STD-04 and the CSO Strategy (USDA 2019) intended. Constraining mechanical treatments to 100 acres within California spotted owl PACs in Alternative 1 is a clear, straightforward, and measurable way to ensure the proposed treatments are compliant with the amended forest plan and California spotted owl habitat is maintained.

Despite Alternative 1's conservative application of component SPEC-CSO-STD-04 it is possible that the proposed forest thinning treatments within California spotted owl PACs may affect the quantity and quality of CSO PACs located within the SERAL project area compared to Alternative 3 which were developed based on the current forest plan.

Indicators and Measures

To assess whether Alternative 1 lessens protections for California spotted owl compared to Alternatives 3 we present two perspectives: (1) How does proposed project-specific plan amendment component SPEC-CSO-STD-04 affect the quantity of California spotted owl PACs proposed for treatment; and (2) How are the post-treatment estimates of habitat quality impacted by proposed project-specific plan amendment component SPEC-CSO-STD-04. No treatments within PACs are proposed in Alternative 4 and therefore Alternative 4 is not included in the effects analysis for Issue 6C.

Acres of existing PACs: Reporting the existing PAC acres represents the areas potentially affected by proposed amendment SPEC-CSO-STD-04.

Acres of Forest Thinning Proposed within CSO PACs: The acres of proposed forest thinning within PACs varies between the alternatives as a direct result of the difference between the agency constraint stipulated by proposed amendment SPEC-CSO-STD-04 and current plan direction S&G 7, S&G 72, and S&G 74 (Appendix B, Table B.1).

High-Quality and Best-Available CSO Habitat: Special considerations were made during project development to ensure high-quality (or best-available where high-quality was lacking) CSO nesting and roosting habitat were maintained when selecting treatment areas within CSO PACs. Reporting the existing and estimated post-treatment high-quality and best-available habitat will demonstrate how effectively the proposed forest thinning treatments maintain high-quality (and best-available) habitat in PACs. Comparing the estimated post-treatment high-quality and best-available habitat will also provide insight into whether component SPEC-CSO-STD-04 affects habitat quality retention compared to current management direction. Post treatment modeled estimates of both the remaining high-quality and best-available CSO nesting and roosting habitat (based on WHR size and density classes and canopy cover product of F3 – INSERT Citation) are presented as total acres.

Direct and Indirect Effects

It is apparent that proposed project specific forest plan amendment component SPEC-CSO-STD-04 allows more acres to be selected for treatment in Alternative 1 as compared to Alternative 3 (current management) (Table 35). This is not surprising, because current management restricts mechanical treatments within PACs to areas located within WUI Defense zones, and in some cases WUI threat zones only.

Issue 1A largely addresses how proposed project-specific plan amendment component SPEC-CSO-STD-04 impacts habitat quality but for simplicity those results will be represented here.

None of the alternatives eliminate high-quality habitat within CSO PACs (Table 35). Both Alternative 1 and 3 increase the acres of high-quality habitat within CSO PACs. The slight increase in high-quality habitat acres in PACs in Alternatives 1, and to a lesser degree in, Alternative 3, occurs because our proposed forest thinning treatments in PACs target smaller trees akin to a thin-from-below silviculture prescription and intentionally retain larger old-growth trees. Applying this treatment converts WHR 4D forests to WHR 5M because by thinning smaller trees and retaining older trees the QMD is increased.

More importantly, despite a greater quantity of acres proposed for treatment in Alternative 1 (+2,860 acres) compared to Alternative 3 (Table 35), Alternative 1 still increases the acres of high-quality habitat within PACs. This result demonstrates above all others that treating up to 1/3 of a PAC and allowing habitat quality reduction to occur in these areas, does not definitely result in a loss of quality habitat or reduced habitat quality — either short-term or long-term. For Alternative 1, the effectiveness of the proposed forest thinning treatments coupled with the effectiveness of the Stine et. al (2020) California spotted owl departure index with informed PAC treatment area selection (see “DEIS Appendix E” – standalone document available on project website) at maintaining and promoting high-quality California spotted owl habitat in PACs are validated. The forest thinning treatments in Alternative 1 were successfully located and limited to areas with lower quality habitat— areas containing small trees in dense stands with few openings — in order to most effectively reduce the threat of high severity fire and promote faster recruitment of large trees, while ensuring portions of PACs already containing higher quality habitat — large, old, closed-canopy structure — are maintained.

This same summary statement explains why the acres of best-available habitat in California spotted owl PACs are reduced in both Alternative 1 and Alternative 3 in comparison to the existing condition (Alt. 2). Best-available habitat represents areas containing lower quality habitat (e.g., WHR 4D, 4M) which contain smaller and often overly dense stands with few openings. Forested areas composed of smaller trees in high densities are the most vulnerable to high severity fire and inter-tree competition and are the areas where proposed treatments were intentionally targeted. These areas most often represent the area most in need of treatment and most departed from the natural range of variation. Treatments applied in these areas are expected to promote faster recruitment or growth of large trees to provide future high-quality habitat. Therefore, although the acres containing best available habitat are reduced, a proportion of those acres are converted into high-quality habitat as discussed previously, and the remainder of those acres are expected to become high-quality habitat as the thinned trees grow.

The results presented here dispute the concern that the proposed project specific forest plan amendment component SPEC-CSO-STD-04 will lessen protections for CSO compared to current management and demonstrate effective this change in management is at promoting and conserving high-quality California spotted owl habitat.

Table 35. Issue 6C effects.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Acres of existing PACs	15,721	Same as Alt. 1	Same as Alt. 1	Same as Alt. 1
Forest Thinning Proposed within CSO PACs	3,609	0	849	0
High-quality CSO Habitat within CSO PACs	3,373	3,157	3,162	Same as Alt. 2
Best-available CSO Habitat within CSO PACs	10,177	10,696	10,686	Same as Alt. 2

Cumulative Effects

In light of the conclusion drawn above, allowing habitat reduction in up to 1/3 of a PAC as the proposed project specific forest plan amendment component SPEC-CSO-STD-04 would allow in Alternative 1, does not definitely result in a loss of quality habitat or reduced habitat quality — either short-term or long-term. Quite the contrary. Alternative 1 is expected to actually increase the quantity of high-quality habitat despite treatment almost 3,000 more acres than Alternative 3. Therefore, amending the forest plan

to “allow” habitat reduction would not cause any negative or detrimental cumulative effects when added to other current or reasonably foreseeable future actions. Rather, “allow” habitat reduction in up to 1/3 of a PAC, at least as applied to Alternative 1, promotes increased habitat quality. Therefore, the proposed treatments within PACs in the SERAL project when added to other current or reasonably foreseeable future actions on NFS lands or non-federal lands would balance the potential impacts of those other treatments.

Issue 8. The proposed use of herbicides to treat non-native invasive plants may adversely affect human health and the health and diversity of other native species.

Affected Environment

Thirty (30) species of non-native and invasive plants have been found within the project area. Population sizes vary among the species and the use of herbicides to control or eradicate their occurrences is proposed to occur within these known populations. As such the proposed use of herbicides is limited to occur: (1) where necessary to treat the approximately 231 acres (plus an additional 20% to account for population spread prior to treatment) of currently mapped infestations of invasive / noxious weeds; and (2) where new infestations are detected within the proposed fuelbreak network. .

Indicators and Measures

A Human Health and Ecological Risk Assessment was completed by the Syracuse Environmental Research Associates (SERA) for each herbicide proposed for use (USDA 2021(b)). The information in these assessments is the basis for worksheets which estimate concentrations of herbicide in water for a range of potential scenarios (USDA 2021(b)). Analysis indicators and measures from these risk assessments vary among the proposed herbicides: those used to assess the effects of glyphosate and those used to assess the effects of all other proposed herbicides.

Water Quality – Glyphosate:

Is the Maximum Contaminant Level (MCL) exceeded? Yes or No. Both the State of California and the Environmental Protection Agency has set a MCL for glyphosate. The assumption is if the MCL is not exceeded then water quality standards would be met, and beneficial uses of water would be protected. If levels exceed the MCL, then further analysis is needed to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses, and what management requirements are needed to prevent standards from being exceeded. Each of the following will be compared to the MCL:

Peak Expected Environmental Concentration (EEC): The risk assessment estimates a peak EEC - a short-term peak concentration of glyphosate in water (acute exposure).

Chronic Expected Environmental Concentration (EEC): The risk assessment estimates a chronic EEC – a long-term peak concentration of glyphosate in water (chronic exposure).

Accidental Spill into a Pond: The risk assessment estimates the concentration of glyphosate in water under the scenarios of an accidental spill of 20, 100, and 200 gallons into a pond.

Water Quality – All Other Herbicides:

Is the hazard quotient (HQ) greater than 1 for sensitive aquatic invertebrates? Yes or No. Neither the State of California nor the Environmental Protection Agency (EPA) have developed MCLs for the other six proposed herbicides. Since MCLs are not established, as a proxy, the no observed adverse effect concentration (NOAEC) for sensitive aquatic organisms is used. This is the concentration in water where there are no anticipated adverse effects to sensitive aquatic invertebrates. Modeled concentrations of herbicides in water are divided by the NOAEC to get a hazard quotient (HQ). If the HQ is less than one,

then it is assumed that water quality objectives are met, and beneficial uses of water are protected. If the HQ is greater than 1, then further analysis is needed to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses of water, and any management requirements that could mitigate that risk.

The HQ for sensitive aquatic invertebrates will be evaluated for the following scenarios:

Peak Expected Environmental Concentration (EEC): The risk assessment estimates a peak EEC - a short-term peak concentration of herbicides in water (acute exposure).

Chronic Expected Environmental Concentration (EEC): The risk assessment estimates a chronic EEC – a long-term peak concentration of herbicides in water (chronic exposure).

Accidental Spill into a Pond: The risk assessment estimates various scenarios of herbicide spill into a pond.

Human Health – All Herbicides:

Is the hazard quotient (HQ) greater than 1 for human health? Yes or No. The risk assessment estimates a dose for exposure to each herbicide. A hazard quotient (HQ) was calculated by dividing this dose by the human reference dose (RfD) established by the EPA. In general, if the HQ is less than or equal to 1, then the dose is at or below the RfD and the risk of human health effects is considered acceptable. Whether a particular dose is at or below the RfD will be assessed for the following circumstances:

Workers with General Occupational Exposure (Chronic)

Workers with Accidental Exposure (Acute)

General Public with Longer-term Exposure (Chronic)

General Public with Shorter-term Exposure (Acute)

Surfactants and Colorants:

Surfactants improve the activity and penetration of herbicides by reducing surface tension, allowing the herbicide mixture to spread evenly over the surface of vegetation. A colorant is added so that the actual treated area can be readily determined, which eliminates the probability of over-application of herbicides and avoids skips, overlaps and human exposures to recently treated vegetation. A qualitative assessment of their potential water quality impacts will be discussed.

Qualitative Assessment of the Effectiveness of Best Management Practices (BMPs):

Implementation and effectiveness of BMPs in protecting water quality following herbicide application is monitored annually on the Stanislaus National Forest. Results of past monitoring can be used as an indicator of future BMP effectiveness for the SERAL project.

Direct and Indirect Effects

Table 36. Issue 8 direct and indirect effects.

Indicator / Measure		Alt 1	Alt 2	Alt 3	Alt 4
Does Peak Expected Environmental Concentration (EEC) Exceed the Maximum Contaminant Level (MCL)	Glyphosate	No		Same as Alt 1.	
Is the Hazard Quotient >1 for Aquatic Invertebrates (sensitive) when Exposed to the Peak Expected Environmental Concentration (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Does Chronic Expected Environmental Concentration (EEC) Exceed the Maximum Contaminant Level (MCL)	Glyphosate	No		Same as Alt 1.	
Is the Hazard Quotient > 1 for Aquatic Invertebrates (sensitive) when Exposed to the Longer-term Expected Environmental Concentration (Chronic)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Does Accidental Spill into a Pond Exceed the Maximum Contaminant Level (MCL)	Glyphosate	Yes		Same as Alt 1.	
Is the Hazard Quotient >1 for Aquatic Invertebrates (sensitive) when Exposed to an Accidental Spill in a Pond (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	No		Same as Alt 1.	
Is the Hazard Quotient >1 for Workers with General Occupational Exposure (Chronic)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	Not reported		Same as Alt 1.	
Is the Hazard Quotient >1 for Workers with Accidental Exposure (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	Yes		Same as Alt 1.	
	Clopyralid	No		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	Not reported		Same as Alt 1.	
	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	Yes		Same as Alt 1.	

Indicator / Measure		Alt 1	Alt 2	Alt 3	Alt 4
Is the Hazard Quotient >1 for the General Public with Longer-term Exposure (Chronic)	Clethodim	No		Same as Alt 1.	
	Clopyralid	Yes		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	Yes		Same as Alt 1.	
	Triclopyr	Yes		Same as Alt 1.	
Is the Hazard Quotient >1 for the General Public with Shorter-term Exposure (Acute)	Aminopyralid	No		Same as Alt 1.	
	Chlorsulfuron	No		Same as Alt 1.	
	Clethodim	No		Same as Alt 1.	
	Clopyralid	Yes		Same as Alt 1.	
	Glyphosate	No		Same as Alt 1.	
	Indaziflam	No		Same as Alt 1.	
	Triclopyr	Yes		Same as Alt 1.	

The discussion on water quality and human health, below, addresses all “yes” answers above in Table 36 for Alternatives 1 and 3. Further analysis is needed on all “yes” answers to determine the likelihood of the modeled scenario, the risk to water quality and beneficial uses of water, the risk to human health for workers and the general public, and any management requirements that could mitigate that risk.

Water Quality

Glyphosate: The scenario of an accidental spill into a pond exceeds the MCL for glyphosate. The scenarios modeled included spills of 20 gallons, 100 gallons, and 200 gallons into a pond. A spill of 20 gallons into a pond does not exceed the MCL, but the 100-gallon and 200-gallon spills do exceed the MCL. For SERAL implementation, the treatment with highest risk of spill/largest quantity of herbicide carried is application with a backpack sprayer. Backpack sprayers typically carry 4 or 5 gallons of herbicide. Twenty to 25 full backpacks would have to fail and spill in a pond to meet the 100-gallon spill scenario where the MCL was exceeded. Therefore, even in the case of accidental spill, it is unlikely that MCLs would be exceeded for glyphosate. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of glyphosate.

Aminopyralid: The HQ was not greater than 1 under any of the water quality scenarios evaluated for aminopyralid. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of aminopyralid.

Chlorsulfuron: The HQ was not greater than 1 under any of the water quality scenarios evaluated for chlorsulfuron. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of chlorsulfuron.

Clethodim: The HQ was greater than 1 under the scenario of an accidental spill into a pond. The scenarios modeled were 20-gallon, 100-gallon, and 200-gallon spills. Sensitive aquatic invertebrates had a HQ greater than 1 for the 100- and 200-gallon spills only. As described for glyphosate, high quantity spills into a stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of clethodim.

Clopyralid: The HQ was not greater than 1 under any of the water quality scenarios evaluated for clopyralid. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of clopyralid.

Indaziflam: The HQ was greater than 1 under the scenario of an accidental spill into a pond. The scenarios modeled were 20-gallon, 100-gallon, and 200-gallon spills. Sensitive aquatic invertebrates had a HQ greater than 1 for the 200-gallon spill only. As described for glyphosate, high quantity spills into a

stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of indaziflam.

Triclopyr: The HQ was not greater than 1 under any of the water quality scenarios evaluated for triclopyr. It is, therefore, unlikely that water quality standards would be exceeded under the proposed use of triclopyr.

Human Health

Glyphosate: The HQ was not greater than 1 under any of the human health assessments for glyphosate. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of glyphosate.

Aminopyralid: The HQ was not greater than 1 under any of the human health assessments for aminopyralid. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of aminopyralid.

Chlorsulfuron: The HQ was greater than 1 under the scenario of longer-term chronic exposure of chlorsulfuron to the general public. The exceedance was specifically for an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to uses of chlorsulfuron in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of chlorsulfuron.

Clethodim: The HQ was greater than 1 for both the acute and chronic exposures of workers. These exceedances are when a worker wears contaminated gloves for an hour (acute exposure) or has extended general exposure (chronic) to the highest application volume analyzed. The acute exposure scenario can be mitigated by washing contaminated hands and replacing contaminated gloves, as described in the management requirements. The chronic exposure modestly exceeds the level of concern (HQ = 1.3). The analysis report associated with the calculations (USDA 2021b) states that this level of exposure for workers would, “most likely reflect adverse conditions during the application (e.g., rough terrain) and/or poor worker practices in terms of limiting exposure”, and that an “HQ of about 1.7 would be viewed with clear concern.” Management requirements were designed to minimize exposure. This includes wearing proper personal protective equipment (PPE), providing soap and clean water on site, and only applying when conditions are suitable. Therefore, if good worker practices are used to limit exposure, it is unlikely that human health standards for workers or the general public would be exceeded under the proposed use of clethodim.

Clopyralid: The HQ was greater than 1 for the general public under the scenario of water consumption by a child following an accidental spill into a pond of 200 gallons of clopyralid. As described for glyphosate, high quantity spills into a stagnant waterbody are very unlikely when backpack sprayers carry only 4-5 gallons at a time. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is therefore highly unlikely that this risk to the general public exists.

The HQ was also greater than 1 for the general public under the scenario of an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of clopyralid in agricultural settings than treatment of small populations of noxious weeds. In

addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of clopyralid.

Indaziflam: The HQ was greater than 1 for workers with general occupational exposure (chronic). The chronic exposure modestly exceeds the level of concern (HQ = 1.8). The analysis report associated with the calculations (USDA 2021b) states that “these HQs are relatively modest exceedances in the level of concern and do not raise substantial concern.” Management requirements were designed to minimize exposure. This includes wearing proper personal protective equipment (PPE), providing soap and clean water on site, and only applying when conditions are suitable. These management requirements are anticipated to further mitigate concerns.

The HQ was greater than 1 for the general public under the scenario of an adult female consuming contaminated vegetation (chronic). The likelihood of an adult female repeatedly consuming contaminated vegetation following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of indaziflam in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of indaziflam.

Triclopyr: The worksheets for triclopyr cover the TCP metabolite of triclopyr. Because it is the metabolite and not the actual chemical applied, there are no worksheets related to worker exposure.

The HQ was greater than 1 for the general public under the scenarios of an adult female consuming contaminated vegetation or contaminated fruit (both acute and chronic). The likelihood of an adult female consuming contaminated vegetation or fruit following noxious weed treatment in SERAL is unlikely. This scenario is more applicable to use of triclopyr in agricultural settings than treatment of small populations of noxious weeds. In addition, sites that are treated with herbicides have signs posted to warn the general public that spraying has recently occurred. It is, therefore, unlikely that human health standards for workers or the general public would be exceeded under the proposed use of triclopyr.

Surfactants and Colorants

Syl-tac™: Syl-tac™ is a surfactant that is proposed for use as an additive during herbicide application. It has a Caution signal word and may cause slight skin and eye irritation. Syl-tac™ is a mixture of the following two products: Hasten® and Sylgard® 309.

Hasten® has a Caution signal word. It may be irritating to the skin and to the eyes. The main ingredient in Hasten® contained in the Syl-tac™ product is esterified canola seed oil. The MSDS lists isopropylamine as a hazardous ingredient at levels of 2 percent in the formulation (Bakke 2007).

Sylgard® 309 has a Warning signal word. It is considered slightly irritating to the skin and is considered severely irritating to the eyes. It is not a skin sensitizer. The MSDS describes a 28-day oral dosing study in rats, in which rats were fed doses of 0, 33, 300, or 1,000 mg/kg/day. No significant findings of biological relevance were seen in females, while males showed some effects at highest dose (body weight gain, and changes in food consumption). This would indicate a subchronic NOEL of 300 mg/kg/day (Bakke 2007).

The rainbow trout 96-hr LC50 for Syl-tac™ is >5mg/L. The daphnia 48-hr EC50 for Syl-tac™ is also >5mg/L (Bakke 2007). According to the Syl-tac™ label, the product should not exceed 5 percent of the finished spray volume. The project is proposing to use for Syl-tac (0.4 percent). Due to the small amount of surfactant being used, it is unlikely that these toxicity levels would be exceeded.

Hi-Light™ Blue: Hi-Light™ Blue is a water-soluble dye that contains no toxic chemicals (USDA 2021b). It is mildly irritating to the skin and eyes. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems (Bakke 2007). The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (USDA 2021b).

Colorfast™ Purple: Colorfast™ Purple is a water-soluble dye that contains no toxic chemicals (USDA 2021b). It is mildly irritating to the skin, but, because of the acetic acid content, can be severely irritating to the eyes and can cause permanent damage. Acetic acid is the ingredient in household vinegar, although household vinegars are typically 4-10 percent acetic acid and Colorfast™ Purple contains 23.4 percent by weight. Colorfast™ Purple contains gentian violet, which is a common laboratory reagent and stain. This dye is commonly used as an antifungal or antibacterial medication for dermal or mucous membrane infections (USDA 2021b).

BMP Effectiveness

The Stanislaus National Forest has utilized herbicides for treatment of noxious weeds as well as for reforestation purposes. Reforestation activities utilize much larger quantities of herbicides than those proposed for noxious weeds, as noxious weed populations are often much smaller and isolated populations, compared to large-scale site prep or release with herbicides in reforestation. Therefore, effectiveness of BMPs during reforestation activities can indicate the likelihood of success of BMPs for smaller noxious weed projects.

Monitoring has been conducted by the Stanislaus National Forest on reforestation herbicide treatments. The most recent monitoring was completed for BMP implementation and effectiveness for Rim Reforestation following the National Core BMP Evaluation Protocol in 2018, 2019, and 2021. Monitoring indicated that BMPs were fully implemented and were effective at all three sites, resulting in composite scores of excellent. In addition, all Rim Reforestation units that were treated with herbicides have a BMP checklist that is filled out by the project lead, documenting whether BMPs were implemented as planned in the Rim Reforestation NEPA. Between 2018 and 2020, BMP checklists were completed for 82 units, and all applicable BMPs were implemented as planned. Based on this track record of implementing BMPs on the ground and monitoring results showing that implemented BMPs were effective at protecting water quality, it is assumed that BMPs proposed for SERAL will be implemented and effective at protecting water quality and human health and safety.

Cumulative Effects

Past noxious weed treatments within the SERAL project watersheds are limited. Previous activities include 8 acres of herbicide treatment in the Dry Meadow watershed, 69 acres of herbicide treatment in the Middle South Fork Stanislaus River watershed, and 41 acres of herbicide treatment in the Stony Gulch watershed.

There is the potential for future herbicide treatments within the SERAL project watersheds outside of those proposed for the SERAL project on private land (noxious weeds and/or reforestation) or within FERC boundaries (noxious weeds). It is estimated that up to approximately 2,000 acres could be treated.

There are unlikely to be cumulative impacts from either previous herbicide treatments or potential future herbicide treatments outside of those proposed for SERAL when combined with the proposed treatments under SERAL. Risk assessment modeling indicated low risk to human health and water quality. In addition, evaluations of implementation and effectiveness of BMPs on much larger herbicide treatments for reforestation projects indicate that BMPs for herbicide treatments are typically implemented as

planned and effective. Therefore, cumulative effects of herbicide treatments on water quality and human health are not anticipated.

Issue 9. Due to the conditional nature of the proposed salvage the site-specific environmental impacts of those actions are not clear.

The rapid response salvage proposed in SERAL is in line with standard practice in planning and project implementation. In nearly every USFS NEPA decision for vegetation management, provisions are made on what to do if a tree dies. For example, a tree that was “supposed” to be retained in a decision suddenly dies post-decision and becomes a hazard, that tree may be removed post-decision provided the action was identified and analyzed in the NEPA document. Thus, whether or not a tree is retained or removed post-decision depends on its condition. Likewise in SERAL, rapid response salvage is designed to deal with post-decision condition of trees and groups of trees to address safety hazards and fuel load hazards. Although scaling up from the usual single tree condition, the salvage provisions in SERAL still require well-defined thresholds of scope and scale. As we learned in the southern Sierra Forests and elsewhere, groups of beetle-killed drought-stricken trees exceeding NRV subsequently helped fuel megafires that devastated communities and wildlife habitat. This scaling up is critical to public safety, community safety, and forest management. Although it cannot be predicted where exactly a tree may die, we know that trees and groups of trees will die and that there will be needs to rapidly respond to manage the associated risks. The site-specific requirements for resource protections, e.g., archaeological surveys, rare plant surveys, wildlife surveys, etc., and subsequent management requirements remain the same and the scale and scope of the action and associated effects analysis applicability is well-defined by management requirements and thresholds described in the SERAL proposed action.

The Watershed Management Report details the environmental impacts of the proposed salvage activities on sediment and temperature (see Direct and Indirect Effects/Beneficial Uses of Water: Sediment and Temperature). Salvage of insect-, disease-, or drought-killed trees and salvage of roadside hazard trees that were killed by insects, disease, or drought, is very similar to harvesting of live green trees. The insects, disease, and drought do not affect the ground cover and duff layer, so there is intact ground cover to filter any offsite movement of sediment that occurs post-harvest. The risk of offsite soil movement is greater with the salvage of wildfire-killed trees (both roadside hazard trees and fire salvage units). This is because, depending on the severity of the fire, there is a reduction, or even complete loss, of ground cover to filter out sediment movement. Because of this elevated risk, additional monitoring is required by the Central Valley Regional Water Quality Control Board (Water Board) under Category 5A (post-fire activities) of the Timber General Order (GO). This monitoring is intended to ensure that BMPs are implemented and effective and that any BMP failures are quickly rectified.

All condition-based salvage activities would be subject to the GO coverage requirements of the Water Board, as described in the Watershed Management Report (see Monitoring Requirements / Timber General Order). Implementation of BMPs and GO monitoring is required for these salvage treatments, regardless of where they fall within the SERAL project area footprint. Site specificity would be provided to the Water Board in the form of maps prior to receiving GO coverage for these activities. The monitoring and reporting requirements of the GO reduce the likelihood of BMP failures being unnoticed and causing water quality impairment.

The Watershed Management Report also details the risk of salvage activities on cumulative watershed effects (CWE). Insect-, disease-, drought-, or fire-killed roadside hazard trees may be salvaged along maintenance level (ML) 2-5 roads under Alternatives 1 and 3. A GIS exercise was completed to determine where this could potentially happen. All roadside acreage that was determined to have the potential for roadside hazard tree treatment in the future were included in the ERA calculations for Alternatives 1 and 3. To be conservative, it was assumed that all treatments happened in one year. This analysis was site-specific, as it included all ML2-5 roads in the GIS layer. Inclusion of potential roadside hazard tree removal in the CWE analysis did not cause a threshold of concern (TOC) to be exceeded in

any watershed. Since the total potential acreage in each watershed was analyzed for, no CWE updates would be needed to authorize roadside hazard tree treatments.

Salvage of insect-, disease-, or drought-killed trees is allowed within 1/4 mile of roads under Alternatives 1 and 3, as long as the TOC is not exceeded. If these salvage activities are proposed in the SERAL project area in the future, the equivalent roaded acreage (ERA) calculations described in the Watershed Management Report will be updated to ensure the TOC is not exceeded and the updated CWE analysis will be provided to the Water Board as part of the GO submittal. ERA coefficients and recovery timeframes outlined in the ERA analysis worksheets will be used. These activities will not be authorized under SERAL in any watershed where the TOC is exceeded. Amount of salvage may be scaled down in order to remain under the TOC. Because the location and extent of this potential future activity is unknown, and because the potential future activity would not be authorized if a TOC is exceeded, this activity is not currently in the ERA calculation spreadsheet. However, the constraints placed on the project, namely following BMPs, not allowing the TOC to be exceeded, providing site-specific maps to the Water Board as part of the GO submittal, and monitoring and reporting to the Water Board, ensures that cumulative watershed effects would not occur as a result of salvage of insect-disease-, or drought-killed trees.

Salvage of up to 500 acres of wildfire-killed trees could also occur in each watershed under Alternatives 1 and 3 as long as the TOC is not exceeded. If these fire salvage activities are proposed in the SERAL project area in the future, the ERA calculations, including the effects of the fire itself, will be updated to ensure the TOC is not exceeded. The updated CWE analysis will be submitted to the Water Board as part of the GO submittal. ERA coefficients and recovery timeframes outlined in the ERA analysis worksheets will be used. These activities will not be authorized under SERAL in any watershed where the TOC is exceeded. Amount of salvage may be scaled down in order to remain under the TOC. Because the location and extent of this potential future activity is unknown, and because the potential future activity would not be authorized if a TOC is exceeded, this activity is not currently in the ERA calculation spreadsheet. However, the constraints placed on the project, namely following BMPs, not allowing the TOC to be exceeded, providing site-specific maps to the Water Board as part of the GO submittal, and monitoring and reporting to the Water Board, ensures that cumulative watershed effects would not occur as a result of salvage of wildfire-killed trees.

Issue 10. What are the potential effects of temporary roads?

Temporary or “temp” road needs are best identified during the layout stage of project implementation. This is because needs are identified as unit boundaries are refined, flag & avoid protection measures are identified (e.g., archaeological sites), available equipment, and other factors. Although the precise location of where those needs are identified during layout, we know from past projects the typical scale and scope of those needs. The SERAL FEIS identifies sideboards, management requirements, and BMPs that remain the same such that the scale and scope of temp road needs and resource protection parameters are known to allow for analysis of potential effects.

The Watershed Management Report, Beneficial Uses of Water: Sediment and Temperature details the environmental impacts of the proposed temporary road construction on erosion and sedimentation. Temporary road construction includes both temporary road needs for forest thinning activities, and temporary roads of up to 500 feet in length for condition-based salvage activities. These temporary roads would be decommissioned following use, further reducing the potential for erosion and sedimentation. Monitoring of temporary roads would be completed as part of the Significant Existing and Potential Erosion Sites (SEPES) data collection/monitoring required by the Central Valley Regional Water Quality Control Board (Water Board) under the Timber General Order (GO). Although exact locations of forest thinning temporary roads and condition-based salvage temporary roads are not known at this time, the monitoring and reporting requirements outlined in the Timber GO will be utilized to ensure that temporary roads do not become sources of sedimentation and cause water quality impairments.

Construction of temporary road segments less than 500 feet in length needed for salvage could occur as part of the condition-based treatments in Alternatives 1 and 3. If temporary road construction is proposed, the cumulative watershed effects (CWE) analysis will be updated to account for this disturbance. The updated CWE analysis will be submitted to the Water Board as part of the GO submittal. ERA coefficients and recovery timeframes outlined in the ERA analysis worksheets will be used. The temporary road construction will not be authorized under SERAL in any watershed where the TOC is exceeded. Amount of temporary road construction may be scaled down in order to remain under the TOC. Because the location and extent of this potential future activity is unknown, and because the potential future activity would not be authorized if a TOC is exceeded, this activity is not currently in the ERA calculation spreadsheet. However, the constraints placed on the project, namely following BMPs, not allowing the TOC to be exceeded, providing site-specific maps to the Water Board as part of the GO submittal, and monitoring and reporting to the Water Board, ensures that cumulative watershed effects would not occur as a result of construction of temporary road segments needed for salvage activities.

3.02 Ability of the Alternatives to Meet the Purpose and Need

The purpose and need analysis informs the decisionmaker and the public of the relative effectiveness of the alternatives at meeting the project objectives.

Need 1. Increase Landscape Resilience to Natural Disturbances (drought, insects, disease, wildfire) by Restoring Resilient Forest Conditions as Guided by the Natural Range of Variation

Affected Environment

The narrative in Chapter 1, The Purpose and Need for Action, establishes why the proposed vegetation management is needed in order to increase landscape resilience to natural disturbances and establishes how those proposed treatments contribute to resilient forest conditions. This section focuses on how effective the proposed treatments are at increasing landscape resilience. To do so, this analysis adopts the assumption that if, collectively, the proposed treatments (A) increase forest heterogeneity; (B) reduce stand densities; (C) retain large, old, structurally diverse trees and snags; (D) increasing the relative abundance of fire-tolerant and shade-intolerant trees; (E) reduce surface and ladder fuels; (F) increase management by fire; (G) construct and maintain a network of fuelbreaks; and (H) salvage disturbed areas for NRV-based restoration and conservation benefits, then the SERAL project will effectively increase the resilience of the landscape to natural disturbances.

Indicators and Measures

Departure from NRV by Seral Stage: Proportions of seral stages across the landscape can be an indicator of resilience in Sierra Nevada mixed conifer forests to fire, insects, disease, drought and climate change. For this indicator, desired conditions are based on the descriptions in GTR-256: Natural range of variation for yellow pine and mixed-conifer forests in the Sierra Nevada (Safford and Stevens, 2017) and GTR-263: Natural range of variation of red fir and subalpine forests in the Sierra Nevada bioregion (Meyer and North, 2019). Existing conditions were summarized using ForSys/F3-generated modelled outputs of WHR size and density classifications which were used to bin the data into the different seral stages.

The NRV-assessment of conifer forest types was divided into two forest type groupings: (1) Yellow Pine / Dry Mixed Conifer; and (2) Fir / Moist Mixed Conifer. This NRV-assessment identified a need to increase the amount of open canopy conditions and reduce the proportion of closed canopy conditions in mid- and late-seral stages (Figure 2) to get a patchy distribution of diverse stand types across the landscape. To assess the effectiveness of the proposed treatments in moving the landscape into closer

alignment with NRV, a comparative assessment of the difference between historic landscape structure and the existing and post-treatment estimates of landscape structure are calculated.

Evaluation of landscape restoration needs requires a perspective larger than individual stands. The rationale for using this metric was to systematically assess the landscape-scale forest structure restoration needs within the SERAL project area, with the assumption that forest structure is an appropriate indicator of overall ecosystem health, and that restoring forest structure towards its NRV will increase the landscape's resilience and adaptive capacity. As Haugo et al. (2015) notes... "...a fundamental principle of landscape ecology is the linkage between ecological patterns and processes. Restoration of pattern in forested landscapes, from local to regional scales, facilitates the restoration of ecological processes." The primary intent of this metric was to compare the existing landscape forest structure to NRV, communicate the magnitude of departure from NRV within the project area, and provide a landscape-scale context that could help inform finer-scale (i.e., stand-level) treatments. Conducting the same post-treatment modeled estimates of the departure from NRV then allows a comparative assessment of the effectiveness of the proposed treatments at restoring forest structure towards NRV.

The existing departure from NRV is calculated as the difference between the historic range of variation mean % and the existing % for each seral stage (Alternative 2). The post-treatment modeled departure from NRV is calculated as the difference between the historic range of variation mean % and modeled % for each seral stage post-treatment (Alternatives 1, 3, and 4). The closer to zero the difference values, the closer the landscape structure is aligned with NRV. The calculated difference values represent the proportion of the landscape containing either a deficit (positive values) or excess (negative values) for each seral stage as compared to historic range seral state proportions.

Stand Density Index (SDI): see description of SDI under Issue 1B above.

Large Tree Retention: Large trees, which are often older and have more structural complexities, provide critical wildlife habitat, such as owl and roosting habitat. Large trees are commonly defined as those equal or greater than 30 inches DBH, and very large trees are those equal or greater than 36 inches DBH. There are few trees of this stature across the landscape, so retaining those that do exist and promoting their health is an important component of the proposed actions. The proposed treatments were located and designed to avoid areas composed of large trees and / or to retain them where treatments occur. To assess how effectively the proposed treatments avoid and retain large trees, a comparative assessment of the difference between the existing proportion of large trees and the modeled estimate of the proportional composition of large trees on the landscape remaining post-treatment is presented as total acres of WHR size and density class 5 or 6 S,P,M, or D across the project area. Because the proposed treatments were located to avoid forested areas containing large trees coupled with included DBH limitations, the loss of large trees post-treatment should be minimal. Since WHR size 5 classifications include trees greater than 24 inches DBH, the difference in acres among the alternatives may be only in part due to increases or losses of trees greater than 30 inches DBH. Using WHR may for this assessment may overestimate the proportion of the project area containing the "large" and "very large" trees, but similarly may also overestimate increases or losses of large and very large trees. To supplement the assessment of large tree retention we also present the mean trees per acre greater than 30 inches DBH for each alternative.

Proportion of shade-tolerant vs. shade-intolerant species: Compared to the pre-European settlement landscape, there has been a major shift in dominance from fire-tolerant, shade-intolerant tree species (i.e., pines, oaks) towards fire-intolerant, shade-tolerant species (i.e., fir, incense cedar) throughout Sierra Nevada mixed conifer forests (Safford and Stevens 2017). To address this imbalance within the SERAL project area, the proposed forest thinning treatments under each action alternative have been designed to selectively retain these shade-intolerant species (ponderosa pine, Jeffrey pine, sugar pine, black oak) while targeting the overabundance of shade-tolerant species (primarily white fir and incense cedar) for removal. At this time, we do not have the ability to accurately quantify the landscape-scale, pre- and post-treatment species composition. As an alternative, to demonstrate that proposed forest thinning treatments

would be effective at shifting the existing species compositions more towards pines and oaks, stand exam data was collected from two different mixed-conifer stands within the SERAL project area, and a silvicultural prescription—designed to mimic a forest thinning treatment as proposed in SERAL—was simulated using the Forest Vegetation Simulator (FVS).

Surface and Ladder Fuel Reduction: Section 1.01E outlined this concept and the descriptive and partially qualitative assessment of the existing understory vegetation and dead fuel loading (or amounts) (i.e., fuel models) across the landscape highlight the need for treatments (Table 6). Spatial fire modeling, such as Nexus and FSim, utilize these fuel models at 1/8th of their inputs, but this fuel model input fills a dominant modeling role in determining fire type, flame lengths, and burn probabilities due to describing the surface and ladder fuel amounts (e.g., vertical and horizontal fuel or vegetation continuity) which often drive fire behavior and spread. The fuel model changes used for each spatial pixel during modeling was determined by each alternative's treatment type, intensity, and location. In sum, where intensive treatments were proposed based on current conditions, and especially at locations where multiple treatments were applied (e.g., tree thinning and prescribed burns), surface and ladder fuels as represented by these fuel models were reduced in parallel correlation to the amount of understory and overstory vegetation cut and removed. Fuel models with reduced fuel loading are a landscape indicator of improved conditions moving towards increased landscape resiliency. Since all spatially delineated prescribed burn units are at the same locations among the action alternatives, then the difference in acreage of lower-load fuel models most clearly highlighted differences where mechanical or tree thinning and removal actions are proposed. The assessment of the effectiveness of the proposed actions at reducing surface and ladder fuels are addressed in the discussion pertaining to expected fire type, conditional flame lengths, and vegetation burn severity.

Expected Fire Type: see description of Fire Type under Issue 3A **above**.

Annual Burn Probability: see description of Burn Probability under Issue 1B. Annual burn probabilities percentage reductions across the project area are the most desirable (e.g., closer to less than 1% is best scenario), and reducing the percentage of burn probability is expected from the treatment activities.

Conditional Flame Lengths: see description of conditional flame lengths under Issue 1B **above**. The goal of the action alternatives is to reduce the ratio of higher flame lengths (greater than 8 ft) acreage and increase the lowest flame lengths (less than 4 ft) acreage in order to increase the landscape's resilience to wildfire hazards and subsequent fire effects or mortality/damage to dominant vegetation and human infrastructure and safety. Changes in the middle category flame lengths (4 to 8 ft) are also desirable to reduce fire behavior and effects.

Predicted Vegetation Burn Severity: see description of vegetation burn severity under Issue 1B **above**. Similar to the other fire behavior indicators or measures, the goal is for each action alternative to improve the ratio of the project area from expected high severity to low severity effects based on amount, intensity, and location of treatments.

Prescribed Fire: The percent of the landscape with prescribed fire proposed among the action alternatives is nearly the same but has key differences on where it is coupled with other treatment methods, and this demonstrates a commitment to larger, watershed scale prescribed fire efforts. Secondly, the post-treatment modeled estimates of predicted fire type, flame lengths, and reduced fire severities (see above and Issue 3A) help to assess the effectiveness of the proposed prescribed fire activities, especially in conjunction with the other vegetation management actions in increasing landscape resilience.

Construct and maintain a network of fuelbreaks: The proposed network of fuelbreak construction and maintenance are static among the alternatives. Comparatively each action alternative is equally effective in regard to fuelbreak construction, and the proposed fuelbreak treatment contributes equally to the modeled effectiveness of the entire suite of proposed actions among the alternatives. Therefore, the

effectiveness of the proposed fuelbreaks and their contribution to the overall effectiveness of meeting Need 1 is not addressed further in the DEIS.

Salvage for NRV-based restoration and conservation benefits: Alternative 1 and Alternative 3 propose the same salvage, while neither Alternative 2 nor Alternative 4 include salvage as a proposed action. The intent for including salvage as a proposed action in Alternative 1 and 3, prior to a mortality event occurring, is to rapidly, effectively and efficiently eliminate accumulated fuels and reduce further increasing wildfire risk on the landscape. The proposal confines the area of potential salvage and includes additional conditions that must be met which ensure the potential impacts of the action remains minimal while enabling conservation and economic benefits are achieved. It is impossible to quantitatively measure the effectiveness of potential future salvage at restoring NRV or meeting conservation objectives other than relying on literature or recent past salvage operations which supports the need for such actions and citing the project-imposed limitations required in order to salvage. Therefore, Alternatives 1 and 3 contribute to the effectiveness of the proposed salvage at increasing landscape resilience to natural disturbance but the assessment of that effectiveness relies solely on what is presented in Section 1.01 H and is not addressed further in the analysis for Need 1.

Direct and Indirect Effects

Table 37. Need 1 effectiveness.

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Landscape Structure NRV Departure – Yellow Pine / Dry Mixed Conifer	Early Seral	15%	15%	15%	15%
	Mid-Seral Open	0%	15%	6%	7%
	Mid-Seral Closed	-42%	-67%	-53%	-55%
	Late-Seral Open	29%	43%	37%	38%
	Late-Seral Closed	-3%	-6%	-6%	5%
Landscape Structure NRV Departure – Fir / Moist Mixed Conifer	Early Seral	15%	15%	15%	15%
	Mid-Seral Open	-9%	6%	-6%	-3%
	Mid-Seral Closed	-6%	-37%	-12%	-19%
	Late-Seral Open	8%	33%	14%	18%
	Late-Seral Closed	-7%	-17%	-10%	-11%
Pine-dominant stands:	SDI: Less than 130	12,632	5,052	12,080	10,451
	SDI: 130 - 220	39,723	20,086	3,1852	28,345
	SDI: Greater than 220	20,675	47,892	29,098	34,234
Fir-dominant stands:	SDI: Less than <200	3,335	873	2,190	1,786
	SDI: 200 to 330	3,070	5,310	4,159	4,566
	SDI: Greater than 330	348	570	403	401
Pine-dominant stands:	BA Less than 150 ft ² /acre	56,687	32,789	45,781	43,010
	BA: Greater than 150 ft ² /acre	16,343	40,241	27,249	30,020
Fir-dominant stands:	BA: Less than 200 ft ² /acre	5,412	3,655	5,251	5,197
	BA: greater than 200 ft ² /acre	1341	3,098	1,502	1,555
WHR 5 S & P		11,370	0	4,959	4,426
WHR 5 M & D		7,475	10,478	10,157	9,539
Mean Trees per Acre greater than 30 inches DBH		4.8	4.9	4.9	4.9
Annual Burn Probability: Less than 1%		87,436	10,813	84,893	79,900
Annual Burn Probability: 1% to 2%		31,371	79,599	33,914	38,869
Annual Burn Probability: between 2% to 5%		0	28,395	0	39
Conditional flame lengths < 4 feet		72,388	30,888	69,231	68,047
Conditional flame lengths between 4 – 8 feet		26,420	39,748	27,469	27,859
Conditional flame lengths > 8 feet		20,000	48,172	22,107	22,902
Expected active crown fire		1,726	7,130	1,918	1,952

Indicator / Measure		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Expected passive or conditional crown fire		45,197	74,573	47,919	48,915
Expected surface fire		58,260	23,479	55,346	54,316
Predicted high vegetation burn severity		33,254	64,981	36,783	37,453
Predicted moderate vegetation burn severity		31,699	34,639	31,426	31,272
Predicted low vegetation burn severity		51,152	16,486	47,897	47,381
Prescribed Fire	Burn Only	19,763	0	21,007	21,304
	Follow-up	51,366	0	47,361	46,292
	Total	71,129	0	68,368	67,596

Increase Forest Heterogeneity: In both the yellow pine/dry mixed conifer and the fir/moist mixed conifer forest types, current departure is pronounced in both mid- and late-developmental stages, with the current landscape containing much more closed canopy and much less open canopy in both developmental stages. This finding is consistent with GTR-256 (Safford and Stevens 2017) and GTR-263 (Meyer and North. 2019): GTR-256 says "*Modern mean canopy cover is above presettlement...Current lack of old-forest successional stages*"; and GTR-263 says "*...These results suggest that there may be a current deficit of the open-canopy late-seral class, a surplus of closed-canopy late-seral class...compared to the NRV.*"

Each action alternative would move the conifer forest structure at the landscape scale towards NRV (as described in Section 1.01), by decreasing the amount of closed canopy conditions and increasing the amount of open canopy conditions, with Alternative 1 making the most progress towards the range of natural variability—and thus, a more resilient condition—in both forest types (Figure 11 and Figure 12).

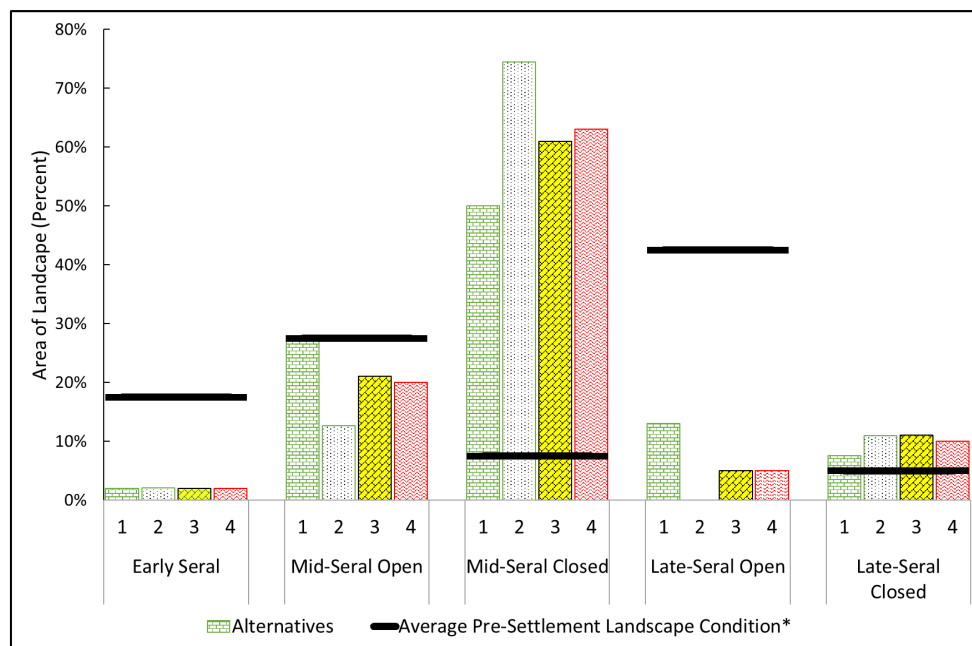


Figure 11. A comparison of post-treatment landscape structure of the yellow pine / dry mixed conifer forest types among the alternatives compared to historic conditions.

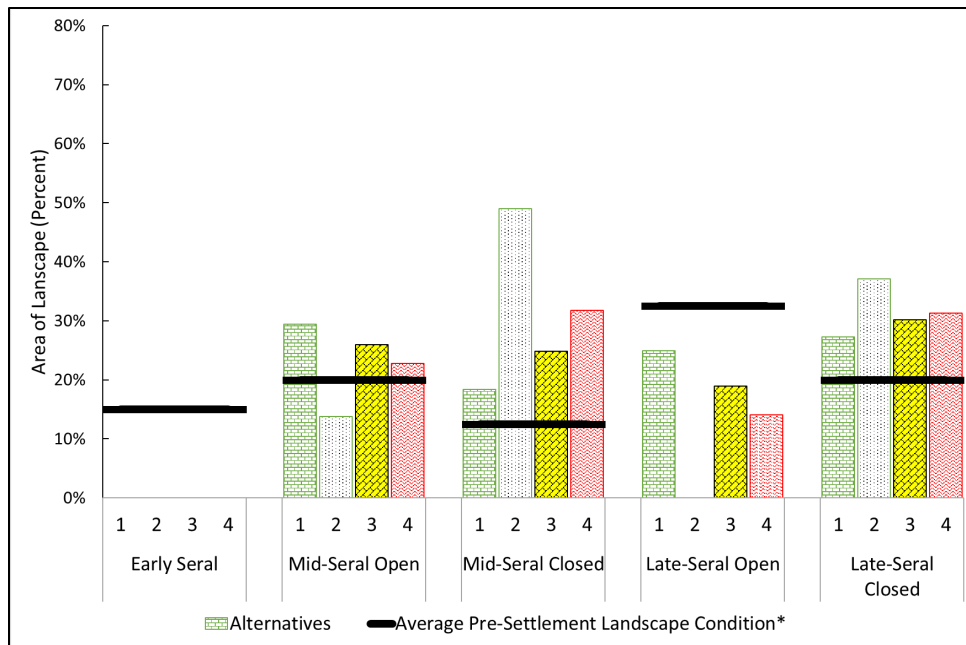


Figure 12. A comparison of post-treatment landscape structure of the fir / wet mixed conifer forest types among the alternatives compared to historic conditions.

The “no-action” Alternative 2 would maintain a relatively homogeneous landscape forest structure, due to an overabundance of acreage in both the mid- and late-seral closed canopy conditions and a conspicuous lack of more open-canopy conditions (Figure 11 and Figure 12). Under Alternative 2, forested stands would remain at high risk to many disturbances, such as large-scale, high severity fire; insects; disease; drought; and climate change. Significant acreage of late-seral, open canopy conditions—which historically would have been the most abundant condition on the landscape—would be unlikely to develop under the no-action alternative. Due to the existing abundance of dense, closed canopy stands, eventual disturbances are likely to be stand-replacing in nature, thus moving large, contiguous areas into the ‘Early Seral’ successional class.

Alternatives 3 and 4 perform remarkably similar to one another: both achieve a modest decrease in the amount of closed canopy acreage, along with a corresponding increase in the acreage of open-canopy conditions. While each of these alternatives would achieve a slight improvement in terms of landscape-scale seral stage distribution, neither would move towards NRV in a particularly meaningful way. The amount of mid-seral, closed canopy forest on the landscape would still be well above the average landscape conditions under NRV, and mid- and late-seral open conditions would be severely lacking as compared to NRV. This is largely due to the relatively small area proposed for mechanical treatment under Alternatives 3 and 4, and also to the more restrictive nature of the silvicultural treatments that were modelled under these alternatives. For example, treatments simulated under Alternatives 3 and 4 maintain a minimum of 40% or 50% canopy cover in treated stands, thus limiting the ability to achieve more open-canopy conditions (that would be more representative of NRV) within the project area. Furthermore, Alternative 4 has a more restrictive diameter limit: 20 inches, as opposed to 30 inches in Alternative 3, or up to 34 inches in Alternative 1, which would further constrain moving towards NRV in some treated stands as well.

Of the four alternatives, Alternative 1 is the most effective at moving landscape forest structure towards NRV. It achieves the most progress in terms of decreasing the proportion of dense, closed canopy conifer stands and increasing the amount of open canopy conditions. That said, even this alternative does not make full progress towards NRV targets immediately post-treatment. In some areas, a lack of access for

equipment or a lack of volume in a stand can hinder potential mechanical treatments, thus making full achievement of NRV impossible with mechanical treatments alone. One important note about this metric is that the post-treatment values represent post-*mechanical* treatment. Follow-up prescribed burning, while proposed in the SERAL project, was not simulated in the development of these post-treatment values of seral stages. Broadcast burning after mechanical treatments, along with forest succession, would be expected to further move these proportions toward the desired conditions, as represented by the average NRV values.

Reduce Stand Densities: Regarding stand density and resilience to natural disturbances (which is also discussed under Issues 1B, 3A, and 3B) each action alternative would reduce the amount of conifer forest acreage at high-risk to drought-, insect-, and disease-related mortality and increase the acreage of conifer forests at low risk (Table 37). Alternative 1 would shift the most acreage of conifer forest to densities considered to be at lower risk to largescale mortality, followed by Alternatives 3 and 4. Without treatment however (Alt. 2), tree density and competition for growing space would continue to increase, and stand vigor would decrease. Growth rates of individual trees would slow and delay the development of larger trees. Competition-related mortality would increase over time, as stands increasingly exceed at-risk density thresholds.

Retain large, old, structurally diverse trees and snags: Prior to “applying” (modeling) the proposed treatments, the project area lacked any forest structure classified as WHR 5 S & P (Table 37). Each alternative increases the occurrence of WHR 5 S & P which contain trees greater than 24 inches DBH with open canopies (10-39% canopy cover). Alternative 1 increases the occurrence of this WHR classification most measurably (Table 37). Even if these forested areas are composed primarily of trees at the lower end in this size category, with succession these areas are expected to grow more rapidly than prior to treatment. After applying the proposed treatments, the estimated proportion of the landscape containing forest structure classified as WHR 5 M & D will be reduced. Alternative 1, again, will cause the greatest change (-3,004 acres). A portion of the WHR 5 M & D acres reduced are converted to WHR S & P so the change is most an artifact of a reduction in canopy cover rather than loss of large trees. Relying on WHR to assess the effectiveness of the proposed treatments at retaining large, old, structurally diverse trees likely overestimates the proportion of large trees on the landscape and the post-treatment increases and losses in proportion. Nonetheless, using the WHR classification to assess large tree retention across the landscape post-treatment demonstrates that comparatively, Alternative 1 promotes more large trees on the landscape than any of the action alternatives and greater than 8,000 acres more than the existing condition (Alt. 2).

To further assess large tree retention among the alternatives we present the average trees per acre of trees greater than 30 inches DBH (Table 37). Alternatives 3 and 4 do not allow cutting of trees greater than 30” DBH (with limited exception). The estimated trees per acre of trees greater than 30 inches DBH among the alternatives reflect the 30-inch DBH restriction. Alternatives 2, 3, and 4 all have 4.9 trees per acre greater than 30 inches DBH. Alternative 1 which includes the selective cutting of larger trees reduces the estimated large trees per acre just slightly from 4.9 to 4.8 trees per acre. Therefore, although Alternative 1 allows some, limited, larger trees to be cut, in general the proposals effort to retain large trees is effective.

Proportion of shade-tolerant vs. shade-intolerant species: In order to demonstrate how proposed mechanical thinning treatments would shift species compositions from shade-tolerant species (white fir, incense cedar) to shade-intolerant species (pines), an example silvicultural prescription was simulated for each alternative using FVS in both a typical dry-mixed conifer stand (Stand 1) composed predominantly of incense cedar and ponderosa pine, and a moist-mixed conifer stand (Stand 2) composed predominantly of white fir within the SERAL project area.

The general parameters of the prescriptions modeled in FVS included the following:

Alternative 1:

- Thin trees less than 10-inch DBH to a target of 25 trees per acre
- Thin trees throughout the DBH range of 10-inches to 33.9-inches to a residual stand density index of 200
- DBH limits of 30-inch for pines and 34-inch for fir and cedar (a fir or cedar up to 34-inch DBH may be removed wherever a 30-inch shade intolerant conifer is left within one tree height of the tree removed).

Alternative 3:

- Thin trees less than 10-inch DBH to a target of 25 trees per acre
- Thin from below trees in the DBH range of 10-inches to 29.9-inches to a residual canopy cover of 40%

Alternative 4:

- Thin trees less than 10-inch DBH to a target of 50 trees per acre
- Thin from below trees in the DBH range of 10-inches to 19.9-inches to a residual canopy cover of 40%

The species preference for removal in all alternatives was as follows: white fir, incense cedar, Douglas-fir, ponderosa pine, Jeffrey pine, Sugar pine.

Results of prescription modeled in FVS for both stands are presented in Table 38. This example demonstrates the effectiveness of the proposed treatments in modifying the proportion of shade-tolerant vs. shade-intolerant species. The proportion of stand basal area in pine increases in each alternative, and the proportion of fir and cedar declines. Left untreated, these stands will continue to lose the existing overstory pine with replacement occurring with white fir and incense cedar.

Table 38. FVS post-treatment results of representative stands found within the SERAL project area.

Proportion of Basal Area by Species		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Stand 1	White fir & incense cedar	62%	71%	58%	61%
	Ponderosa/ Jeffrey/ sugar pine / black oak	38%	29%	44%	39%
Stand 2	White fir & incense cedar	72%	78%	62%	71%
	Ponderosa/ Jeffrey/ sugar pine / black oak	35%	22%	38%	29%

Reduce surface and ladder fuels and increase management by fire: Fuel model inputs fill a dominant role in determining fire type, flame lengths, and burn probabilities due to describing the surface and ladder fuel amounts (e.g., vertical and horizontal fuel or vegetation continuity). The fuel model changes used for each spatial pixel during modeling was determined by each alternative's treatment type, intensity, and location. In sum, where intensive treatments were proposed based on current conditions, and especially at locations where multiple treatments were applied (e.g., tree thinning and prescribed burns), surface and ladder fuels as represented by these fuel models were reduced in parallel correlation to the amount of overstory vegetation cut and removed. Since all spatially delineated prescribed burn units are at the same locations among the action alternatives, then the difference in amount of fuel models reduced is most clearly highlighted by where mechanical or tree thinning and/or removal actions are proposed. The assessment of the effectiveness of the proposed actions at reducing surface and ladder fuels are inferred through the assessment of fire type, flame lengths, vegetation burn severity, and burn probabilities as presented next.

Fire Type: The modeled fire type predictions demonstrate that the proposed treatments for each alternative will improve and increase the surface fire to crown fire acreage expected during unplanned wildfires. Alternative 1 is most effective at reducing the active crown fire potential and has the largest increase (over double the amount) in acres of surface fire compared to the existing conditions, with

similar, but reduced acres of surface fire predicted in Alternative 3 and 4. Alternatives 3 and 4 have very similar acres expected to have passive and conditional crown fire, but Alternative 1 has the best ratio for this fire type category across the project area. Alternative 1 succeeds in reducing unwanted crown fires and improving all lower fire type categories, which is most likely due to proposing the highest amount and intensity of acres treated coupled with specific treatment locations.

The goal of the action alternatives is to reduce the ratio of expected crown fire acres and increase the surface fire ratio in order to increase the landscape's resilience to wildfire hazards and subsequent fire effects or mortality/damage to dominant vegetation and human infrastructure and safety. Crown fire potential is greatest under existing conditions (Alt. 2). Without management intervention, 70% of the project area is expected to experience crown fire behavior (e.g., high rates of mortality in the dominant vegetation) during a wildfire. After treatments are applied, the expected crown fire potential should be reduced for each alternative, and the ratio of surface fires becomes more prevalent. The same prescribed fire spatial units are used for each action alternative, but implementation complexities, effects, and risks occur when no other forest thinning type treatments recently precedes the burn activities.

Flame Lengths: The flame length predictions have a similar pattern as the fire type indicators, where Alternative 1 has the best ratio of increased low flame lengths (less than 4 ft) and decreased middle flame lengths (4 to 8 ft) and high flame lengths (greater than 8 ft) due to the amount, intensity, and locations of treated acres.

Vegetation Burn Severity: The vegetation burn severity (or mortality to vegetation) has a similar pattern of some improvements in all action alternatives, and the greatest improvement in the reduction of high vegetation burn severity and increase in low burn severity is Alternative 1. The amount of moderate vegetation burn severity is almost equal among the action alternatives and demonstrates a vast reduction compared to existing conditions (Alt. 2). This indicates good progress in expected burn severity after the proposed treatments, but this needs to be followed up by maintenance treatments to continue this positive pattern to progressively change and maintain lower severity outcomes during future fires and other disturbance processes. Post-wildfire impacts to watersheds increase when a greater proportion of a watershed burns at moderate to high severity fire (Cannon 2010; Neary 2011).

Annual Burn Probabilities: Annual burn probabilities similarly are reduced among each action alternative across the project, but Alternative 1 shifts the proportion of the project area with lower probabilities most effectively.

Prescribed Fire: Prescribed fire spatially delineated implementation units and acreage are nearly identical for all the action alternatives, but when coupled with other forest thinning or mechanical treatments, the acreage changes between "burn only" and "follow up" treatments. Prescribed fire is a key tool or treatment method that cannot be easily replaced by a fire-surrogate type treatment in terms of creating the full range of burn effects and nutrient recycling. Alternative 1 has the highest acreage of combined (burn only and follow up) prescribed fire treatments, so then it's most successful quantitatively at initially returning fire processes back to the landscape to improve the balance of the fire return interval departure (FRID, see section 1.01 F) improve landscape resiliency (Knapp et al. 2017, Knapp et al. 2020). As mentioned previously (Section 2.01i), all NFS land is proposed to receive prescribed fire treatments over a long temporal implementation schedule as initial or "burn only" treatments or follow up treatments, and then subsequent maintenance treatments. This combination of returning multiple fire cycles back to the landscape's fire regime process is the best way to create and maintain resilient landscape conditions and understory biodiversity (Goodwin et al. 2018). One way to improve the often-slow pace and scale of prescribed burning is to conduct forest thinning or other mechanical fuel reduction or rearrangement treatments first and in order to reach increased resiliency outcomes (North et al. 2015, Knapp et al. 2020). This is especially important if a long time has passed since the last wildfire or vegetation/fuel treatment has occurred, which is the situation for most NFS land in the project area.

Prescribed fire implementation only occurs after a range of preparation activities, such as those listed in Section 2.03-C **above**. Preparation needs impact implementation efficiencies. For example, the more temporary control line construction or pre-burn hazard tree mitigation is needed, then the pace (and scale) of prescribed fire is slowed. The need for temporary control lines and hazard tree mitigation is often higher in areas that have (1) had no recent disturbances (e.g., high fuel loading and dense vegetation are present), or (2) had recent near-past disturbances but are located where no post-disturbance treatment has been applied. After a disturbance a large number of dead trees are still standing or recently fallen trees are stacked on top of the existing high fuel loading. Large accumulations of surface and ladder fuels in these areas are likely and often need to be managed in at least temporary control line locations prior to initiating a prescribed fire treatment. Where mechanical treatments have been applied to remove or divide up surface and ladder fuels, less prescribed fire preparation activities are needed. As more mechanical treatments are completed, prescribed fire will be efficient at larger scales, at a faster rate, and with better effects (Kane et al. 2019, Odland et al 2021). Until mechanical treatments are completed however, prescribed fire will be applied in smaller, more discrete and manageable burn unit sizes to ensure safe ignition conditions are in place and to mitigate unwanted fire behavior, and/or higher severity effects. To best meet these objectives, burn piles, rather than understory or broadcast burning ignition techniques, will be most likely used as the initial prescribed fire treatment approach until the landscape has been prepared sufficiently to safely and efficiently apply understory or broadcast burning techniques more regularly.

Alternative 3 and 4 will leave the forested stands denser with less forest thinning and fuel reduction implemented. For these reasons, burn piles will be the dominant prescribed fire technique for a longer duration and prescribed fire preparation needs will be greater than in Alternative 1. Burn piling is laborious requiring multiple steps — cut trees and understory vegetation, build piles, then burn piles, and then result in small, but important differences in fire effects. For example, although burn piles reduce accumulated fuels, the burn pile patterns lack the more desired natural mosaic of an understory burn pattern that is partially determined by natural and treatment-generated spatial surface fuel distributions. A second example is our constraints on machine piling methods due to slope limitations and access, which are efficient compared to the pace of hand piling work.

Cumulative Effects

The SERAL proposed actions are designed and located to increase landscape resilience to natural disturbances by increasing and restoring resilient conditions on only NFS lands. The past and reasonably foreseeable future actions identified in Table A.4 are planned on both private and NFS lands. The reasonably foreseeable future actions under Forest Service control (Tuolumne Main Canal, Cedar Ridge, Cold Springs, and the prescribed burning) were planned and analyzed in compliance with the Stanislaus National Forest current forest plan which includes specific constraints and standards and guidelines which limit where and when forest thinning may occur, as well as limit the size of the trees (DBH limit) and require canopy cover retention thresholds. As the analysis for Need 1 presented above demonstrates, the management constraints of the current forest plan contribute to a reduced effectiveness of the treatments (Alternative 3 and 4) in comparison to Alternative 1. Nonetheless, we expect the previously planned treatments or actions will collectively contribute to reducing the landscape's susceptibility to disturbances. Therefore, when the SERAL proposed actions are added to these other actions, we expect cumulatively beneficial effects across the project area.

Need 2. Provide economic benefits to local communities.

The analysis presented in Issue 4 (Section 3.01) above, provides the most direct comparison of economic opportunities that would occur under each alternative. Table 30 shows that the total anticipated volume removed under Alternative 1 is over twice that as Alternative 3, and over 3.5 times as much as Alternative 4. The delivered market value of wood products removed is largest in Alternative 1 for both biomass and

sawlogs, followed by Alternative 3. The delivered market value is a relative measure of economic benefits workers in the timber and biomass industries (truckers, mill workers, equipment operators, etc.), but also businesses and staff supporting the industry (seasonal crews, and to some extent service industries) could receive if all SERAL actions are implemented. Of course, the net values in Table 30 show that biomass treatments come at a cost (negative values) for all alternatives, but this is simply the difference between cost of treatments and the delivered market value, it does not take into consideration grant funding or other sources of money that may be used (brought in) to pay for biomass treatments. While negative values potentially reduce the amount of biomass removal feasible, there has been an increase in grant opportunities for fuels reduction work to improve forest health, protect water sources and reduce carbon emission. These grants opportunities to fund fuels reduction work including biomass removal could result in an infusion of millions of dollars; however, the amount of grant funding any individual forest might receive is unknown. Although not all of this funding will go to local contractors, the duration of the contracts will result in indirect revenue to the local area as contractors purchase fuel, stay in hotels or rent housing and frequent grocery stores, restaurants and stores.

Additionally, at least 2 new pellet facilities are scheduled to come online in the next couple years capable of utilizing up to 344,000 bone-dry tons, or roughly 287,000 ccf per year, this additional demand has the potential to increase the feasibility of biomass removal. While all alternatives show similar total net value of thinning treatments (where product is being removed) if fully implemented, Alternative 1 has substantially more dollars flowing through the system generated through the value of the forest products. Alternative 2 would result in no forest product removal and associated revenue generation. The SERAL project is a substantial part of the Forests planned program of work, and not implementing this project would result in greatly reduced offering of sawlogs, biomass and other forest products due to the time it takes between project conception and implementation. Replacement of sawlogs and biomass from National Forest System lands with other sources would likely impact current and planned facilities that rely on this supply to at least some extent and may result in reduction the number of employees or hours offered.

Based on the economics of implementing these forest thinning treatments, Alternative 1 has the largest potential to affect job creation, or at least, job retention in local communities; Alternative 4 has the lowest potential, and Alternative 3 is intermediate.

Other economic indicators, besides market value of wood products are more difficult to quantify directly, but they are no less important to the overall economy for this region. In fact, the recreation and tourism economy is a larger total economic contributor to Tuolumne County than the forest products industry, and more jobs are available in recreation, arts and entertainment in Tuolumne County, than there are in forestry, and agricultural services (U.S. Department of Commerce, 2021(a)). Rural communities located along access routes to national forests benefit from the economic contributions that recreation visitors provide. This includes the spending that supports jobs, but also contributions to local tax revenues through sales and lodging taxes collected. These local tax revenues support important public services that improve the quality of life in these communities. Thus, disruptions to the recreation economy can have a wider impact to local communities. Economic data show in Tuolumne County, after large, local fire events in 2013 (Rim Fire), and 2018 (Ferguson and Donnell Fires), there was an employment decline for at least 1 year in industries that include travel and tourism (U.S. Department of Commerce, 2021(b)). These temporary declines could be tied to closures of popular NFS lands destinations, severe smoke, or (in the case of Rim and Ferguson fires) temporary closures of neighboring Yosemite National Park. SERAL proposed treatments are designed to change vegetation and fuel conditions on NFS lands to limit large wildfire disturbance or high severity events, and to support ongoing, long-term, safe recreation and forest products industries and economies. While the performance of the regional and state economies overall likely fills a bigger role in these employment trends, the effects are certainly felt at the local level.

Another way the SERAL activities would affect the local economy, indirectly, is through maintaining access to public lands. All three action alternatives would authorize road reconstruction and maintenance

where needed to improve the road conditions to provide access to treatment units, provide for safe and efficient haul of forest products, and maintain or improve safe access to public lands. Alternatives 1 and 3 also include hazard tree abatement treatments that would allow felling or removal of dead and dying trees that could temporarily block access. Alternative 4 does not include hazard tree abatement.

Need 3. Maintain safe access to public lands (abate hazard trees along roads).

Affected Environment

Long-term closures, or limits to public access due to tree mortality, active wildfires, or unsafe post-fire conditions on the Stanislaus National Forest in recent years have closed or reduced tourist traffic for several months to popular destinations. [Number] campgrounds, other numerous semi-developed dispersed camping and concentrated use areas, [number] day use areas, [number] non-motorized trailheads, [number] OHV riding areas, [number] developed recreation sites under special use permit, and [number] inventoried dispersed campsites occur within the SERAL project area. Many other uses are also known to occur such as fishing, hunting, and gathering. When trees pose a hazard to human safety and access, hazard tree abatement is needed in order to sustain the multiple uses of National Forest System lands to best meet the needs of the American people (Public Law 86–517; Approved June 12, 1960).

There are many miles of Forest Service system roads within the project area that provide public access (Table 39). If hazards are present along these routes, public safety and access may be affected.

Table 39: Miles of access roads on NFS lands within the project area.

NFS Road Maintenance Level	Miles
Miles of ML2	309.4
Miles of ML3	36.5
Miles of ML4	0.5
Miles of ML5	5.5

Indicators and Measures

Miles of Public Access Maintained by Potential Hazard Tree Removal: The focus of this analysis is to determine the effectiveness of the proposed treatments at maintaining safe, public access to public lands among the alternatives. Mainly, this analysis is a static presentation of the miles of public access routes that travel through NFS lands within the project area. These miles represent the access the proposed hazard tree removal is proposed to protect. The proposed hazard tree removal does not vary between Alternative 1 and Alternative 3. Alternative 4 on the other hand does not include hazard tree abatement as a proposed action. For this analysis we assume that authorizing hazard tree abatement in the decision, prior to a hazard developing, will most effectively and efficiently maintain public access because the proposal would enable the hazards to be mitigated or removed as soon as they are detected.

The miles of public access that will be maintained through hazard tree abatement are presented as the total miles of roads, by maintenance level classification, that travel through NFS lands that contain conifer forests with WHR sizes 3,4, and 5.

Direct and Indirect Effects

Alternative 4 is less effective at maintaining safe access to public lands because hazard tree removal is not included in the proposal. Alternative 1 and Alternative 3 would authorize hazard tree removal along 274 miles of roads located within the SERAL project area (Table 40), should hazards occur. Including this action as part of Alternative 1 would enable forest management to rapidly respond to hazards as soon as they are detected and maintain public access most efficiently. Including hazard tree removal in the suite

of Alternative 1 and Alternative 3 proposed actions also enabled resource specialists to consider the action in their analysis.

Table 40. Miles of roads on NF lands with Potential Hazard Tree Removal.

Indicator		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Miles of Public Access through forested lands	ML2	236.7	0	Same as Alt. 1	0
	ML3	31.5	0	Same as Alt. 1	0
	ML4	0.4	0	Same as Alt. 1	0
	ML5	5.4	0	Same as Alt. 1	0
	All	274	0	Same as Alt. 1	0

Cumulative Effects

The modeling efforts conducted to assess the effectiveness of the SERAL proposed actions at reducing the landscape's susceptibility to natural disturbances and to increase landscape resilience demonstrate, convincingly, that the current and expected ratio of dead and potentially hazardous trees within the project area will be measurably reduced by the action alternatives. The suite of other present and reasonably foreseeable actions identified in Table A.4 are also expected to reduce the rate of dead and potentially hazardous trees in the area. Therefore, the actions listed in Table A.4 and the SERAL proposed actions, including in particular the hazard tree removal, collectively maintain safe access to public lands, including those traveling through public lands to other private or corporate lands

Need 4. Reduce the Spread of Invasive Non-Native Weeds

Affected Environment

Forest Service Manual 2903(4) requires the Forest to “determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action, as an integral component of project planning and analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk prior to project approval.” The Stanislaus National Forest Land and Resource Management Plan (Forest Plan) as amended, and the Pacific Southwest Region Noxious Weed Management Strategy require that a noxious weed risk assessment be conducted to “determine risks for weed spread ... associated with different types of proposed management activities” (USDA, USFS 2010).

There are 231 acres of known infestations of invasive plants within the SERAL project area, and a likely risk of the establishment of new infestations if left uncontrolled. Yellow star-thistle, Maltese star-thistle (tocalote), and bull thistle account for approximately 100 acres of the known, mapped occurrences. Occurrences are found across the project area and more than 97 percent are less than one acre in size. Annual rates of spread vary from 10 to 24 percent for many invasive plant species in the western United States (Asher and Dewy 2005). Since non-native species have proliferate seeding rates that quickly colonize disturbed settings, potential influx along major travel routes poses risk for high rates of weed spread into areas where vegetation is being treated to reduce the risk of wildfire or to provide conditions supporting more natural fire regimes. Timely treatment of known infestations as well as small, newly discovered infestations before they have a chance to spread, is critical to maintaining an effective invasive species control program. Once in the natural setting, the costs and potential damages increase because weeds affect the natural successional response to disturbance and create large, infested areas too difficult to eradicate with existing control measures.

Indicators and Measures

The SERAL proposed actions include treatments designed to control and eradicate invasive non-native weed and include management requirements designed to reduce the spread of or additional introductions of new infestations during project implementation. The proposed treatments are static among the alternatives differing only in regard to herbicide use. Alternative 4 would only employ the use of manual, mechanical, or cultural treatment methods as described in Section 2.01-A.iii.

Direct and Indirect Effects

Although invasive plant seed could be vectored through the activities proposed across each action alternative depending on the type of equipment and associated personnel, where they were prior entering the project area, how clean the equipment entering and operating in the project area is, and each treatments proximity to existing populations. Standard management requirements, mitigation measures, and monitoring practices reduce the likelihood of introducing new noxious weed infestation and reduce the risk of spreading existing noxious weeds in the project area (see 2021-1119_DRAFT_SERAL_InvasiveWeedRiskAssessment).

The proposed invasive plant control and eradication will further reduce the spread of invasive non-native weeds and those already existing in the project area. However, treatment methods will take multiple years to take effect, therefore some risk of spread will remain. Some established weeds will only be controlled not eradicated. If early detection rapid response is employed and successful, new infestations should be fully mitigated. The ability to use herbicides as is proposed in Alternatives 1 and 3 will enable a more effective response for certain invasive weeds compared to Alternative 4. However, each alternative will reduce the spread of invasive non-native weeds.

Cumulative Effects

Reducing and avoiding the spread of invasive non-native weeds is considered in every reasonably foreseeable future action planned on private and federal lands within the SERAL project area (Table A.4). Some projects (i.e., Cedar Ridge CE and FERC) include herbicide weed treatments in the suite of actions planned. Collectively the SERAL proposed actions and management requirements added to the other past invasive weed treatments and the reasonably foreseeable future actions identified in Table A.4 are expected to mitigate the spread of invasive non-native weeds, and potentially lead to a cumulative reduction of the existing non-native weeds already present in the project area.

4. LIST OF PREPARERS

4.01 Interdisciplinary Team

Name	Title/Discipline	Relevant Experience	Education
Jacob Baker	Silviculturist, Planning Forester	Planning Forester, Stanislaus National Forest, 7 years; Forestry Technician, US Forest Service, 2 seasons; Peace Corps Volunteer, Mexico, 3 years	BS, Forestry MF, Forestry
Carol Ewell	Fire Management Specialist (Fire Planner)	Forest Fire Management Specialist (planning) Stanislaus NF 6 years, National/regional ecologist (fire/fuels emphasis) based in CA 11 years, NPS and USFS biological or forestry technician monitoring fire effects and active wildfires 4 seasons	BA, Environmental Studies and Community Studies MS, Natural Resource Management, Forestry
Steve Holdeman	Aquatic Biologist	Forest Aquatic Biologist, Stanislaus National Forest 19 years; Aquatic Biologist, Private Consulting 12 years	BS, Wildlife and Fisheries Science MS, Fisheries Science
Crispin Holland	Botanist	Forest Range Wildlife Aquatic and Botany Program Manager 13 years; Region 5 Range Program Manager 3 years; Rangeland Specialist Plumas and Stanislaus National Forests 10 years	BS, Rangeland Resource Science - Soils and Botany Minor
Curtis Kvamme	Soil Scientist	Soil Scientist, Stanislaus National Forest 11 years; Soil Scientist, Shoshone NF Student Career Experience Program 2 years	BS, Ecology & Conservation Biology MS, Forest Ecology & Management
Mark Schug	GIS Coordinator	GIS Coordinator Stanislaus National Forest, 7 years, GIS Specialist, Stanislaus National Forest, 13 years, Forest Technician, Private industry 10 yrs.	BS, Forestry. GIS Certificate
Kathy Strain	Heritage and Archeology	Forest Archaeologist and Tribal Relations Program Manager; National Forest 31 years; District Archaeologist, Sequoia National Forest 4 years; Ecosystem Archaeologist, Humboldt-Toiyabe National Forest 4 years; Forest Archaeologist, Stanislaus National Forest 23 years	BA, Anthropology MA, Behavioral Science emphasis Anthropology
Adam Rich	Wildlife Biologist	Wildlife Biologist, Stanislaus National Forest 23 years; Wildlife Biologist, Deschutes National Forest 1 year; Research Biologist, US Fish and Wildlife Service 2 years	BS, Biology MS, Biology
Ryan Kalinowski	Wildlife Biologist	Wildlife Biologist, Stanislaus National Forest, 9 years; Student Career Experience Program (Wildlife), Stanislaus National Forest 3 years; Wildlife Technician 4 seasons	BS, Wildlife Management and Conservation MS, Natural Resources – Wildlife Emphasis
Tracy Weddle	Hydrologist	Hydrologist, Stanislaus National Forest 15 years; Hydrologist, White Mountain National Forest 3 years	BS, Environmental Studies MS, Watershed Science
Katie Wilkinson	Forest Environmental	Environmental Coordinator, Stanislaus National Forest, 5 years; Ecologist, Stanislaus National	BS, Environmental Biology / Zoology

Name	Title/Discipline	Relevant Experience	Education
	Coordinator, SERAL Team Leader	Forest, 4 years; Biological Science Technician, Stanislaus National Forest 8 years.	MS, Biology — Aquatic Wildlife Emphasis
Lucas Wilkinson	GIS specialist, ForSys Technician, Resource Model Support	GIS Coordinator, Stanislaus National Forest, Less than 1 year; Aquatic Biologist, Stanislaus National Forest, 6 Years; Ecologist, Stanislaus National Forest, 4 Years; Biological Science Technician, Stanislaus National Forest 7 Years.	BA, Environmental Sciences (Double Major); MS, Ecology

4.02 Additional Technical Advisors and Contributors

Name	Title/Discipline
Becky Estes	Region 5 Central Sierra Province Ecologist
Beverly Bulaon	Region 5 Forest Health Protection, South Sierra Shared Service Area
Eric Knapp	Research Ecologist, USFS Pacific Southwest Research Station
Peter Stine	USFS Pacific Southwest Research Station
Alan Agar	Research Forester, Rocky Mountain Research Station
Mark Metcalf	Resource Planning and Monitoring, USFS Pacific Northwest Region
Chris Dunn	Research Associate, Oregon State University
Jessica Haas	Fire and Fuels Ecologist, USFS Enterprise Program
Stacy Drury	Research Fire Ecologist - USFS Pacific Southwest Research Station
Carlos Ramirez	Region 5 USFS Remote Sensing Lab Program Manager
Carol Clark	GIS Analyst Region 5 USFS Contractor – Remote Sensing Lab
Kirk Evans	GIS / RS Analyst, Region 5 USFS Contractor– Remote Sensing Lab
John Hogland	Research Forester, Rocky Mountain Research Station
Sarah Sawyer	National Wildlife Ecologist, WO Biological & Physical Resources Staff
Gretchen Jehle	Wildlife Planner, Region 5, Pacific Southwest Region, Ecosystem Planning
Laura Hierholzer	Environmental Coordinator, Region 5, Pacific Southwest Region, Ecosystem Planning

4.03 Yosemite Stanislaus Solutions Collaborators

Name	YSS Leadership Role	Affiliation
Brian Wayland	YSS Leadership Chair	Sierra Pacific Industries
John Buckley	YSS Leadership Vice Chair	Central Sierra Environmental Resource Center
Mike Albrecht	YSS Leadership Team	Sierra Resource Management, Inc.
Chris Trott	YSS Leadership Team	CT Bioenergy Consulting
Patrick Koepele	YSS Leadership Team	Tuolumne River Trust, Executive Director
John Amodio	YSS Leadership Team	Tuolumne River Trust
Carolyn Lott	YSS Member	Facilitator
Byron Krempf	YSS Member	Tuolumne River Trust

5. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

5.01 Federal, State and Local Agencies

Advisory Council on Historic Preservation, Director, Planning and Review
U. S. Army Corp of Engineers, South Pacific Division
Environmental Protection Agency, Region 9, EIS Review Coordinator
Federal Aviation Administration, Regional Administrator, Western-Pacific Region
NOAA Fisheries Service, SW Region, Habitat Conservationist Division
Natural Resources Conservation Service, National Environmental Coordinator
APHIS PPD/EAD, Deputy Director
National Agricultural Library, Acquisitions and Serials Branch
US Coast Guard, Office of Environmental Management
US Department of Energy, Director, Office of NEPA Policy and Compliance
USDI Fish and Wildlife Service

5.02 California State Agencies

California Department of Fish and Wildlife
California Department of Parks and Recreation OHMVR
Central Valley Regional Water Quality Control Board

5.03 Local Elected Officials

Alpine County Board of Supervisors
Tuolumne County Board of Supervisors
Calaveras County Board of Supervisors
Mariposa County Board of Supervisors

5.04 Tribes

Tuolumne Band of Me-Wuk Indians
Washoe Tribe of Nevada and California
Chicken Ranch Tribal Council

5.05 Individuals and Organizations

The Forest Service distributed the final environmental impact statement or made it electronically available to over 700 individuals and groups. Each specifically subscribed to the project mailing address or Forestwide mailing address, commented during scoping or the during the comment period for the DEIS.

Electronic correspondence was distributed via GovDelivery (USDA Forest Service forestservice@public.govdelivery.com).

An additional 100 letters were mailed via USPS to individuals, organizations, permit holders, and others interested in the SERAL project. We have omitted a complete listing from this FEIS, but it is available on request.

6. REGULATORY REVIEW OF OTHER (THAN NEPA) LAW, REGULATION, AND POLICY COMPLIANCE

6.01 National Forest Management Act (NFMA) — Land Management Plan Consistency and Compliance

This project is consistent with the forest plan as documented in the Forest Plan Consistency checklist. The consistency of Alternative 1 is compared to the forest plan as amended by the proposed project-specific forest plan amendments (Appendix B, Table B.1). Alternatives 3 and 4 are consistent with the current forest plan (USDA Forest Service 2017).

Supporting Project Documentation

Documentation Title	File Name
Forest Plan Compliance Checklist	2021-1210_SERAL_ForestPlanCompliance

6.02 Endangered Species Act

Stanislaus National Forest specialists reviewed the proposal and made effects determinations for threatened, endangered, and proposed species and critical habitat that occur or have the potential to occur within the project area (Table 41) and ensured compliance with the Endangered Species Act.

Table 41: Effect Determination for Endangered Species Act species and habitat.

Species/Habitat	Status	In Project Area?	ESA Determination	Supporting File Name
Yosemite Toad	Threatened	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Yosemite Toad Critical Habitat	Designated	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Sierra Nevada Yellow-Legged Frog	Endangered	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Sierra Nevada Yellow-Legged Frog Critical Habitat	Designated	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
California Red-legged Frog	Threatened	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
California Tiger Salamander	Threatened	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Delta Smelt	Threatened	No	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Sierra Nevada red fox	Endangered	No	No Effect	2021-0907_SERAL_SNRF_ConsiderationDocumentation
<i>Pinus albicaulis</i>	Proposed	Unlikely	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation

Additional Supporting Project Documentation

Documentation Title	File Name
U.S. Fish and Wildlife Service ECOS-IPaC Online Species List	2021-0907_SERAL_SpeciesList_SacramentoFishAndWildlifeOffice

6.03 Forest Service Sensitive Species (Forest Service Manual 2670)

Sensitive species are those designated by the Regional Forester with the goal of proactively developing and implementing management practices to ensure that those species do not become Threatened or Endangered, and therefore require protection under the Endangered Species Act because of Forest Service actions (FSM 2670.12). Stanislaus National Forest resource specialists reviewed the proposal and made determinations as to whether the status of Forest Service Sensitive species would be impacted. The summary determinations and documentation references are provided in Table 42.

Table 42. Effect determinations for Forest Service Sensitive Species.

Species	FSM Determination	Documentation Title and File Name
California Spotted Owl	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
American Marten	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Northern goshawk	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Willow flycatcher	No Effect	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Bald eagle	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Great gray owl	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Pallid bat	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Townsend's big-eared bat	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
North American wolverine	No Effect	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Western Bumblebee	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Fringed myotis	May Affect, not likely to result in a trend toward Federal listing or loss of viability in the planning area	2021-1202_DRAFT_SERAL_Wildlife_BiologicalEvaluation
Limestone salamander	No Effect	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Foothill yellow-legged frog	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Western pond turtle	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation
Hardhead	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_AquaticBiologicalAssessmentEvaluation

Species	FSM Determination	Documentation Title and File Name
<i>Allium jepsonii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Allium tribracteatum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Allium yosemitense</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Arctostaphylos nissenana</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Balsamorhiza macrolepis</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Boechera evadens</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Boechera tularensis</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium ascendens</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium crenulatum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium lineare</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium lunaria</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium minganense</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium montanum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium pedunculosum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium pinnatum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium tunux</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Botrychium yaaxudakeit</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Bruchia bolanderi</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Calochortus clavatus</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation

Species	FSM Determination	Documentation Title and File Name
<i>Clarkia australis</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Clarkia biloba</i> ssp. <i>australis</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Clarkia lingulata</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Cypripedium montanum</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Dendrocollybia racemosa</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Draba asterophora</i> var. <i>asterophora</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Draba asterophora</i> var. <i>macrocarpa</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Eriastrum tracyi</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Eriogonum luteolum</i> var. <i>saltuarium</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Eriophyllum congdonii</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Eriophyllum nubigenum</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Erythronium taylorii</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Erythronium tuolumnense</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Fissidens aphelotaxifolius</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Helodium blandowii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Horkelia parryi</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Hulsea brevifolia</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Iris hartwegii</i> ssp. <i>columbiana</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Lewisia congdonii</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation

Species	FSM Determination	Documentation Title and File Name
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Lomatium stebbinsii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Meesia uliginosa</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Mielichhoferia elongata</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Mielichhoferia shevockii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Mimulus filicaulis</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Mimulus pulchellus</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Peltigera gowardii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Pinus albicaulis</i>	No Effect	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation
<i>Tauschia howellii</i>	May affect, not likely to lead to a trend in federal listing or loss of viability in the planning area	2021-1119_DRAFT_SERAL_Botany_BiologicalEvaluation

6.04 Management Indicator Species (Forest Service Manual 2630)

Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Framework MIS Amendment Record of Decision (ROD) signed December 14, 2007, which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the Stanislaus Forest plan Direction.

An MIS report was completed to evaluate and disclose the impacts of SERAL on the habitat of the thirteen (13) MIS identified in the Stanislaus National Forest – Forest Plan (USDA 2017). This report documents the effects of the proposed action on the habitat of selected project-level MIS.

Additional Supporting Project Documentation

Documentation Title	File Name
Management Indicator Species Report	2021-1119_DRAFT_SERAL_MIS_Report

6.05 Invasive Species Management (Forest Service Manual 2900, Executive Order 13112)

The Stanislaus National Forest conducted an analysis to assess the risk of introducing, establishing, or spreading invasive plants as a result of the SERAL proposed actions and included mitigation measures to reduce the risk. In addition, the SERAL proposed actions include an early detection rapid response proposal to control or eradicate existing or future infestations. The results of this analysis and the proposed invasive weed treatments are documented in the invasive plant risk assessment document.

Additional Supporting Project Documentation

Documentation Title	File Name
Invasive Weed Risk Assessment	2021-1119_DRAFT_SERAL_InvasiveWeedRiskAssessment

6.06 National Historic Preservation Act (NHPA) – Section 106 Review

The National Historic Preservation Act of 1966 is the principal, guiding statute for the management of cultural resources on NFS lands. Section 106 requires federal agencies to consider the potential effects of a project on historic, architectural, or archaeological resources that are eligible for inclusion on the National Register of Historic Places and to afford the President’s Advisory Council on Historic Preservation an opportunity to comment. The criteria for National Register eligibility and procedures for implementing Section 106 are outlined in the U.S. Code of Federal Regulations (36 CFR Parts 60 and 800, respectively). Section 110 requires federal agencies to identify, evaluate, inventory, and protect National Register of Historic Places resources on properties they control.

A. Programmatic Agreement

Compliance to Section 106 is accomplished through in the “Programmatic Agreement 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” (Regional Programmatic Agreement), signed February 2013, and amended 2018.

The entire project area was completely surveyed for the presence of historic, architectural, or archaeological resources. Sites will be protected in compliance with the Regional Programmatic

Agreement, and we anticipate that current design features [see 2.03 Management Requirements B.1, B.2, B.3] will ensure that no significant effects would occur.

B. Tribal Consultation

The Stanislaus National Forest consulted with the Tuolumne Band of Me-Wuk, Chicken Ranch Tribal Council, California Valley Miwok Tribe also known as the Sheep Ranch Rancheria of Me-Wuk Indians of California, and Washoe Tribe of Nevada and California in July and August 2020. The Forest only received a verbal supportive comment from the Tuolumne Band.

6.07 Soil Quality and Hydrologic Function (FSM 2500 – USDA 2010)

FSM 2500 establishes the management framework for sustaining soil quality and hydrologic function while providing goods and services outlined in the Forest Plan. Primary objectives of this framework are to inform managers of the effects of land management activities on soil quality and to determine if adjustments to activities and practices are necessary to sustain and restore soil quality. Soil quality analysis and monitoring processes are used to determine if soil quality conditions and objectives have been achieved.

Supporting Project Documentation

Documentation Title	File Name
Soil Report	2022-0224_Final_SERAL_SoilsReport

6.08 Soil Conditions (FSM 2500 Chapter 2550 Supplement – USDA 2012)

FSM 2500 Chapter 2550 Supplement establishes soil functions (support for plant growth (productivity) function, soil hydrologic function, and filtering and buffering function) that the Region uses to assess soil conditions. The analysis standards are used for areas dedicated to growing vegetation. They are not applied to lands with other dedicated uses, such as system roads and trails or developed campgrounds.

Supporting Project Documentation

Documentation Title	File Name
Soil Report	2022-0224_Final_SERAL_SoilsReport

6.09 Water Quality Management Handbook (FSH 2509.22, Chapter 10 - USDA 2011)

The Forest Service Region 5 Water Quality Management Handbook (WQMH) includes requirements for best management practices (BMP) implementation monitoring of all projects with the potential to adversely affect water quality using a “checklist” approach (FSH 2509.22 Chapter 10). The Forest Service water quality protection program relies on implementation of prescribed BMPs. The checklists are the primary means for early detection of potential water-quality problems and should be completed early enough to allow corrective actions to be taken, if needed, prior to any significant rainfall or snowmelt throughout the duration of the project.

These BMPs are procedures and techniques that are incorporated in project actions and determined by the State of California to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. Forest Service BMPs, as presented in the 2011 Handbook include detailed descriptions of individual BMPs (section 12), a requirement that site-specific BMPs be included in timber sale contracts (section 13), and direction that legacy sites (sites disturbed by previous land use that is causing or has potential to cause adverse effects to water quality) within timber project boundaries will be restored or improved. Additionally, the 2011

Handbook amendment establishes an expanded water quality management monitoring program (section 16).

Supporting Project Documentation

Documentation Title	File Name
SERAL BMP Checklist	2021-1117_DRAFT_SERAL_BMP_checklist.pdf

6.10 National Best Management Practices for Water Quality Management on National Forest System Lands (Vol. 1 – National Core BMP Technical Guide. FS-990a).

http://www.fs.fed.us/biology/resources/pubs/watershed/FS_National_Core_BMPs_April2012.pdf

Current Forest Service policy directs compliance with required CWA permits and State regulations and requires the use of BMPs to control nonpoint source pollution to meet applicable water quality stands and other CWA requirements. The SERAL BMP checklist was prepared to identify all of the applicable BMPs that need to be followed during implementation of the SERAL project.

Supporting Project Documentation

Documentation Title	File Name
BMP Checklist	2021-1117_DRAFT_SERAL_BMP_checklist.pdf

6.11 Protection of Wetlands (Executive Order 11990) and Floodplain Management (Executive Order 11988)

Wetlands within the project area include meadows, stream channels, springs, fens, and shorelines. This project is consistent with Executive Order 11990 since this project would maintain or improve the condition of wetlands in the project area.

Supporting Project Documentation

Documentation Title	File Name
Watershed Report	2021-1118_DRAFT_SERAL Watershed Report

6.12 Clean Water Act (CWA)

The Clean Water Act of 1948 (as amended in 1972 and 1987) establishes federal policy for the control of point and non-point pollution and assigns the states the primary responsibility for control of water pollution. The Clean Water Act regulates the dredging and filling of freshwater and coastal wetlands. Section 404 (33 USC 1344) prohibits the discharge of dredged or fill material into waters (including wetlands) of the United States without first obtaining a permit from the U.S. Army Corps of Engineers. Wetlands are regulated in accordance with federal Non-Tidal Wetlands Regulations (Sections 401 and 404). No dredging or filling is part of this project, and no permits are required.

Compliance with the Clean Water Act by national forests in California is achieved under state law. The California Water Code consists of a comprehensive body of law that incorporates all state laws related to water, including water rights, water developments, and water quality. The laws related to water quality (sections 13000 to 13485) apply to waters on the national forests and are directed at protecting the beneficial uses of water. Of particular relevance for the SERAL project is section 13369, which deals with non-point-source pollution and best management practices. All actions proposed result in the maintenance of the applicable beneficial uses of water in the Water Quality Control Plan for the California Central Valley Water Quality Control Board.

Supporting Project Documentation

Documentation Title	File Name
Watershed Report	2021-1118_DRAFT_SERAL Watershed Report

6.13 Migratory Bird (Executive Order 13186)

Direction for integrating migratory bird conservation into forest management and planning includes the Landbird Conservation Strategic Plan (USDA Forest Service 2000), Executive Order 13186 (2001), and the Partners in Flight North American Landbird Conservation Plan (Rosenberg et al. 2016), and the 2017 Department of Interior Solicitor's Opinion M-37050.

Within the National Forests, migratory bird conservation focuses on providing a diversity of bird habitats at multiple spatial and temporal scales over the long-term. Our actions also include promoting migratory bird conservation through collaboration and cooperation with the Fish and Wildlife Service as well as other agencies, non-profit organizations and private citizens.

Although some project actions may have incidental short-term adverse effects on some individual birds, eggs or nests, we do not expect adverse effects at the species population level. Additionally, potential adverse effects to migratory bird species have been reduced through the adherence of Forest Plan Standards and Guidelines such as: riparian reserve buffers; select tree thinning that maintains a variety of forest canopies and canopy gaps needed for migratory birds; limited ground disturbance; snag/down woody debris retention and others. Forest management generally creates and maintains migratory bird habitat heterogeneity (including late-seral and early-seral habitats), as well as creating habitat with greater resilience to ecosystem stressors such as abnormal high severity fire, insect and disease infestation and prolonged drought.

Supporting Project Documentation

Documentation Title	File Name
Migratory Bird Assessment	2021-0630_DRAFT_SERAL_MigratoryBird_Report

6.14 National Forest System Land Management Planning Rule (36 CFR 219)

A. Identification of the Need to Change the Plan (36 CFR 219.13(b)(1))

The 1991 Stanislaus National Forest Land and Resource Management Plan, as amended and as consolidated in the Stanislaus National Forest Plan Direction (USDA Forest Service 2017) provides the current management direction — land allocations, desired conditions, management intents, objectives, and standards and guidelines (S&Gs) — specific to the California spotted owl (CSO).

Much of the current direction pertaining to the CSO originates from the 2004 Sierra Nevada Framework amendments. The Framework presented management guidance focused on retaining suitable habitat and minimizing disturbance to breeding CSO. Since that time, much research and additional monitoring has been conducted providing updated information related to the status, habitat preferences and habitat needs of the CSO. This new information indicates threats to owls are shifting and evolving, environmental conditions are changing, threats of habitat loss due to large scale high severity wildfire are increasing, and owl populations are declining in some areas of the species range and particularly in areas where habitat has been lost due to disturbance. During the lengthy fire season of 2020 alone, of the fires with RAVG data, over 55,000 acres of CSO PACs were located within a fire perimeter. Of those CSO PAC acres, more than half, almost 28,000 acres of the existing PAC habitat, were lost based on estimated loss of basal area. Retention of suitable habitat by avoiding management actions in CSO habitat is no longer acceptable and comes at a great risk (Jones et al. 2021(a); Jones et al. 2021(b), *In Press*). An all-lands approach, including CSO PACs and territories, to manage the vegetation structure and composition towards a condition that accepts fire at more regular intervals and at lower intensities, and a landscape

that can persist and evolve with other natural processes such as fire, insects, disease, and drought is necessary.

In April of 2019, the *Conservation Strategy for the California Spotted Owl in the Sierra Nevada* (hereafter referred to as the “**CSO Strategy**”) was published by the USDA Forest Service (USDA 2019). A central goal of the CSO Strategy is to move the Sierra Nevada forests as a whole toward the natural range of variation where there would be an abundance of resilient and dynamic owl nesting, roosting, and foraging habitat distributed across the landscape and having specific management constraints in regard to CSO habitat would no longer be necessary. The CSO Strategy recognizes that vegetation management has the potential to increase forest resilience at the landscape scale — including vegetation management, that in some instances, may reduce spotted owl habitat quality in the near-term but preserve long-term sustainability of spotted owl habitat by promoting additional, future, spotted owl habitat. To accomplish this balance of short-term disturbance with long-term conservation, the CSO Strategy synthesized newly available science into recommended management approaches and conservation measures, including management constraints, that provide some immediate stability for individual owls while allowing landscape treatments to occur.

In order to apply an all-lands approach to forest management based on NRV (Approach 2, USDA 2019) while ensuring high-quality habitat is maintained, especially around occupied nest sites (Approach 1, USDA 2019) as presented in the CSO Strategy it is necessary to adopt a suite of forest plan amendments, in at least one alternative. The suite of needed amendments include plan components which: (1) Update the plan to promote landscape scale NRV-based restoration; (2) Eliminate PAC avoidance based plan content; (3) Add standards and guidelines to constrain management activities in PACs and Territories; (4) Update PAC designation direction to better define high quality CSO habitat; (5) Add new guidelines which address post-disturbance management; (6) Convert plan content from HRCA to Territory; (6) Update and add new PAC retirement standards.

Appendix B, Table B.1 presents the suite of project-specific forest plan amendments applied to Alternative 1. The specific need for each category of amendments are further addressed below.

i. Update the Plan to Promote Landscape Scale NRV-Based Restoration

NRV-based restoration is a central and guiding principle of the CSO Strategy. NRV is a relatively new, well supported, concept that was not contemplated or considered during the development of the current forest plan in 1991 or during the development of the 2004 Framework amendments. The CSO Strategy as well as numerous other studies, conclude that restoring landscape structure and function to be within the NRV can help develop a resilient landscape including habitat conditions that provide CSO conservation in the long term.

ii. Eliminate PAC Avoidance-Based Plan Content

For more than a quarter of a century, the Forest Service has been engaging in proactive California spotted owl (CSO) conservation focusing on retaining suitable habitat and minimizing disturbance to breeding owls by locating mechanical vegetation treatments to “avoid” PACs to the greatest extent feasible, as is demonstrated by S&G 72. However, new science indicates threats to spotted owls are shifting and evolving, environmental conditions are changing, and owl populations are declining in some areas of the species’ range. In the CSO Strategy, active management within PACs is promoted where necessary to increase resiliency and sustainability (USDA 2019, p. 28). This concept recognizes that PACs are not immune to the risk of large-scale, high severity wildfire or severe tree mortality from insects and disease and drought. The 2019 CSO Conservation Strategy provides updated guidance and recommendations focusing on maintaining high-quality habitat, while allowing for the development of resilient habitat across the landscape (USDA 2019), including the use of mechanical treatments within PACs. Shifting management direction from a single, limiting resource focus and general PAC avoidance to a more landscape level approach is needed in order to allow management an opportunity to consider, if, where,

and what restoration is needed across the landscape, including within PACs, to best achieve landscape scale resiliency. The CSO Strategy and local experts stipulate that a more wholistic approach to treating the landscape is critical for reducing the risk of habitat loss.

iii. Add Standards and Guidelines to Constrain Management Activities in PACs and Territories

A central goal of CSO Strategy is to improve the overall resilience of forest vegetation types relative to stressors including altered fire regimes and drought, for the long-term benefit of the ecosystems and the species found therein. In regard to habitat for California spotted owl, the goal is to move Sierra Nevada forests as a whole toward the natural range of variation where there would be an abundance of resilient and dynamic owl nesting, roosting, and foraging habitat distributed across the landscape and having specific management constraints in spotted owl territories would no longer be necessary. In the interim, however, management constraints within protected activity centers and territories are an important component of a comprehensive approach that considers both near- and long-term needs of the species.

Plan components for California spotted owl applicable to either protected activity centers or territories are necessary to balance the application of NRV-based management and species conservation needs. Protected activity centers are intended to meet the specific habitat needs that support successful reproduction of breeding owls. Territories, which contain protected activity centers, are areas defended by the resident pair of owls and include foraging and other important habitat. Desired conditions for protected activity centers and territories align with both the near-term need for high quality nesting and roosting habitat, and increased resilience and sustainability of this habitat into the future. Given the role vegetation management plays in increasing forest resilience at the landscape scale, vegetation management that does not reduce spotted owl habitat quality needs to be encouraged within and around owl territories and, if necessary, in protected activity centers. In some instances, vegetation management that may reduce spotted owl habitat quality in the near term may also be necessary to preserve long-term sustainability of spotted owl habitat and the forest plan needs to be modified provide this allowance.

Because of the need to protect human safety, some plan components to define exceptions which allow management constraints to be modified in order to meet safety objectives or mitigate extreme risks to habitat sustainability need also to be included in the forest plan.

iv. Update PAC Designation Direction to better define high quality nesting and roosting habitat

The current forest plan directs that 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 codominant 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).

The CSO Strategy suggests that PACs be designated to include 300-acres of the *highest quality nesting and roosting habitat* rather than the best available. The difference between *highest quality nesting and roosting habitat* and *best available nesting and roosting habitat* was further defined by authors of the CSO Strategy and incorporated into both the forest plan revision efforts of the Sequoia and Sierra National Forests and the SERAL proposed amendments, Alternative 1's proposed actions, and analysis. The updated definitions of highest quality and best available habitat add a snag and down woody debris aspect that is not included in the current forest plan. The slight, albeit important, differentiation from best available to both highest quality and best available is needed in order to more effectively meet the specific habitat needs of the California spotted owl and will better ensure that near-term impacts to reproductive

owls and nest stands are minimized and the highest quality nesting and roosting habitat is maintained and promoted—based on characteristics identified as the most important by the most current science.

v. Add New Guidelines Which Address Post-Disturbance Management

Prior to the 20th century, regular patterns of fire created a mosaic of vegetation patterns including varying degrees of canopy cover and forest openings at densities far less susceptible to insect-, disease-, or drought mortality. Now, when insect- or disease-outbreaks or lengthy droughts occur mortality is common. CSO PACs are not immune to these disturbances. Large scale mortality leads to an accumulation and eventual overabundance of fuels: coarse woody debris, snags, litter, and duff. These fuels collectively heighten the landscape's risk (including PACs) to experience high severity wildfire. In these instances, management activities to reduce the fuels may be necessary to restore resilient conditions based on NRV.

Generally, NRV can inform the salvage needs in response to both fire and insect related mortality. Historically, fire effects that mimic NRV would have produced a mosaic of patches burned at low (30 to 60 percent) and moderate (15 to 35 percent) severities interspersed with large, unburned patches (10 to 30 percent) and small, high severity patches (1 to 10 percent) (USDA 2019). High severity burns are most likely to result in tree mortality. Where that occurs in excess of 10 percent of the landscape, there would be an NRV-based restoration need to salvage.

Similarly, insect and disease outbreaks that mimic NRV would have produced patches of beetle- or disease-killed trees between 0.25 and 10-acres over up to 15 percent of the landscape (Fettig 2012 *in* USDA 2019). When insect or disease cause mortality in excess of this condition, there would be an NRV-based restoration need to salvage.

The current forest plan specifically prohibits salvage harvest in PACs outside of WUI defense zones unless a Biological Evaluation determines the area is rendered unsuitable. This PAC avoidance-based management direction, as addressed in section A.2 above, is contradictory to NRV-based landscape restoration and impacts management's ability to move the landscape into a condition more resilient to future disturbances. To correct this, S&G 35 in the current forest plan needs to be amended to provide guidelines for conducting vegetation management within highly disturbed areas including allowing the determination of desired conditions for amount, location, and configuration of patch retention to be informed by best available science as referenced above.

vi. Convert Plan Content from HRCA to Territory

Owls benefit from mature forests with a mosaic of vegetation types and seral stages. A mosaic condition of small open areas or gaps and edges interspersed with high-quality nesting/roosting habitat is considered an important predictor for owl occupancy and reproduction. Circular territories rather than Home Range Core Areas (HRCA) better recognize the need to manage toward NRV and fine scale habitat heterogeneity that recent research shows owls prefer for nesting, roosting, and foraging. In contrast, HRCA focus mainly on canopy cover over a large area which may result in homogenization, densification, and continuous fuel profiles that increase the risk of sustained crown fire. Circular territories also better recognize how owls are central place foragers (i.e., tend to focus activities in a circular pattern). In contrast, HRCA delineation requirements often result in more "amoeba" like or long linear features that may not actually be defended by owls (an owl territory is the area defended by a resident pair).

vii. Update and Add New PAC Retirement Standards

The CSO exhibits high site fidelity. However, when a PAC becomes abandoned, research suggests the probability of recolonization of a vacant PAC is relatively low (0.34 one-year post vacancy) and continues to decline through time (USDA Forest Service 2019). The recolonization probability is 0.20 the

fourth year and 0.06 the tenth year after abandonment (Wood et al. 2018). CSO occupancy and reproduction are best predicted by previous year occupancy, and previous year occupancy and reproduction, respectively (Hobart et al. 2019), suggesting unoccupied PACs tend to stay unoccupied and, if colonized, are not reproductive the following year. To best maintain high-quality habitat while protecting it from risk of loss from high severity wildfire and other stressors, there is a need for PAC management to continually improve the effectiveness and dynamic nature of the PAC network (USDA Forest Service 2019). Local observations of owls conclude that these abandoned and non-active PACs have poor habitat quality and lack nest structures. Retiring these poorer condition PACs, lacking high-quality habitat characteristics, not likely to support reproduction, will allow a broader array of management actions designed to increase long-term suitable habitat development and promote future recruitment of owls into those same areas. The objective for areas that were once but are no longer in active PACs is to increase long-term suitable and sustainable habitat development in a dynamic landscape (Ibid).

B. Substantive Requirements Directly Related to the Amendments (36 CFR 219.13(b)(5))

In accordance with 36 CFR 219.13(b)(5), based on the proposed amendments' purpose and anticipated effects, the Responsible Official has determined the following substantive provisions are directly related to the proposed amendments:

36 CFR 219.8 Sustainability,

(a) Ecological sustainability.

(1) Ecosystem Integrity;

36 CFR 219.9: Diversity of Plant and Animal Communities,

(a) Ecosystem plan components.

(b) Additional, species-specific plan components.

36 CFR 219.10 Multiple Use,

(a) Integrated resource management for multiple use:

(1) Aesthetic values, cultural and heritage resources, ecosystem services, fish and **wildlife species**, forage, geologic features, grazing and rangelands, **habitat and habitat connectivity**, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, **timber**, trails, **vegetation**, viewsheds, and other relevant resources and uses;

(5): Habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments);

(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 National Forest Management Act,

(c) Timber harvest for the purposes other than timber production; and

(d) Limitations on timber harvest,

(3) Timber harvest would be carried out in a manner consistent with the **protection** of soil, watershed, fish, **wildlife**, recreation, and aesthetic resources

C. *Applying the Substantive Requirements that are Directly Related*

Each of the substantive requirements set forth in 36 CFR 219.8 through 36 CFR 219.11 provide an overarching purpose to which the regulation is directed as well as specific means to meet that purpose, generally with the inclusion of plan components. Application of the directly related substantive requirements listed in the preceding section entails documenting that 1) the amended plan will meet the overarching purpose of each specific substantive requirement; 2) identifying specific plan components which ensure that purpose is met; and 3) explaining how the agency action triggering the amendments (in this case the SERAL project) is consistent with the purpose of the substantive requirement (Table 43).

Table 43: Application of the Directly Related Substantive Requirements.

Directly Related Substantive Requirements	How the plan amendments meet the purpose of the substantive requirement	Plan components that meet purpose of the substantive requirement	How the SERAL Project will meet the purpose of the substantive requirement
36 CFR 219.8(a)(1)	<p>Compliance with requirements of paragraph (a) item (1) of this section is intended to provide for the ecological sustainability and ecosystem integrity of the plan area. The plan must include plan components, including standards or guidelines, to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity.</p> <p>Ecological sustainability is defined as the maintenance or restoration of the composition, structure, and processes of ecosystems including the diversity of plant and animal communities and the productive capacity of ecological systems. Ecological integrity refers to the ability of an ecosystem to support and maintain ecological processes and a diverse community of organisms. 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 unbalanced species diversity and lush understory ladder fuels, and overly stressed due to changes in precipitation (drought), increasing temperature, and decades long absence of regular fire regimes. Together, these landscape characteristics impact the landscape’s ability to experience and survive change or disturbance. Competition for limited resources in stressed, overly dense and lush forests increases the forests vulnerability to insect and disease infestations, drought, and the persistent and growing threat and occurrences of large-scale, high severity megafires (USDA 2019, p. 2).</p> <p>The project-specific forest plan amendments were developed to adopt the management approaches and conservation measures of the CSO Strategy. Moving the landscape toward the natural range of variation (NRV) is a central and guiding principle of the CSO Strategy. The concept of restoring the landscape into closer alignment with historic reference conditions, as in NRV, is rooted in the assumption that the structural and species composition of forests occurring in pre-settlement times, were, and would still be, more resilient to disturbances such as insects, disease, drought, and climate change, and less susceptible to large-scale, high severity wildfires (USDA 2019, p. 19 [Kalies and Kent 2016, Larson et al. 2013, Stephens et al. 2016]). The NRV is recognized as a means in which to assess ecological integrity. NRV can help identify key structural, functional, compositional, and connectivity characteristics which may be important for either maintenance or restoration of such ecological conditions.</p> <p>The CSO Strategy, and thus the proposed forest plan amendments, stipulate that landscape forest structure is an appropriate indicator of overall health of forests across the landscape, and that restoring forest structure to its NRV will increase the landscape’s resilience and adaptive capacity. Collectively, improving landscape resilience and increasing adaptive capacity will directly promote ecological sustainability and integrity in the project area. Development of a resilient landscape able to sustain during and after disturbances, will not happen overnight. Aligning the landscape with NRV is the first step towards an eventual resilient future range of variation (USDA Forest Service 2019; pp. 2, 19) composed of a persistent, present, and functioning ecosystem (ecological sustainability) which will support and maintain ecological processes and a diverse community of organisms (ecological integrity).</p> <p>The CSO Strategy supports the use of active management utilizing forest thinning, fuel reduction and prescribed fire to achieve both short-term and longer-term objectives to develop more resilient, sustainable, and dynamic habitat to support a diverse community of organisms (USDA 2019, pp. 29). The proposed plan amendments developed to adopt approach 2 of the CSO Strategy encourage and support the maintenance and restoration of ecological sustainability by adding goals (broad statements of intent) and desired conditions whose main objectives address restoring resilient forest conditions guided by NRV (USDA Forest Service 2019, Approach 2, pp 30-33).</p>	TERR-SERAL-GOAL-01, TERR-SERAL-GOAL-02, TERR-SERAL-GOAL-03, SPEC-CSO-DC-01, SPEC-CSO-DC-02, SPEC-CSO-DC-03, SPEC-CSO-DC-04, SPEC-CSO-DC-05, TERR-SERAL-STD-01, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-06, SPEC-CSO-GDL-01, SPEC-CSO-GDL-02, SPEC-CSO-GDL-03, SPEC-CSO-GDL-04, SPEC-CSO-GDL-05, SPEC-CSO-GDL-06, SPEC-SERAL-MA-01	<p>The management approaches synthesized in the CSO Strategy directly influenced aspects of SERAL's purpose and need for action and the need to amend the plan. The overall objectives of the SERAL project are focused on restoring ecological sustainability as related to landscape resilience to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the project area, as demonstrated by Purpose and Need 1.01: Increase Landscape Resilience to Natural Disturbances (drought, insects, disease) by Restoring Resilient Forest Conditions as Guided by NRV (Chapter 1, 1.01, A through G). More specifically, Alternative 1, the only alternative in which the proposed project-specific forest plan amendment apply and which was developed to fully incorporate the proposed amendments, is designed to promote ecosystem sustainably and increase ecosystem integrity by increasing forest heterogeneity, reducing stand densities, retaining large structurally diverse trees and snags, increasing the relative abundance of fire-tolerant and shade-intolerant trees, and reducing understory and surface fuels. These objectives will be met via a combination of mechanical forest thinning, fuel reduction, and prescribed fire techniques. During implementation, NRV conditions will be mimicked by creating a pattern of individual trees, clumps of trees, and openings (ICO structure) of various sizes, similar to what was once found in historical forests prior to logging and fire suppression. Desired conditions will be further restored and maintained via broadscale, regular prescribed fire. Salvage actions to respond to tree mortality occurring outside the natural range of variability will also be implemented on a limited basis.</p> <p>Treatment areas were located in areas more in need of restoration based on a few objectives. Research scientists from the University of Washington (UW) conducted an assessment of the landscape resiliency of the SERAL project area. UW’s efforts provided a modeled estimate of the landscape’s departure from NRV as compared to reference conditions. Similarly, research scientists from the Rocky Mountain Research Station conducted an assessment to determine wildfire risk across the landscape. Their efforts produced a value of the expected net value change as a result of wildfire. Their assessment focused on key weighted Forest Service mission-oriented resources and assets identified by the forest leadership team. Areas of the project area most departed from NRV and expected to experience the greatest losses due to wildfire were prioritized when locating treatment areas throughout the project area.</p> <p>The environmental consequences section of this DEIS devoted to presenting how well our proposed actions meet Need 1.01 (Section 3.02 – Need 1) further corroborate consistency with the purpose of 36 CFR 219.8(a)(1). Alternative 1, the only alternative which the project-specific forest plan amendments apply, best achieve the objectives of those purpose and needs.</p>
36 CFR 219.9(a)	<p>36 CFR 219.9 adopts a complimentary ecosystem (coarse filter) and species-specific (fine filter) approach to maintaining the diversity of plant and animal communities and the persistence of native species in the plan area. Compliance with the ecosystem requirements of paragraph (a) of this section is intended to provide the ecological conditions to both maintain the diversity of plant and animal communities and support the persistence of most native species in the plan area. Compliance with the requirements of paragraph (b) of this section is intended to provide for additional ecological conditions not otherwise provided with paragraph (a) of this section for individual species (addressed in the next row in this table – see 36 CFR 219.9(b) [CLICK HERE]).</p>	<p>(1) Ecosystem integrity. TERR-SERAL-GOAL-01, TERR-SERAL-GOAL-02, TERR-SERAL-GOAL-03, SPEC-CSO-DC-01, SPEC-CSO-DC-02, SPEC-CSO-DC-03, SPEC-CSO-DC-04, SPEC-CSO-DC-05, TERR-SERAL-STD-01, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-06, SPEC-CSO-GDL-01, SPEC-CSO-GDL-02, SPEC-CSO-GDL-03, SPEC-CSO-GDL-04, SPEC-CSO-GDL-05, SPEC-CSO-GDL-06, SPEC-SERAL-MA-01</p>	<p>The SERAL project recognizes that maintaining the diversity of plant and animal communities and the persistence of native species in the plan area is dependent on a resilient landscape composed of diverse, heterogenous forests that mimic historic conditions (distribution, densities, and species composition). To meet the overarching objective to increase ecosystem integrity and move the project area as a whole to a more resilient condition, treatment areas were located in areas most departed from NRV and at greatest risk of wildfire.</p> <p>Forest thinning will be implemented to best mimic NRV conditions by creating a pattern of individual trees, clumps of trees, and openings of various sizes, similar to</p>

Directly Related Substantive Requirements	How the plan amendments meet the purpose of the substantive requirement	Plan components that meet purpose of the substantive requirement	How the SERAL Project will meet the purpose of the substantive requirement
	<p>36 CFR 219.9(a)(1) re-emphasizes the importance of maintaining or restoring ecological integrity of terrestrial and aquatic ecosystems in the plan area as required by 36 CFR 219.8(a)(1)(see previous row) and includes the added importance of maintaining or restoring ecosystem diversity (§219.9(a)(2)).In particular, §219.9(a)(2) states, the plan must include plan components, including standards and guidelines, to maintain or restore the diversity of ecosystems and habitat types throughout the plan area. In doing so, the plan must include plan components to maintain or restore: (i) key characteristics associated with terrestrial and aquatic ecosystem types; (ii) Rare aquatic and terrestrial plant and animal communities; and (iii) The diversity of native tree species similar to that existing in the plan area.</p> <p>Additional supporting documentation for how the plan amendments meet the purpose of 36 219.9(a)(1) Ecosystem Integrity is addressed above [CLICK HERE].</p> <p>After a decade’s long over-emphasis on fire suppression, Sierran mixed-conifer forests, like the SERAL project area, have lost the ecosystem diversity of historic conditions. Both structural and species diversity have been impacted. Forests are now composed of homogenous expanses of overly dense, even-aged, fire-intolerant and shade-tolerant species (USDA 2019 p. 18: Barbour et al. 2002, Dolanc et al. 2014, Guarin and Taylor 2005, McIntyre et al. 2015, Stephens et al. 2015). This shift in species composition coupled with uncharacteristically dense, homogenous forests with a heavy presence of surface and ladder fuels directly compromises both the ecological integrity and resilience of the landscape. 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.</p> <p>The proposed project-specific forest plan amendments increase ecological integrity and maintain or restore ecosystem diversity in the plan area because they include standards and guidelines which direct active management to: (1) increase structural and species diversity (forest heterogeneity); (2) reduce tree densities while retaining diversity of size and age classes consistent with NRV; (3) retain large, old trees and snags; (4) restore the proportion and distribution of tree species on the landscape consistent with NRV and potential vegetation type (e.g., increase species diversity by increasing the relative abundance of fire tolerant and shade-intolerant tree species); (5) reduce ground fuels; (6) increase management by fire; and (7) restore habitat after disturbances that do not align with NRV (USDA 2019, Approach 2, p. 30 – 33).</p> <p>Each of these objectives supported by the proposed plan amendments are critical to mitigating the threat of large, high severity wildfire and increasing the landscape’s resilience to other natural disturbances such as insect and disease outbreaks (USDA 2019).</p>	<p>(2) Ecosystem diversity. TERR-SERAL-GOAL-01, SPEC-CSO-DC-02, SPEC-CSO-DC-03, SPEC-CSO-DC-04, SPEC-CSO-DC-05, TERR-SERAL-STD-01, SPEC-CSO-STD-06</p>	<p>what was once found in historical forests prior to logging and fire suppression. In doing so, treatments will be applied to increase within- and between stand structural diversity, reduce stand densities, retain large, old, and structurally diverse trees and snags, increase species diversity by creating openings to promote regeneration of shade-intolerant species (pines), reduce ground and ladder fuels, and selectively remove or retain trees to achieve the desired species composition (larger abundance of fire-tolerant and shade-intolerant trees – PP, SP, JP, and BO).</p> <p>Ecosystem integrity and diversity will be further achieved by locating openings, where possible, adjacent to healthy, mature conifers and oaks to promote oak regeneration and to limit water and soil competition within immature trees nearby the crown of the mature trees (Hood et al. 2017). The integrity of meadow and aspen stands will also be maintained and restored by selective removal of encroaching conifers and shrubs growing within meadows or aspen stands where large numbers of conifers have not historically occurred. The objective is to reestablish the historic meadow edge and enhance meadow function, or to promote and/or stimulate aspen growth. Ecosystem diversity is further supported by the SERAL project because the proposed action specifically targets the location and intensity of forest thinning and removal of trees by species and location (Chapter 2.01, A.i). For example, outside of CSO PACS and Territories, Alternative 1 in particular, limits the thinning of shade-intolerant trees to 30-inches DBH, but allows shade-tolerant (fire intolerant) trees up to 34-inches DBH to be removed where at least one 30-inch shade-intolerant conifer is left within 1-tree height of the tree removed. The same pattern is applied within CSO Territories, but the DBH limits are lowered to 24-inch DBH for shade-tolerant, and 30-inch DBH for shade-intolerant. The specificities of the proposed action are important to balance short term impacts to habitat while reducing forest densities and rearranging the composition of structural and species diversity as guided by NRV across the project area. Achieving the desired ecosystem diversity based on NRV through forest thinning treatments varying by tree species and forest plan land allocations will best ensure ecosystem integrity is restored.</p>
36 CFR 219.9(b)	<p>Compliance with paragraph (b) of this section is intended to provide for additional ecological conditions not otherwise provided by compliance with paragraph (a) (addressed in previous row) for individual species. In particular paragraph (b) requires the responsible official to determine whether or not the plan components required by paragraph (a) of this section 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. If the responsible official determines that the plan components required in paragraph (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.</p> <p>The proposed project specific forest plan amendments include plan components which were developed to conserve CSO habitat and habitat elements around occupied CSO sites (USDA 2019, Approach 1, pp 25 – 29) as a critical component of the landscape effort to increase resiliency. Locally, the Stanislaus National Forest experienced firsthand the importance of landscape resiliency to maintaining important ecological conditions and habitat characteristics which support viable populations of CSO and the vulnerability of the landscape to habitat loss. For example, the 2013 Rim Fire overlapped with 46 CSO PACs. After a post-disturbance analysis was conducted by wildlife biologists , with technical assistance from PSW researchers, it was found that these 46 PACs clustered into three categories related to high severity fire: Category 1 – burned primarily at high severity with small amounts of post-fire suitable habitat remaining (10 PACs); Category 2 – lower amounts of high severity fire, lower amounts of suitable habitat loss so high amounts of post-fire suitable habitat remaining (27 PACs); Category 3 – intermediate levels of high severity burning, suitability of habitat unknown (9 PACs). The 10 PACs (approximately 3,000 acres) that primarily burned at high severity were ultimately retired because it was clear that those sites had very low to no probability of continued occupancy.</p> <p>These CSO specific plan components will ensure the ecological conditions (e.g., habitat conditions) necessary to ensure successful CSO reproduction and persistence across the project area is maintained and promoted into the future, considering both short-term and long-term needs of the species. The proposed project specific plan</p>	<p>LAND-SERAL-WILDLIFE-01, LAND-SERAL-WILDLIFE-02, LAND-SERAL-WILDLIFE-03, SPEC-CSO-DC-01, SPEC-CSO-DC-06, SPEC-CSO-DC-07, SPEC-CSO-STD-01, SPEC-CSO-STD-02, SPEC-CSO-STD-03, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-07, SPEC-CSO-GDL-01, SPEC-CSO-GDL-02, SPEC-CSO-GDL-03, SPEC-CSO-GDL-04, SPEC-CSO-GDL-05, SPEC-CSO-GDL-06, SPEC-SERAL-MA-01, S&G 80, first three sentences of unamended S&G 71 (USDA 2017, p. 34).</p>	<p>A primary purpose and need component of the SERAL project is to retain, large, old, and structurally diverse trees and snags across the project area (Chapter 1.01, C). The California spotted owl (CSO) depends on these large, old, and structurally diverse trees and snags for nesting, roosting, and foraging. (USDA 2019). The SERAL project was developed to specifically maintain and promote these important habitat characteristics for the CSO.</p> <p>Alternative 1, as developed in compliance with the proposed project-specific forest plan amendments, in particular includes the following CSO specific constraints which provide the ecological conditions necessary to provide some immediate stability for individual owls while allowing landscape treatments to occur: (1) limit forest thinning to 100 acres per CSO PAC and constrain tree removal within PACS to trees 20 inches DBH and below; (2) limit tree removal during forest thinning within Territories to 24 inches DBH for shade-intolerant pines and Douglas firs and up to 30 inches DBH for shade-tolerant cedars and red and white fir ; (3) no mechanical harvest within 10-acres surrounding the most recent known nest site; and (4) application of an limited operating period (from March 1 to August 15) which prohibits mechanical harvest within 0.25 mile of a known nest or roost site and prescribed fire within 500 feet of a known nest or where the location of a nest site is unknown, application of the limited operating period to the entire PAC (Chapter 2.01 and 2.03).</p> <p>The areas of PAC selected for treatment in Alternative 1 were chosen after a two-step assessment. First, key CSO habitat characteristics were assessed to inform where treatments within PACs were needed. Priority considerations were made to ensure high-quality habitat — CWHR 5D and 5M — was maintained within PACs when determining areas available for treatment. Treatable PAC areas are made up of PAC</p>

Directly Related Substantive Requirements	How the plan amendments meet the purpose of the substantive requirement	Plan components that meet purpose of the substantive requirement	How the SERAL Project will meet the purpose of the substantive requirement
	amendments include new components which specify the desired ecological conditions which will best support CSO, standards and guidelines which constrain management actions within CSO protected activity centers and territories and guide the consideration of treatment needs and locations, as well as where and when a particular treatment type is applied. Collectively these plan components aim to maintain high-quality habitat while protecting it from risk of loss from high severity wildfire and other stressors. These plan components balance high-quality habitat retention while allowing treatments to increase landscape resiliency.		LMUs containing greater than 50% of lesser quality habitat — CWHR 4D and 4M or less — and/or a greater proportion of large, high density trees — CWHR 5D and 5M — than reference conditions. Once the treatable PAC LMUs were identified, the areas were secondarily screened to identify which were most departed from NRV — as represented by a resiliency departure metric developed by UW, and the risk of loss of resources and assets as represented by the mission oriented expected net value change developed by the RMRS. Up to 100 acres per PAC were selected where the criteria were met in both step one and two. In addition, the effects analysis in the DEIS (Chapter 4, Issue 1A and 1B) demonstrates the projects effectiveness at maintaining high-quality CSO (and other wildlife) habitat. from two perspectives: (1) How the proposed treatments are located to maintain high-quality habitat — through avoidance or treatment constraints; and (2) How the proposed treatments lead to long-term maintenance of habitat as represented by a reduction in wildfire risk and loss of habitat. These results further support the actions including the proposed project-specific forest plan amendments 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 CFR 219.10(a)	<p>The overarching purpose of substantive requirement 36 CFR 219.10(a) <i>Integrated Resource Management for Multiple Use</i> is to ensure that the forest plan provides 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, § 219.10(a) stipulates that the plan must include plan components, including standards and guidelines for integrated resource management to provide for ecosystem services and multiple use in the plan area. This substantive requirement then lists 10 itemized descriptions of what the responsible official shall consider when developing the plan components for integrated resource management. Not every consideration listed — or aspects of each consideration listed — are directly related to the scope and scale of the proposed project-specific plan amendments. The directly related considerations include aspects (emphasized in bold below) of item (1), (5), and (8). The proposed forest plan amendments recognize the interdependence of ecological resources.</p> <p style="text-align: center;">36 CFR 219.10(a)(1)</p> <p>In particular, 36 CFR 219.10(a)(1) stipulates that when developing the plan components for integrated resource management, the responsible official shall consider (1) aesthetic values, air quality, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, wilderness, and other relevant resources and uses.</p> <p>The CSO, a sensitive wildlife species, and the critical habitat needs of the CSO, were directly considered in the development of the proposed project-specific forest plan amendments because the amendments were developed adopt the central goals, management approaches and conservation measures presented in the CSO Strategy (USDA 2019). . The central tenet of the suite of proposed project-specific forest plan amendments are focused developing a resilient landscape as guided by NRV. The general assumption is that conducting NRV-based restoration to improve landscape resilience to multiple disturbances, considering climate change, is synonymous with an overall healthier landscape, and a landscape more apt to support a fully functioning ecosystem and opportunities for a variety of uses. Restoring and maintaining critical CSO habitat needs, consisting of dynamic owl nesting, roosting, and foraging habitat, is mutually beneficial to supporting ecological sustainability and providing forested lands to meet the needs of present and future generations, including outdoor recreation, cultural and heritage resources, forage, grazing and rangelands, trails, and viewsheds.</p> <p>The proposed project-specific forest plan amendments support, and encourage, effective use of timber harvest, other mechanical thinning of vegetation, and fire to reduce stand densities and ladder fuels to increase the resilience of forests to fire, drought, and other disturbances incited by drought (USDA 2019, p. 29, Fettig et al. 2019, Kolb et al. 2016, North et al. 2015a, North et al. 2015b). The amendments include desired conditions which will be best achieved through actions which will naturally provide timber, such as density reduction (mechanical forest thinning), species composition conversion, and response to natural disturbance (salvage) (USDA 2019, p. 30 – 33).</p>	TERR-SERAL-GOAL-01, TERR-SERAL-GOAL-02, TERR-SERAL-GOAL-03, LAND-SERAL-WILDLIFE-01, LAND-SERAL-WILDLIFE-02, LAND-SERAL-WILDLIFE-03, SPEC-CSO-DC-01, SPEC-CSO-DC-02, SPEC-CSO-DC-03, SPEC-CSO-DC-04, SPEC-CSO-DC-05, SPEC-CSO-DC-06, SPEC-CSO-DC-07, TERR-SERAL-STD-01, SPEC-CSO-STD-01, SPEC-CSO-STD-02, SPEC-CSO-STD-03, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-06, SPEC-CSO-STD-07, SPEC-CSO-GDL-01, SPEC-CSO-GDL-02, SPEC-CSO-GDL-03, SPEC-CSO-GDL-04, SPEC-CSO-GDL-05, SPEC-CSO-GDL-06, SPEC-SERAL-MA-01	<p>Many uses of public lands occur within and adjacent to the SERAL project area — including, but not limited to livestock grazing, hiking, swimming, hunting, motorized recreation (OHV), gathering, and camping.</p> <p>The SERAL project recognizes the interdependence of a healthy functioning ecosystem to provide and sustain multiple-uses in the area. The surrounding communities near the project area have social and economic ties to National Forest System lands. Management decisions made by the Forest Service can often impact the economies of smaller, resource-based communities nearby. Economic effects can include changes in local employment and income, as well as changes in local services and community infrastructure. Businesses in small rural towns often rely on tourism and wood product revenue throughout the year, so maintaining safe and consistent access to National Forest System lands for recreation and industry uses (timber and concessionaire businesses operated on or nearby NFS lands) contribute to resilient communities.</p> <p>Forest products resulting from restoration and management activities on National Forest System lands contribute to the local economy and to the sustainability of the local forest products industry. Improved recreation opportunities and conservation and restoration of terrestrial habitats also sustain livelihoods and provide economic benefits to businesses and industries supporting recreation, hunting, fishing and other such uses on public lands.</p> <p>Long-term closures, or limits to public access due to tree mortality, active wildfires, or unsafe post-fire conditions on the Stanislaus National Forest in recent years have closed or reduced tourist traffic for several months to popular destinations. These impacts weigh heavily on local business owners, make operating seasonal businesses in small towns more difficult, and have led directly to business closures. Hazard tree abatement is critical to maintaining safe access to the project area to sustain multiple uses of National Forest System lands to best meet the needs of the American people (Public Law 86–517; Approved June 12, 1960).</p> <p>The SERAL project’s main objectives are rooted in the assumption that a resilient landscape is overall healthier and more apt to support a fully functioning ecosystem and opportunities for a variety of uses. Increasing ecosystem resilience and integrity will ensure the project area will experience less severe or catastrophic losses as a result of wildfire, insect, disease, or drought. This is the essence of landscape sustainability. In order to provide a full suite of multiple uses across the project area,</p>

Directly Related Substantive Requirements	How the plan amendments meet the purpose of the substantive requirement	Plan components that meet purpose of the substantive requirement	How the SERAL Project will meet the purpose of the substantive requirement
	<p>36 CFR 219.10(a)(5)</p> <p>In particular, 36 CFR 219.10(a)(5) stipulates that the responsible official shall consider 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). The aspects of substantive requirement § 219.10(a)(5) that are directly related to the scope and scale of the proposed project-specific plan amendments are narrow. We have demonstrated that wildlife habitat conditions subject to the requirements of § 219.9 were considered and those are addressed above (see § 219.9 (a) and (b)). None of the proposed project specific plan amendments 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 amendments promote the opportunity to move the project area as a whole to a condition more resilient to large-scale, stand-replacing disturbances such as high severity wildfire or insect outbreaks. Maintaining habitat conditions and a healthy ecosystem is key to providing persistent and sustainable opportunities for the public to hunt, fish, trap, gather, observe or other activities.</p> <p>36 CFR 219.10(a)(8)</p> <p>In particular, 36 CFR 219.10(a)(8) stipulates that 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 (§ 219.8(1)(iv)). This consideration re-emphasizes the importance of ecological sustainability and integrity as defined and addressed in 36 CFR 219.8(a)(1) above. The proposed project-specific forest plan amendments promote forest restoration toward the NRV which serve two main habitat goals: (1) the maintenance and creation of key habitat elements and (2) the resilience of habitat to natural disturbances and climate change (USDA 2019, p. 19). Restored forests provide the range of conditions in which terrestrial and aquatic ecosystems evolved and survived prior to European settlement. Restored forests are more heterogeneous and resilient to many disturbances, such as large-scale, high severity fire; insects; disease; drought; and climate change. Restoring forest composition, structure, and processes based on NRV conditions is linked to greater resilience to wildfire, climate change, and other stressors (Kalies and Kent 2016, Larson et al. 2013, Stephens et al. 2016a). The proposed project-specific forest plan amendments which were developed to adopt CSO Strategy’s Management Approach 2 encourage forest managers to increase landscape resiliency to fire and other disturbances as guided by NRV. Generally, the project specific-forest plan amendments provide plan components, including standards or guidelines, which support meeting these objectives through active management to (1) increase within- and between-stand heterogeneity; (2) reduce stand densities; (3) increase the large tree component on the landscape; (4) increase the relative abundance of fire-tolerant and shade-intolerant tree species; (5) reduce ground fuels; (6) restore natural disturbance regimes through increase management by fire, both prescribed and managed wildfire; and (7) actively restore habitat after disturbances that do not align with NRV (USDA 2019, p. 30-33).</p>		<p>the landscape must be able to support and maintain ecological processes and a diverse community of organisms.</p> <p>As previously noted, treatment needs were primarily assessed considering wildfire risk, landscape departure from historic conditions, and key CSO habitat characteristics, but economic viability was also considered. Much of the forest restoration needs will be achieved via forest thinning and timber harvesting. Portions of the project area which met all or some of the objectives were prioritized over other areas. The proposed actions developed to meet these objectives, promote and provide for ecological sustainability and ecosystem integrity as guided by NRV while incorporating the newly amended goals, desired conditions, standards, guidelines, and potential management approaches. The environmental consequences section of this DEIS devoted to presenting how well our proposed actions achieve the purpose and needs of the project further corroborates consistency with the purpose of 36 CFR 219.10(a). Alternative 1, the only alternative which the project-specific forest plan amendments apply, best achieve the objectives of those purpose and needs.</p>
36 CFR 219.11(c)	<p>Compliance with paragraph (c) of this section is intended to support inclusion of plan components that allow timber harvest for the purposes other than timber production throughout the plan area as a tool to assist in achieving or maintaining one or more applicable desired conditions or objectives of the plan in order to protect other multiple-use values, and for salvage, sanitation, or other public health or safety. Examples include using timber harvest to improve wildlife habitat and thinning to reduce fire risk — both of which are applied in the SERAL project.</p> <p>To correct the landscape’s current departure from historic conditions, as in NRV, the CSO strategy and the amended plan recognize the important role timber harvesting will play to achieve the desired forest structure, density, and composition across the landscape. The project specific forest plan amendments recognize, support, and allow vegetation management (including timber harvest) for the purpose of reducing the risk of undesired wildfire effects, increasing landscape resilience to natural disturbances (drought, insects, disease) by restoring forest conditions as guided by the NRV, and maintaining and improving wildlife habitat (Purpose and Need 1.01) at the landscape scale.</p>	SPEC-CSO-DC-02, SPEC-CSO-DC-03, SPEC-CSO-DC-04, SPEC-CSO-DC-05, TERR-SERAL-STD-01, SPEC-CSO-STD-01, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-06, SPEC-CSO-STD-07, SPEC-CSO-GDL-05, SPEC-CSO-GDL-06, SPEC-CSO-GDL-07, SPEC-SERAL-MA-01, S&G 1 (first paragraph), S&G 2, S7G 3, S&G 4, S&G 5, S&G 7 (unamended portion, USDA 2017, p. 34)	The SERAL proposed actions include timber harvest as a mechanism to achieve our landscape desired condition which is aimed at restoring the natural range of variation and reducing the risk of resource losses due to wildfire (DEIS, Chapter 2.01, Section A.i.).

Directly Related Substantive Requirements	How the plan amendments meet the purpose of the substantive requirement	Plan components that meet purpose of the substantive requirement	How the SERAL Project will meet the purpose of the substantive requirement
36 CFR 219.11(d)(3)	<p>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 amendments are limited to those related to wildlife.</p> <p>The proposed project specific forest plan amendments developed to adopt Approach 1 of the CSO strategy (USDA 2019, p. 25-29) were designed to conserve California spotted owl habitat and habitat elements around occupied CSO sites (USDA 2019, p. 25). These plan components are focused on the immediate need for maintaining high-quality habitat, especially around occupied nest sites, while resilient habitat is developed across the landscape as promoted and presented in Management Approach 2 of the CSO Strategy (USDA 2019, p. 25). They provide some immediate stability for individual owls while allowing landscape treatments (including timber harvest) to occur.</p>	TERR-SERAL-STD-01, SPEC-CSO-STD-01, SPEC-CSO-STD-04, SPEC-CSO-STD-05, SPEC-CSO-STD-06, SPEC-CSO-STD-07, SPEC-CSO-GDL-03, SPEC-CSO-GDL-04, SPEC-CSO-GDL-06, SPEC-CSO-GDL-07, S&G 7 (unamended portion; USDA 2017, p. 34), S&G 13 (USDA 2017, pp. 34-35); Practice 13-A Soil Support Services — all S&G in that section (USDA 2017, p. 57); Practice 18-A- Water Quality Management — all S&G in that section (USDA 2017, p. 60); Riparian Conservation Objectives —S&G 95 through S&G 122 (USDA 2017, pp. 189-191), and Practice 15-A- Timber Program Administration —(USDA 2017, pp. 120-121 and p. 156).	See response for 36 CFR 219.9(b) above.

D. Potential Species of Special Concern Determination and Consideration (36 CFR 219.13(b)(6))

The proposed project-specific forest plan amendments will apply to the 1991 Stanislaus National Forest Land and Resource Management Plan (as amended) which was developed and revised under the 1982 Planning Rule. The Regional Forester has not yet identified species of special concern for the plan area. Public comments received during scoping expressed concern about the potential for the proposed project-specific forest plan amendments to lessen protections for the California spotted owl. The NEPA effects analysis does not reveal a substantial adverse impact of the amendments or the other proposed actions (DEIS, Chapter 4). Nonetheless, § 219.9(b) is directly related to the proposed project-specific forest plan amendments and has been applied as if the CSO were a species of special concern. See [36 CFR § 219.9\(b\)](#) in Table 42.

6.15 Clean Air Act (CAA), Air Quality, and Smoke Emissions

The Clean Air Act of 1970 (amended in 1977 and 1990) requires the United States Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (40 CFR part 50) for pollutants considered harmful to public health and the environment, and it was designed to “protect and enhance” the quality of the nation’s air resources. The Clean Air Act identifies two types of national ambient air quality standards. Primary standards provide public health protection, including protecting the health of ‘sensitive’ populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The EPA has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, which are called ‘criteria’ air pollutants and they include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter less than 10 microns in size (PM₁₀), particulate matter less than 2.5 microns in size (PM_{2.5}), and sulfur dioxide.

The EPA’s General Conformity Rule, established under Section 176(c)(4) of the Clean Air Act, provides a specific process for ensuring that federal actions do not interfere with a state’s plans to attain or maintain NAAQS. Compliance with the CAA by national forests in California, including prescribed fire authorizations, is achieved under state and local law (e.g., Tuolumne County Air Pollution Control District [APCD]). The California Air Resources Board (CARB) leads this effort under the process established by the California Smoke Management Program (Title 17). The legal basis of the program is found in the Smoke Management Guidelines for Agricultural and Prescribed Burning adopted by the CARB. The Guidelines provide the framework for state and local air district regulators to conduct the program. Elements of the program include registering and permitting of agricultural and prescribed burns; meteorological and smoke management forecasting; daily burn authorization; and enforcement.

The Great Basin Unified (which Alpine County is part of), Calaveras, Tuolumne and Mariposa County Air Pollution Control Districts (APCDs) are responsible for implementing and regulating air quality programs for projects occurring on the Stanislaus National Forest. The SERAL project is in Tuolumne County, but smoke dispersion can travel in all directions, and affect multiple states and countries during large wildfires (e.g., 2021 Dixie Fire). See Tuolumne County APCD website for rules and thresholds (available online at <https://www.tuolumnecounty.ca.gov/364/Air-Pollution-Control-District>).

As described in Sections 1.01A through F, tree stand densities and surface fuels accumulations are far greater than the natural range of variation. These dense, largely contiguous fuel and vegetation conditions have direct, significant contributions to generate large amounts of smoke during proposed prescribed burns, or during potential natural- and human-caused wildfires. The proposed action alternatives outlined in this EIS all have similar amounts of initial operational prescribed fire units (as outlined Section 2.02), but there are key differences in the amount of potential material to be burned, and its location, due to the differences in mechanical thinning treatments in each alternative that will often occur before prescribed fire treatments. The amount of prescribed burning in the action alternatives might cause short-term, sporadic diminished air quality, but they create long-term gains for subsequent reductions in size of wildfires and their associated smoke emissions for up to about 10 years (depending on amount of consumed material and meteorological conditions). In comparison, the no action alternative (Alt. 2) does not propose vegetation or prescribed fire treatments that would change potential future wildfire behavior, timing, and amount/intensity of emissions; so another long-term multi-month, wildfire smoke event could occur soon, with the potential to impact multiple states (e.g., 2013 Rim Fire, 2021 Caldor Fire).

During mechanical treatments, fossil fuel use, emissions and changes to atmospheric chemistry from proposed mechanical implementation will be minor in the context of ongoing global fossil fuel use and changes to our climate. See section 2.01Ai (Prescribed Fire) and section 2.03 (Management Requirements) for more information.

Quantitative estimates of emissions have been done for nearby, similar mixed conifer ecosystems of the Sierra Nevada and are presumed to be similar to those proposed in the SERAL project; but as mentioned above (and in Section 2.01 Ai.) the amount and rate of burning is based on multiple factors. For quantification reference see: Sequoia and Sierra National Forest, Forest Plan Revision DEIS, Air Quality Report (Nick 2016); and Rim Fire Restoration project on Stanislaus NF, Fire Fuels Air Quality Report (Boucher Jr. 2016). The bioregional science synthesis (i.e., PSW-GTR-247) chapter on air quality and related pollutants is also relevant to the SERAL project and proposed prescribed burning treatments (see Chapter 8.1 by Bytnerowicz et al. 2014). By following the regulations and procedures outlined above, and by utilizing Best Available Control Measures and Best Smoke Management Practices, as described in Section 2.01 Ai. (Prescribed Fire), effects to air quality should be predictable and be more manageable than effects from large, unplanned wildfires. The SERAL action alternatives will comply with the CAA, and burning on NFS lands would not occur unless prior approval is granted by Tuolumne County APCD in coordination with other regional and state agencies and fire events.

6.16 Environmental Justice (Executive Order 12898, as amended by EO 14008)

Executive order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” states (Section 1-101), “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.” Environmental Justice concerns are also a priority of the current administration, as affirmed by the January 27, 2021 Executive Order 14008 - Tackling the Climate Crisis at Home and Abroad,⁴ which amends aspects of EO 12898.

Demographic information is useful to determine if, and where project activities might impact minority or low-income populations. Multiple online tools were used to pull information for the areas of Tuolumne and Calaveras counties surrounding the SERAL project area (CalEnviroScreen Version 4.0; U.S. Department of Commerce, 2020). The data show both Tuolumne and Calaveras counties have lower percent minority populations than the state of California, and the United States as a whole, with one exception that the Native American population is slightly higher than the U.S. average in Tuolumne County. Environmental justice concerns can also focus on low-income populations, and age discrimination can be an issue for the Civil Rights Act. The median age in both counties is much higher than the U.S. average, with 26.5% of the population over age 65 in the two-county area in 2019. In 2019 median household, and per capita income were fairly close to the U.S. average (\$62,843), but both measures were much lower than the California average. Interestingly, proportionately fewer people are living below the poverty line when compared to the U.S. average, combining the 2 counties, 7.7% of families were below the poverty line, but nation-wide 9.5% of families live below poverty. The supporting project documents below, offer more details on demographics and socioeconomic indicators for communities around the SERAL project area.

These data represent county-wide averages, but of course there are variations within county boundaries. Some communities lie closer to the Stanislaus’ boundary where SERAL actions would occur, and have median household incomes lower than county-wide, and also higher poverty rates. While it is difficult to estimate economic changes and effects of the SERAL project to those communities directly, the effects to the landscape surrounding those communities have been discussed in more detail throughout this FEIS. Issues 1B and 3A detail how project activities would affect conditional flame lengths, annual burn probability, and predicted vegetation burn severity (Issue 1B), and expected fire type (Issue 3A). Removal of hazard trees along roadways and maintaining roadside fuelbreak networks free of snags and down logs may reduce the abundance of fuelwood available, potentially affecting those who rely on fuelwood as their primary source of heat. It is possible that low-income populations in the area may rely more heavily on fuelwood than the general population. This impact is expected to be minimal since the roads identified for fuelbreaks are generally main roads where hazard trees are usually felled and removed regularly, and

there is an abundance of road miles open for fuelwood cutting within the project area which will not be maintained as fuelbreaks. Additionally, within fuelbreaks or thinning treatments where product removal is not operationally or economically feasible, cut material in accessible areas will be decked or piled and available for fuelwood cutting prior to burning. Potential adverse impacts of the project are not expected to disproportionately impact minority or low-income populations. Communities and individuals most adversely impacted through minor disturbances such as short-term increased traffic, noise and potential road closures or delays are the ones expected to benefit most in the long-term due to their proximity to fuels reduction treatments and reduction in subsequent fire behavior. In short, the action alternatives show improvement in these indicators when compared to Alternative 2 (no action), indicating project activities could have a beneficial impact to communities adjacent to the SERAL boundary by reducing the overall risk of negative fire effects.

Air and water quality: Communities in closer proximity to the SERAL boundary, or in the case of prescribed fire treatments those that are downwind of treatments, could be subject to slightly more days where smoke from prescribed burning is present than larger communities more distant from the project area. These local smoke impacts are expected to be fewer in number, and be much less severe, than what has occurred in recent years as a result of many large wildfires across California. For example, in 2016 there were only 2 days on the Mi Wuk Ranger District where more than 100 acres of prescribed burning occurred by Stanislaus NF fire staff, and 11 days forest-wide, all occurring between the months of November to February. With the scale of fuel reduction and prescribed fire treatments proposed, these local smoke impacts may occur more often, but the intent is they could reduce the likelihood of larger, smokier unplanned wildfires. The primary conveyance of drinking water to most of Tuolumne County's population is connected to Pinecrest, Beardsley, and Lyons Reservoirs (i.e., South and Middle Fork Stanislaus Rivers), and all of these are within or bordering the SERAL project area. The Tuolumne Main Canal ditch and flume system was identified as a highly valued asset/resource during the SERAL wildfire risk assessment which informed the prioritization of treatment locations. The SERAL fuelbreak treatments (as described in FEIS Chapter 2.01 A.i. Fuelbreaks, and Map 6) encompasses this water system, providing additional level of fuels reduction treatment and protection. This canal provides 95% of Tuolumne Utility District's water supply, and also services other agencies, including the Mi Wuk water system. Fuel reduction treatments to protect this system would benefit many communities in Tuolumne County and additional downstream communities and counties (e.g., those connected to New Melones and Lake Tulloch).

Supporting Project Documentation

Documentation Title	File Name
Headwaters Economics Demographic Profiles	US_DeptOfCommerce_2020.pdf

6.17 Consideration of Climate Change

Currently, both NEPA requirements in general and those specific to considerations of greenhouse gas emissions and climate change effects are in flux. The Council on Environmental Quality (CEQ) is revising both its government-wide NEPA regulations and its 2016 climate change guidance. This analysis utilized direction contained in the Forest Service guidance document, "Climate Change Considerations in Project Level NEPA Analysis" (USDA 2009) as the most current guidance for satisfying this requirement.

Supporting Project Documentation

Documentation Title	File Name
Climate Change Consideration Report	2022-0224_FINAL_SERAL Climate Change Report

APPENDIX A: ADDITIONAL TABLES

Table A.1: Historic NRV Range and Seral or CWHR Stage Proportions.

Seral Stage	NRV Range (%)		Size		Density	
	Yellow Pine / Dry Mixed Conifer	Fir / Moist Mixed Conifer	CWHR Code	Tree Size Class (DBH in.)	CWHR Code ¹ ²⁷ (Closure)	Canopy Cover
Early	15-20	10-20	<= 2	Seedlings / Saplings (<6 in.)	All	-
Mid-Open	25-30	20	3 & 4	Poles / Small Trees (6 - 24 in.)	S & P	10% - 39%
Mid-Closed	5-10	10-15	3 & 4	Poles / Small Trees (6 - 24 in.)	M & D	40% - 100%
Late-Open	40-45	25-40	5 (&6)	Medium / Large Trees (>24 in.)	S & P	10% - 39%
Late-Closed	5	20	5 (&6)	Medium / Large Trees (>24 in.)	M & D	40% - 100%

The descriptions of each seral stage in Safford and Stevens (2017) are as follows:

- Early Seral: anything not dominated by trees >4 inches diameter at breast height (DBH)
- Mid-Open: tree size 5-21 inches DBH; canopy cover <50 percent (<40 percent in the yellow pine type)
- Mid-Closed: tree size 5-21 inches DBH; canopy cover >50 percent (>40 percent in yellow pine).
- Late-Open: tree size >21 inches DBH; canopy cover <50 percent (<40 percent in yellow pine).
- Late-Closed: tree size >21 inches DBH; canopy cover >50 percent (>40 percent in yellow pine).

Table A.2: Dry Mixed Conifer.

Seral Stage Excess (CWHR Class)	Seral Stage Deficit (CWHR Class)	Restoration Need	Approximate Restoration Acres
Mid-Closed (3M, 3D, 4M, 4D)	Mid-Open (3S, 3P, 4S, 4P)	Disturbance: Mechanical thinning and/or non-stand replacing fire	11,000
Late-Closed (5M/5D)	Late Open (5S, 5P)	Disturbance: Mechanical thinning and/or non-stand replacing fire	4,300
Mid-Closed (3M, 3D, 4M, 4D)	Early (2 or less)	Disturbance: Small gap creation via mechanical thinning and/or fire.	11,000
Mid-Closed (3M, 3D, 4M, 4D)	Late Open (5S, 5P)	Disturbance, then Succession: Mechanical thinning and/or non-stand replacing fire to transition from mid-seral closed to mid-seral open canopy, followed by growth with periodic, non-stand replacing fire.	27,000
Total Structural Restoration Need			53,300

²⁷ 1S & P = Sparse / Open Cover; M & D = Moderate and Dense Cover.

Table A.3: Wet Mixed Conifer.

Seral Stage Excess (CWHR Class)	Seral Stage Deficit (CWHR Class)	Restoration Need	Approximate Restoration Acres
Mid-Closed (3M, 3D, 4M, 4D)	Mid-Open (3S, 3P, 4S, 4P)	<u>Disturbance:</u> Mechanical thinning and/or non-stand replacing fire	400
Late-Closed (5M/5D)	Late Open (5S, 5P)	<u>Disturbance:</u> Mechanical thinning and/or non-stand replacing fire	1,100
Mid-Closed	Early (2 or less)	<u>Disturbance:</u> Small gap creation via mechanical thinning and/or fire.	1,000
Mid-Closed (3M, 3D, 4M, 4D)	Late Open (5S, 5P)	<u>Disturbance, then Succession:</u> Mechanical thinning and/or non-stand replacing fire to transition from mid-seral closed to mid-seral open canopy, followed by growth with periodic, non-stand replacing fire.	1,100
Total Structural Restoration Need			3,600

Table A.4: List of reasonably foreseeable actions considered for cumulative effects. Each row represents unique polygons including overlapping actions of one or more projects. Individual project names are separated by semi-colons in column "Project Names". There are 45 unique project combinations.

Project Names	Planned Implementation	Type of Action	Acres
SPI	1-2 Years	Clearcut	340.6
		Fuelbreak/Defensible Space	94.3
		Road Right of Way	0.3
		Seed Tree Seed Step	76.0
		Selection	25.1
SPI; Sierra Outdoor School Road 300 ft. Buffer	1-2 Years	Clearcut; Proposed Roadside Treatment	4.0
SPI; Tuolumne Main Canal	1-2 Years	Clearcut; Fuel Reduction	38.8
		Fuelbreak/Defensible Space; Fuel Reduction	3.3
		Selection; Fuel Reduction	1.6
SPI; Tuolumne Main Canal; Private Fuels Treatment	1-2 Years	Clearcut; Fuel Reduction; Proposed Fuel Break	4.6
		Fuelbreak/Defensible Space; Fuel Reduction; Proposed Fuel Break	8.7
		Selection; Fuel Reduction; Proposed Fuel Break	0.5
Cedar Ridge	1-2 Years	Disconnected Parcels	483.8
		Fuel Reduction	831.6
		Fuelbreak	426.1
Cedar Ridge ; Private Fuels Treatment	1-2 Years	Fuel Reduction; Proposed Roadside Treatment	12.6
Cedar Ridge; Sierra Outdoor School Road 300 ft. Buffer	1-2 Years	Fuel Reduction Completed - Needs Maintenance	3.7

Project Names	Planned Implementation	Type of Action	Acres
Cedar Ridge; Sierra Outdoor School Road 300 ft. Buffer; Private Fuels Treatment	1-2 Years	Fuel Reduction Completed - Needs Maintenance; Proposed Roadside Treatment	0.3
Cold Springs	1-2 Years	Fuelbreak	129.8
		Hazard Tree	5.0
		Hazard Tree/Biomass	103.2
		Hazard Trees / Biomass / Fuelbreak Maintenance	175.8
		Hazard Trees / Rx Burn	2.9
		Hazard Trees / Salvage / Biomass / Rx Burn	180.5
		Rx Burn	12.4
Cold Springs; FERC	1-2 Years	Hazard Trees / Biomass / Fuelbreak Maintenance; FERC	1.7
		Hazard Trees / Biomass; FERC	37.7
		Hazard Trees / Salvage / Biomass / Rx Burn; FERC	8.8
Cold Springs; Summit Hazard Tree	Fiscal Year 21-22 and beyond	Hazard Tree/Biomass; Salvage Cut (intermediate treatment, not regeneration)	0.2
		Hazard Tree/Biomass; Salvage Cut (intermediate treatment, not regeneration)	40.4
FERC	1-2 Years	FERC	526.5
Private Fuels Treatment	1-2 Years	Proposed Fuel Break	7.3
		Proposed Roadside Treatment	9.3
Sierra Outdoor School Road 300 ft. Buffer	1-2 Years	Proposed Roadside Treatment	74.6
Sierra Outdoor School Road 300 ft. Buffer; SPI	1-2 Years	Proposed Roadside Treatment; Clearcut	11.9
		Proposed Roadside Treatment Fuelbreak/Defensible Space	5.2
		Proposed Roadside Treatment Selection	0.9
STFBurn_Bald_Mountain	1-2 Years	Underburn	22.1
STFBurn_Cedar_Ridge	+ 5 Years	Underburn	0.5
STFBurn_Cedar_Ridge; Cedar Ridge	+ 5 Years	Underburn; Fuel Reduction	779.6
		Underburn; Fuelbreak	64.7
STFBurn_Cedar_Ridge; Cedar Ridge; Private Fuels Treatment	+ 5 Years	Underburn; Fuel Reduction; Proposed Roadside Treatment	3.4
STFBurn_Crandall	Fiscal Year 21-22	Underburn	689.4
STFBurn_Crandall; Cedar Ridge	Fiscal Year 21-22	Underburn; Fuelbreak	67.0
STFBurn_Crandall; Cold Springs	Fiscal Year 21-22	Underburn; Fuelbreak	0.5
STFBurn_Dry Meadow	Fiscal Year 21-22	Underburn	1,529.9
STFBurn_Dry Meadow; STFBurn_North_Beardsley	Fiscal Year 21-22	Underburn; Underburn	0.2
STFBurn_North_Beardsley	Fiscal Year 21-22	Underburn	1,046.2
STFBurn_South_Beardsley	Fiscal Year 21-22	Underburn	634.8
STFBurn_South_Fork	Fiscal Year 21-22	Underburn	183.9

Project Names	Planned Implementation	Type of Action	Acres
STFBurn_South_Fork; Tuolumne Main Canal	Fiscal Year 21-22	Underburn; Fuel Reduction	31.0
STFBurn_Strawberry	Fiscal Year 21-22	Underburn	4,520.5
STFBurn_Strawberry; Cold Springs	Fiscal Year 21-22	Underburn; Fuelbreak	9.6
		Underburn; Hazard Trees / Biomass / Fuelbreak Maintenance	98.6
		Underburn; Hazard Trees / Rx Burn	4.6
		Underburn; Hazard Trees / Salvage / Biomass / Rx Burn	97.8
		Underburn; Rx Burn	101.1
STFBurn_Strawberry; Cold Springs;FERC	Fiscal Year 21-22	Underburn; Hazard Trees / Salvage / Biomass / Rx Burn; FERC	6.4
STFBurn_Strawberry; Cold Springs; Summit Hazard Tree	Fiscal Year 21-22 and beyond	Underburn; Hazard Tree Salvage Cut (intermediate treatment, not regeneration)	8.6
STFBurn_Strawberry; FERC	Fiscal Year 21-22	Underburn; FERC	1.2
STFBurn_Strawberry; Summit Hazard Tree	Fiscal Year 21-22 and beyond	Underburn; Salvage Cut (intermediate treatment, not regeneration)	19.6
STFBurn_TUD_Canal; SPI; Tuolumne Main Canal	1-2 Years	Underburn; Fuelbreak/Defensible Space; Fuel Reduction	4.0
STFBurn_TUD_Canal; SPI; Tuolumne Main Canal; Private Fuels Treatment	1-2 Years	Underburn; Clearcut; Fuel Reduction Proposed Fuel Break	0.1
		Underburn; Fuelbreak/Defensible Space Fuel Reduction Proposed Fuel Break	6.1
STFBurn_TUD_Canal; Tuolumne Main Canal	1-2 Years	Underburn; Fuel Reduction	61.8
STFBurn_TUD_Canal; Tuolumne Main Canal; SPI	1-2 Years	Underburn; Fuel Reduction Fuelbreak /Defensible Space	2.4
		Underburn Fuel Reduction Selection	0.2
STFBurn_TUD_Canal; Tuolumne Main Canal; Private Fuels Treatment	1-2 Years	Underburn; Fuel Reduction Proposed Fuel Break	16.3
STFBurn_TUD_Canal; Tuolumne Main Canal; Private Fuels Treatment; SPI	1-2 Years	Underburn; Fuel Reduction; Proposed Fuel Break; Fuelbreak/Defensible Space	6.0
		Underburn; Fuel Reduction; Proposed Fuel Break Selection	1.0
Summit Hazard Tree	Fiscal Year 21-22 and beyond	Salvage Cut (intermediate treatment, not regeneration)	278.4
Tuolumne Main Canal	1-2 Years	Fuel Reduction	398.3
Tuolumne Main Canal; SPI	1-2 Years	Fuel Reduction; Clearcut	6.7
		Fuel Reduction; Fuelbreak/Defensible Space	14.1
		Fuel Reduction; Seed Tree Seed Step	2.2
		Fuel Reduction; Selection	2.7
Tuolumne Main Canal; Private Fuels Treatment	1-2 Years	Fuel Reduction; Proposed Fuel Break	86.4
Tuolumne Main Canal; Private Fuels Treatment; SPI	1-2 Years	Fuel Reduction; Proposed Fuel Break; Fuelbreak/Defensible Space	32.0

Project Names	Planned Implementation	Type of Action	Acres
		Fuel Reduction; Proposed Fuel Break; Rehabilitation - Understocked	3.2
		Fuel Reduction; Proposed Fuel Break Selection	0.2
Tuolumne Main Canal; Sierra Outdoor School Road 300 ft. Buffer	1-2 Years	Fuel Reduction; Proposed Roadside Treatment	0.8
TOTAL ACRES			14,534.3

APPENDIX B: PROJECT-SPECIFIC FOREST PLAN AMENDMENTS

A central goal of the California spotted owl conservation strategy is to move the Sierra Nevada forests as a whole toward the natural range of variation where there would be an abundance of resilient and dynamic owl nesting, roosting, and foraging habitat distributed across the landscape and having specific management constraints in regard to CSO habitat would no longer be necessary. In the interim however, management constraints within protected activity centers and territories are an important component of a comprehensive approach that considers both near- and long- term needs of the species. The proposed forest plan amendments itemized in Table B.1 were developed to adopt the management approaches and conservation measures presented in the CSO Strategy (USDA 2019). The vegetation management actions proposed for the SERAL project's Alternative 1, were developed to apply the CSO Strategy management approaches and conservation measures to meet resilience objectives while ensuring the needs of the CSO are incorporated into the desired outcomes of management actions.

Proposed plan amendments that apply to protected activity centers are intended to meet the specific habitat needs that support successful reproduction of breeding owls. Proposed plan amendments that apply to territories are intended to meet the specific habitat needs that support foraging and roosting and other important habitat needs. The desired conditions for PACs and territories address both the near-term need for high quality nesting and roosting habitat and increase resilience and sustainability of this habitat into the future (long-term). Vegetation management has the potential to increase forest resilience at the landscape scale, and therefore the CSO Strategy encourages vegetation management that does not reduce spotted owl habitat within and around owl territories and, if necessary, within PACs. In some instances, vegetation management that may reduce spotted owl habitat quality in the near-term may be necessary to preserve long-term sustainability of spotted owl habitat and promote additional spotted owl habitat into the future.

The CSO Strategy recognizes the importance of ensuring human safety and community protection. As such, some of the proposed plan amendments include exemptions to allow the constraints to be modified to meet safety objectives within fire management features or adjacent to communities in wild-urban interface defense zones. The proposed plan amendments specify when and where exceptions apply.

Terminology Used in Proposed Forest Plan Amendments

Below we provide definitions for some of the common terminology used throughout the CSO Strategy and within the proposed project-specific forest plan amendments.

Large Trees are defined as those equal or greater than 30 inches diameter at breast height.

Very Large Trees are defined as those equal or greater than 36 inches diameter at breast height.

Gaps are defined as forest openings created by mechanical treatments with less than 10 percent tree cover, in various shapes and intermixed with groups of trees.

Small gaps are less than 0.25 acres in size, and

Medium gaps range between 0.25 and 1.25 acres.

Highest quality nesting and roosting habitat for California spotted owl contain the following structural (size, canopy cover, snag, and down woody material) characteristics:

- a. Stands classified as CWHR 6, 5D, 5M;
- b. Trees in the dominant and co-dominant crown classes averaging 24 inches DBH or greater. Large and tall trees, those greater than 30 inches DBH and/or 150 feet have been shown to a critical owl habitat characteristic (Jones et al. 2021).
- c. Average canopy cover greater than 60 percent (range 40 to greater than 70 percent).
- d. Two or more tree canopy layers; and
- e. Snags greater than 45 inches in diameter
- f. Snags and down woody material levels higher than average.

Best-available nesting and roosting habitat for California spotted owl contain the following structural (size, canopy cover, snag, and down woody material) characteristics: Components a and b are the most critical characteristics:

- a. Stands classified as CWHR 4D or 4M with very large remnant trees;
- b. Average canopy cover ranging from 40 to 60%, including hardwoods;
- c. Two or more tree canopy layers; and
- d. Snags greater than 45 inches in diameter and other smaller snags;
- e. Snags and down woody material levels in the moderate to high end of average. .

Management activities that maintain the structural characteristics of highest-quality habitat while protecting it from risk of loss from high severity wildfire and other natural disturbances, require trade-offs. Balancing the retention of high-quality habitat with necessary treatments to increase resiliency, which may cause short-term decreases in habitat quality. To minimize near-term effects of resiliency treatments, such treatments should be implemented only when needed (e.g., where landscape is vulnerable to natural disturbance and loss of habitat) and should be designed to maintain the most important habitat components, such as areas of high canopy cover (more than 55 percent) in large/tall trees within PACs (USDA 2019, p. 25).

When assessing the trade-offs, management activities should strive to maintain or improve the structural characteristics of the highest-quality CSO nesting and roosting habitat. To do so would:

- a. Maintain existing proportion of highest-quality habitat;
- b. Maintain clumps of the largest available trees greater than 24 inches DBH; and
- c. Maintain at least two canopy layers at the stand/patch scale in areas where large trees occur.

It is important to note that maintaining or improving CSO habitat in complex and requires a multi-faceted evaluation. It is imperative to avoid putting an over-emphasis or narrow focus on structural habitat characteristics and failing to consider that areas containing these desirable structural owl habitat characteristics may contain other characteristics that put them at high-risk from natural disturbances such as insect-, disease-, drought-, and high severity wildfires (e.g., high SDIs; accumulated surface and ladder fuels, and too few shade-intolerant and fire-tolerant trees).

It is well documented that a forest, PAC, or Territory containing the large trees and high canopy cover (structural characteristics of the highest-quality and best-available habitat), can also be overly dense, lack forest openings, contain lush understory vegetation which act as ladder fuels, and experience the same

climate related stressors (lack of precipitation, warmer temperatures, higher winds) as the rest of the landscape across the Sierra Nevada. Characteristics which are supported indicators to assess the landscapes vulnerability to natural disturbances are just as critical to maintain and improve CSO habitat quality. To fail to comprehensively evaluate all of the habitat characteristics when assessing habitat quality and developing a project would be inconsistent with the overall CSO Strategy and fail to ensure promote resilient CSO habitat throughout the landscape.

Proposed Project-Specific Forest Plan Amendments

Table B.1 describes in detail the proposed project specific forest plan amendments included in Alternative 1 (Proposed Action & Preferred Alternative). The proposed forest plan amendments do not apply to either Alternative 3 or Alternative 4. Each project-specific forest plan amendment is presented in Table B.1 and organized by plan component type: Goal, Land Allocation; Desired Conditions; Standards; Guidelines; then Other (e.g., Potential Management Approaches). The end of the table also describes amendments included to modify or remove existing plan content.

Table B.1: Proposed Project-Specific Forest Plan Amendments.

Component ID	Existing Plan Direction	Page	Component Type	Proposed Forest Plan Amendments	Component Type	Where does it apply?
TERR-SERAL-GOAL-01				Sierra Nevada forests occur within the natural range of variation (NRV) and contain an abundance of owl nesting, roosting, and foraging habitat distributed across the landscape. [CSO Strategy, p. 25, Approach 1 narrative, paragraph 1]	Goal	Project Area
TERR-SERAL-GOAL-02				Increase large-scale application of managed and prescribe fire to maintain dynamic ecosystem structure and function. [CSO Strategy, p. 33; Approach 2, 6]	Goal	Project Area
TERR-SERAL-GOAL-03				Manage prescribed fires and natural ignitions at multiple scales for a range of fire severity effects. [CSO Strategy, p. 33; Approach 2, 6.C]	Goal	Project Area
LAND-SERAL-WILDLIFE-01	California Spotted Owl Protected Activity Centers 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 or roost locations are known.	179	Land Allocation	Designate California Spotted Owl PACs on National Forest System Lands surrounding territorial owl pairs based on 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. Include 300-acres of nesting and roosting habitat in as compact a unit as possible, including the highest quality nesting and roosting habitat or when the highest quality nesting and roosting habitat is unavailable or scarce, areas including at least the best available nesting and roosting habitat [CSO Strategy, p. 26; PACs 1. C & D]	Land Allocation (Other)	CSO PAC
	California Spotted Owl Protected Activity Centers Designation: 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 codominant 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.	179	Land Allocation			
LAND-SERAL-WILDLIFE-02	California Spotted Owl Home Range Core Areas (HRCAs) Designation. A home range core area is established surrounding each territorial spotted owl activity center detected after 1986. The core area amounts to 20 percent of the area described by the sum of the average breeding pair home range plus one standard error. Home range core area sizes are as follows: 2,400 acres on the Hat Creek and Eagle Lake Ranger Districts of the Lassen National Forest, 1,000 acres on the Modoc, Inyo, Humboldt-Toiyabe, Plumas, Tahoe, Eldorado, Lake Tahoe Basin Management Unit and Stanislaus National Forests and on the Almanor Ranger District of Lassen National Forest, and 600 acres of the Sequoia and Sierra National Forests. Aerial photography is used to delineate the core area. Acreage for the entire core area is identified on national forest lands. Core areas encompass the best available California spotted owl habitat in the closest proximity to the owl activity center. The best available contiguous habitat is selected to incorporate, in descending order of 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.	184	Land Allocation	California Spotted Owl Territory Designation. <ul style="list-style-type: none">▪ A California spotted owl territory represents a 1,000-acre circle, which includes the 300-acre protected activity center, 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 may be adjusted to be non-circular, as needed, to include the entire protected activity center and the most sustainable areas of high-quality habitat and exclude areas less likely to support suitable habitat.▪ Contains diverse structural and seral conditions to facilitate nesting, roosting, and foraging.▪ May overlap adjacent territories.▪ Territories are established and retired together with protected activity centers. [CSO Strategy, p. 28; Approach 1, Territory/Watershed 1. A & B]	Land Allocation (Other)	CSO Territory
LAND-SERAL-WILDLIFE-03	California Spotted Owl Home Range Core Areas (HRCAs) Designation. 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.	185	Land Allocation	When activities are planned adjacent to non-national forest lands containing know CSO nest stands, a 1,000-acre circle territory should be delineated around 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.	Land Allocation	CSO Territory
SPEC-CSO-DC-01				Support conditions for a sustainable network of dynamic resilient, widely distributed California spotted owl nest or roost sites and habitat across heterogenous landscapes. [CSO Strategy, p. 25, Approach 1 narrative, paragraph 2]	Desired Condition	Project Area
SPEC-CSO-DC-02				Restore the proportion, distribution, diversity of tree species on the landscape consistent with NRV and potential vegetation type.	Desired Condition	Project Area

Component ID	Existing Plan Direction	Page	Component Type	Proposed Forest Plan Amendments	Component Type	Where does it apply?
				<ul style="list-style-type: none"> • Design vegetation treatments to increase the abundance and distribution of fire-resilient and resistant species (for example, ponderosa pine, sugar pine, Jeffrey pine, and black oak) and decrease the abundance of shade-tolerant species (for example, white fir, incense cedar, Douglas fir). [CSO Strategy, p. 32; Approach 2, 4] • Remove smaller trees and fire-sensitive species that would not have survived under a natural fire regime. [CSO Strategy, p. 32; Approach 2, 4.A] 		
SPEC-CSO-DC-03				At the landscape scale, manage towards a mix of seral stages and canopy conditions consistent with NRV. This will generally entail increasing the amount of open canopy habitat in all seral stages and the amount of late seral stand conditions (open or closed canopy) to get a patchy distribution of diverse stand types. Seral stage desired conditions can be inferred by comparing current conditions with the level of departure from historic conditions (for example, Safford and Stevens 2017, pages 177 through 181; table 11, pages 178 and 179). [CSO Strategy, p. 30; Approach 2, 1.A.1]	Desired Conditions	Project Area
SPEC-CSO-DC-04				At the stand/patch scales, manage for within-stand and multi-stand diversity. Manage for a pattern of individual trees, clumps of trees, and openings (ICOs) containing various sizes of clumped trees and openings. These patterns range in size, configuration, and frequency based on NRV (Safford and Stevens 2017, table 8, page 140). [CSO Strategy, p. 31; Approach 2, 1.A.2]	Desired Conditions	Project Area
SPEC-CSO-DC-05				Manage the understory of mid- and late-seral areas for a patchy distribution of shrubs, orbs, tree regeneration patches, and bare ground to increase diversity, reduce fuels continuity, and provide habitat for owl prey species. [CSO Strategy, p. 30; Approach 2, 1.A.3]	Desired Conditions	Project Area
SPEC-CSO-DC-06	California Spotted Owl Protected Activity Centers Desired Conditions, Intent and Objectives: 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 to 70 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.	180	Desired Condition	California spotted owl protected activity centers provide high-quality nesting and roosting habitat that contributes to successful reproduction of California spotted owls and is resilient to high severity wildfire and other stressors. Protected activity centers 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 relevant forest vegetation type. Large tree density, snag density, and coarse woody debris align with the old forest desired conditions for the relevant forest vegetation type. [CSO Strategy, p. 25; introductory to Approach 1.]	Desired Condition	CSO PAC

Component ID	Existing Plan Direction	Page	Component Type	Proposed Forest Plan Amendments	Component Type	Where does it apply?
SPEC-CSO-DC-07	California Spotted Owl Home Range Core Areas (HRCAs) Desired Conditions, Intent and Objectives. 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.	185	Desired Condition	Maintain and promote 40 to 60 percent of each territory in mature tree size classes with moderate and high canopy cover for nesting, roosting, and foraging. Priority should be given to maintaining and promoting the highest quality before best available in descending order: 6, 5D, 5M, 4D, and 4M. The remainder of the territory consists of a diversity of many different structure and canopy classes. For areas where multiple territories comprise greater than 75 percent of a watershed (typically a HUC 8 unit and greater than 10,000 acres in size) at least 30 to 50 percent (depending on the vegetation type and site conditions) of the watershed consists of the highest quality nesting and roosting habitat and the remainder of the territory consists of a diversity of many different structure and canopy classes (aligned with desired conditions for terrestrial vegetation type). [CSO Strategy, p. 29; Approach 1, Territory/Watershed 2. A]	Desired Condition	CSO Territory
TERR-SERAL-STD-01	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.	34	Standard & Guideline	Retain live conifer trees greater than 30 inches in diameter 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 in diameter may be removed on an incidental basis. b) Outside of California spotted owl territories, where necessary to move towards terrestrial vegetation desired conditions, live trees greater than 30 inches but less than 40 inches in diameter 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 more effectively meet tree species composition and forest structure restoration goals. • To promote the establishment, growth, and development of shade-intolerant species by creating small gaps (generally less than 0.5 acres) in stands historically dominated by shade-intolerant species. • To improve the growth and vigor of rust-resistant sugar pine trees greater than 16 inches in diameter by reducing competition from surrounding trees; or • To reduce loss of large diameter trees due to competition in overly dense stands within homogeneous plantations. [CSO Strategy, p. 32; Approach 2, 3.D]	Standard	Project Area
	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 remove the material necessary to meet fire and fuels objectives.	34	Standard & Guideline			
	S&G 7. 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.	34	Standard & Guideline			
SPEC-CSO-STD-01	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.	40	Standard & Guideline	For vegetation treatments that maintain or improve habitat quality in California spotted owl nesting and roosting habitat outside of protected activity centers, pre-implementation surveys are not required. Before authorizing vegetation treatments in existing protected activity centers or that may reduce near-term habitat quality in California spotted owl nest or roost habitat of unknown occupancy, 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 protected activity centers and territories, as necessary, within the project area. [CSO Strategy, p. 26; PACs 1. A and CSO Strategy, p. 27; PAC Modification A.1 through A.3]	Standard	Project Area and CSO PAC
	California Spotted Owl Protected Activity Centers Designation: As additional nest location and habitat data become available, boundaries of PACs are reviewed and adjusted as necessary to better include known and suspected nest stands and encompass the best available 300 acres of habitat.	179	Land Allocation			

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SPEC-CSO-STD-02	<p>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.</p>	180	Land Allocation	<p>PAC retirement based on disturbance. 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 protected activity centers 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 protected activity center to encompass the best remaining 300 acres of highest quality nesting and roosting habitat. [CSO Strategy, p. 27; PAC retirement based on disturbance B.1 and B.2]</p>	Standard	CSO PAC
SPEC-CSO-STD-03				<p>PAC Retirement based on lack of occupancy. Existing protected activity centers 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. [CSO Strategy, p. 27; PAC retirement based on occupancy C.1 and C.2 and D (first sentence only, we believe the “for example” to be misleading and contradictory to Approach 2)]</p>	Standard	CSO PAC
SPEC-CSO-STD-04	<p>S&G 7. 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.</p>	34	Standard & Guideline	<p>In California spotted owl protected activity centers (PACs), all management activities 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 100 acres outside of the highest quality nesting and roosting habitat. Throughout protected activity centers all vegetation treatments must:</p> <ul style="list-style-type: none"> 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; [CSO Strategy, p. 31; Approach 2, 3.A] 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 protected activity center; 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% of a stand; Increase the quadratic mean diameter of trees at the protected activity center scale; and Maintain the average canopy cover of the protected activity center above 50 percent. <p>[CSO Strategy, p. 28, Approach 1 – 4.C, 4.G]</p> <p>Exceptions: This standard may be modified when constructing inner core fuelbreaks located within WUI defense zones where avoiding overlap with a protected activity center is not feasible <i>and</i> it was not possible to remap the PAC to maintain acreage equivalent to the quantity of the treated PAC acres (as described in SPEC-CSO-GDL-03).</p>	Standard	CSO PAC
	<p>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.</p>	181	Standard & Guideline			
	<p>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.</p>	181	Standard & Guideline			
SPEC-CSO-STD-05	<p>S&G 7. Within California spotted owl Home Range Core Areas: Where existing vegetative conditions permit, design projects to retain at least 50 percent canopy cover averaged within the treatment unit. Exceptions are allowed in limited situations where additional trees must be removed to adequately reduce ladder fuels, provide sufficient spacing for equipment operations, or minimize re-entry. Where</p>	34	Standard & Guideline	<p>Increase resiliency and promote the development of future nest sites within territories at the watershed scale by reducing tree density of smaller trees that are prohibiting growth of larger trees. Vegetation thinning treatments within California spotted owl territories should be designed to:</p>	Standard	CSO Territory

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	50 percent canopy cover retention cannot be met for reasons described above, retain at least 40 percent canopy cover averaged within the treatment unit.			<ul style="list-style-type: none"> minimize the loss of and to promote the growth and recruitment of trees greater than 24 inches DBH and especially large and very large trees greater than 30 inches DBH and 36 inches DBH, respectively. retain clumps or patches of large/tall trees (greater than 24 inches DBH and more than 48 meters / approximately 160 feet) with greater than 60-70 percent canopy cover. retain connected areas of moderate (at least 40 percent) and high canopy cover (at least 60 percent) in large/tall trees to promote habitat connectivity at the watershed scale. [CSO Strategy, p. 29; Approach 1, Territory/Watershed 2. C1, C2, and C3] Exceptions: In WUI Defense zones this standard may be modified as necessary to meet safety objectives. This standard may be modified as specified in SPEC-CSO-GDL 03 when constructing a fuelbreak where avoiding overlap with a protected activity center or territory is not feasible.		
SPEC-CSO-STD-06				When mechanical treatments create canopy gaps within California spotted owl territories but outside of protected activity centers, individual openings shall not exceed 1.25 acres (and should generally not exceed 0.5 acre) and shall not comprise more than 20 to 30 percent (as appropriate depending on the desired conditions for the terrestrial vegetation type and existing site conditions) of the total area in the territory. This includes openings created for the construction of landings or temporary roads (restricted to 0.57 miles or less). [CSO Strategy, p. 31; Approach 2, 1.A.2]	Standard	CSO Territory
SPEC-CSO-STD-07	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, <i>they are prohibited within a 500-foot radius buffer around a spotted owl activity center within the designated PAC.</i> 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 guidelines for mechanical thinning.	181	Standard & Guideline	Avoid mechanical treatments within 10 acres surrounding a nest tree or nest structure. Prescribed burning is allowed within the 10 acres surrounding a nest tree or structure. 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. [CSO Strategy, p. 28, Approach 1 4.F]	Standard	CSO PAC
SPEC-CSO-STD-08				In California spotted owl territories that do not meet the territory desired condition (SPEC-CSO-DC-07), retain habitat quality in the highest quality nesting and roosting habitat wherever it exists throughout the territory. If the territory desired condition has been met, vegetation treatments to improve resilience and increase heterogeneity should be designed to ensure the desired condition in SPEC-CSO-DC-07 is maintained.	Standard	CSO Territory
SPEC-CSO-GDL-01	Desired Conditions, Intent and Objectives: Avoid vegetation and fuels management activities within PACs to the greatest extent feasible. Avoid vegetation and fuels management activities within PACs to the greatest extent feasible. Reduce hazardous fuels in PACs in defense zones when they create an unacceptable fire threat to communities. Where PACs cannot be avoided in the strategic placement of treatments, ensure effective treatment of surface, ladder, and crown fuels within treated areas. If nesting or foraging habitat in PACs is mechanically treated, mitigate by adding acreage to the PAC equivalent to the treated acreage wherever possible. Add adjacent acres of comparable quality wherever possible.	180	Management Objective	Prioritize treatments in PACs to increase resiliency and sustainability to areas that are at highest risk of large-scale, high severity wildfire or severe tree mortality from insects and drought or those that are likely unsustainable long-term. [CSO Strategy, p. 28, Approach 1 4.A]	Guideline	CSO PAC
SPEC-CSO-GDL-02	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.	180-181	Standard & Guideline	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.	Guideline	CSO PAC

Component ID	Existing Plan Direction	Page	Component Type	Proposed Forest Plan Amendments	Component Type	Where does it apply?
	<p>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.</p> <ul style="list-style-type: none"> • 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. <p>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.</p> <p>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.</p>			<p>To minimize potential impacts to California spotted owl reproductive success, vegetation treatments <u>that may reduce habitat quality in the near term</u> should be minimized or avoided in protected activity centers with the highest likely contribution to reproductive success, and otherwise prioritized as follows (from highest to lowest priority for treatment):</p> <ol style="list-style-type: none"> 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. <p>Occupancy and historical occupancy status shall be assess 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. [CSO Strategy, p. 28, Approach 1 4.B]</p>		
SPEC-CSO-GDL-03				To limit fragmentation and maintain connectivity of nesting, roosting, and foraging habitat, construction of fuelbreaks should avoid intersecting with California spotted owl protected activity centers. Where avoiding overlap with a protected activity center is not feasible, the PAC should be remapped to maintain acreage equivalent to the quantity of the treated PAC acres using adjacent acres of comparable quality wherever possible.	Guideline	CSO PACs and Intersecting Fuelbreaks
SPEC-CSO-GDL-04	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.	181	Standard & Guideline	<p>To minimize disturbance that may lead to breeding failure, during the breeding season (March 1 to August 15, or following current Pacific Southwest regional guidance) apply a limited operating period prohibiting:</p> <ol style="list-style-type: none"> a. Mechanical harvest within approximately 0.25 mile of the nest or known roost site; b. Prescribed burning within 500 feet of the nest 	Guideline	CSO PACs
SPEC-CSO-GDL-05				<p>To minimize impacts to overstory canopy and provide conditions for continued use for nesting and roosting within protected activity centers, 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). [CSO Strategy, p. 28, Approach 1 4.D]</p>	Guideline	CSO PACs
SPEC-CSO-GDL-06	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.	35	Standard & Guideline	<p>Before authorizing vegetation treatment 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) to provide future habitat for old forest associated species. Desired conditions for amount, location, and configuration of patch retention should be informed by terrestrial vegetation desired conditions for the forest type. [CSO Strategy, p. 33, Approach 2, 7].</p>	Guideline	CSO PACs
SPEC-SERAL-MA-01				<p>When practical based on existing conditions, use prescribed fire, alone or in combination with mechanical thinning, to restore forest vegetation within California spotted owl protected activity centers. [CSO Strategy, p. 28, Approach 1 4.E]</p>	Potential Management Approach	CSO PAC
MODIFY	A network of land allocations, including California spotted owl and northern goshawk protected activity centers (PACs), California spotted owl home range core areas , forest carnivore den sites, and the southern Sierra fisher conservation area, with management direction specifically aimed at sustaining	11	Strategy	<p>Modify California spotted owl home range core areas to read territories as follows: A network of land allocations, including California spotted owl and northern goshawk protected activity centers (PACs), California spotted owl territories, forest carnivore den sites, and the southern Sierra fisher conservation area, with</p>	Strategy	Project Area

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	viable populations of at-risk species associated with old forest ecosystems well distributed across Sierra Nevada national forests;			management direction specifically aimed at sustaining viable populations of at-risk species associated with old forest ecosystems well distributed across Sierra Nevada national forests;		
REMOVE-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.	33	Standard & Guideline	Remove bold sentence.	N/A	Project Area
REMOVE-2	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.	14	Strategy	Remove bold sentence.	N/A	Project Area
REMOVE-3	California Spotted Owl Home Range Core Areas (HRCAs) Desired Conditions, Intent and Objectives. 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.	185	Management Intent	Remove.	N/A	N/A
REMOVE-4	California Spotted Owl Home Range Core Areas (HRCAs) Desired Conditions, Intent and Objectives: Establish and maintain a pattern of fuels treatments that is effective in modifying wildfire behavior. Design treatments in HRCAs to be economically efficient and to promote forest health where consistent with habitat objectives	185	Management Objective	Remove.	N/A	N/A

APPENDIX C: LITERATURE CITED

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APPENDIX D: GLOSSARY

Basal Area: The total cross-sectional area of all stems in a given area, measured at breast height (4.5 feet above the ground). Usually given in units of square feet per acre.

Biomass: Generally, refers to non-merchantable material (i.e., not sawtimber); may include live trees (generally less than 10 in. DBH) or dead trees or brush.

Broadcast Burning: Prescribed burning activity where fire is applied generally to most or all of an area within well-defined boundaries for reduction of fuel hazard, as a resource management treatment, or both (NWCG Glossary).

Active Crown Fire: During an active crown fire, fire advances from crown to crown in the tops of trees or shrubs. Active crown fires generally produce high severity effects and are considered 'stand replacing' because they top-kill and / or consume most of the dominant overstory vegetation. Active crown fire is linked to surface fire, perpetuated by a combination of surface and canopy fuels.

Conditional Crown Fire: Conditional crown fires move through the crowns of trees but are not linked to surface fire. Conditional crown fires initiate in an adjacent stand and spread through canopy fuels alone. Conditional crown fires burn in areas where canopy base heights are too high for crown fire to initiate within the stand, but there is sufficient horizontal continuity of canopy fuels to carry a crown fire.

DBH: diameter at breast height, refers to the tree diameter measured at 4.5 feet (1.37 meters) above the ground.

Decommission: Activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state.

Dry Mixed Conifer: As used in Safford and Stevens (2017), "dry mixed-conifer" generally refers to mixed conifer forests with a dominance by yellow pine and an annual precipitation mostly <40 inches

Fire Type: Fire types are characterized into four categories: active crown fire, conditional crown fire, passive crown fire, and surface fire.

Fuelbreak: A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled (NWCG Glossary).

Fuels: Any combustible material, such as found in wildlands, that is made up of dead or alive vegetation.

HVRA: Highly valued resources and assets (HVRAs) are simply the things we care about. HVRAs can be both qualitative (e.g., visual quality) or quantitative (e.g., tons of carbon). There are a multitude of

HVRAs for national forests, and the choice of a single or multiple HVRAs depends on the project objectives and needs. Some resources have only modest value and may not be analyzed so that efforts can be focused on the more highly valued resources and assets. At the national scale Calkin et al. (2010) categorized HVRAs into: critical habitat, recreation infrastructure, energy infrastructure, air quality, and municipal watersheds. In an assessment of the Lewis and Clark National Forest Thompson et al. (2013) categorized HVRAs into: green trees, wildlife habitat, infrastructure, watersheds and wildland urban interface. The precise HVRAs used in a fuels or vegetation project depends on the issues at hand as identified in the purpose and need.

Home Range Core Area (HRCa): As described in USDA Forest Service 2004, Home Range Core Areas (HRCAs) are established surrounding each territorial spotted owl activity center. 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 which is 1,000 acres for the Stanislaus National Forest. The acreage in the 300-acre PAC counts toward the total home range core area.

Interdisciplinary Team: A diverse group of professional resource specialists who analyze the effects of alternatives on natural and other resources. Through interaction, participants bring different points of view and a broader range of expertise.

Jackpot Burning: a type of prescribed burn that focuses on consuming a sporadic pattern of built-up fuels (natural, human, or machine piled), as part of an understory burn.

Ladder fuels: Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning (NWCG Glossary).

Mulching-type Mastication: Method of mastication where shredded material is mechanically incorporated into the surface of the soil with the masticating head. Rotating drum type heads are typically used, mounted horizontally. In contrast to ‘traditional’ mastication which leaves shredded material on the soil surface.

Natural Range of Variation (NRV): The “variation of ecological characteristics and processes over scales of time and space appropriate for a given management application. The NRV concept focuses on a subset of past ecological knowledge developed for use by resource managers incorporating a past perspective into management and conservation decisions. The pre-European-influenced reference period is considered to include the full range of variation produced by dominant natural disturbance regimes such as fire and flooding and should also include short-term variation and cycles in climate” (USDA Forest Service 2019).

Moist Mixed Conifer: As used in Safford and Stevens (2017), “most mixed-conifer” generally refers to mixed conifer forests with a greater fir presence and annual precipitation mostly >40 inches; moist mixed-conifer stands are also more common at higher elevations.

Passive Crown Fire: During passive crown fires individual trees or groups of trees ‘torch’, as fire moves up into the canopy, ignited by the passing front of a surface fire. The fire climbs up ladder fuels (low branches, shrubs, or herbaceous vegetation that can produce flame lengths long enough to allow a fire to ‘climb’ into the crown of a tree) into the crown of a tree, igniting the crown (‘torching’ it), but does not spread very far into adjacent crowns (NWCG 2008). Passive crown fire is less of a concern than active but, when other variables are close, it is worth considering passive crown fire in the context of both severity and its potential to become active crown fire under worse conditions. Passive crown fire does not produce the same magnitude of negative effects as active crown fire because those areas that are burned with high severity are smaller, discontinuous and, in an ecological context, can help maintain forest structure and spatial patterns across the landscape, or maintain/improve grassland structure.

Protected Activity Center (PAC): An active or suspected California spotted owl nest stand based on territorial owl behavior (USDA 2019). The PAC is a USFS land allocation designed to protect and maintain high-quality CSO nesting and roosting habitat around active sites (Verner et al. 1992). PACs have been found to generally accommodate spotted owl nesting and roosting activities (Berigan et al. 2012).

Pile burning: Piling slash resulting from logging or fuel management activities and subsequently burning the individual piles.

POD: Potential wildland fire Operational Delineation (PODs) are polygons whose boundary features are relevant to fire control operations (e.g., roads, ridgetops, and water bodies). PODs are created by local fire experts with the help of analytical tools that highlight landscape features with control potential and provide information on their likely effectiveness. See Dunn et al. 2020.

Quadratic Mean Diameter (QMD): In forestry, quadratic mean diameter or QMD is a measure of central tendency which is considered more appropriate than arithmetic mean for characterizing the group of trees which have been measured. For n trees, QMD is calculated using the quadratic mean formula: $\sqrt{(\sum D_i^2/n)}$ where D_i is the diameter at breast height of the i^{th} tree. Compared to the arithmetic mean, QMD assigns greater weight to larger trees – QMD is always greater than or equal to arithmetic mean for a given set of trees.

Sawtimber: refers to live or dead trees that meet commercial sawlog specifications

Seral Stage: A developmental phase, or successional class, of a forest stand, with characteristic structure and plant species composition. Seral stages are generally classified as Early, Mid-, or Late-Seral (Figure D-1).

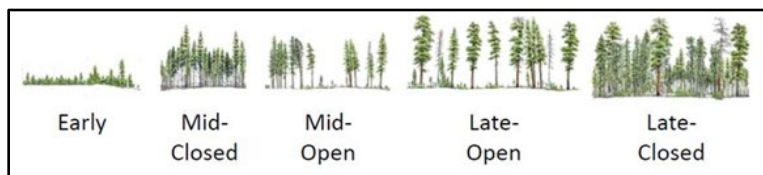


Figure D-1. Example classification of different seral stages in a Sierra Nevada mixed conifer forest (Images from Haugo et al. 2015; originally by Robert Van Pelt).

Stand Density Index: a measurement of stand density or competition among trees in a stand. SDI takes into account the number of trees per unit area as well as the size (diameter) of those trees.

Surface Fire: Surface fires burn in surface and understory fuels only. Such fires consume surface fuels such as litter, duff, dead/down woody fuels, and herbaceous or shrubby fuels that are cured enough to be ‘available’ (or flammable) as fuel. Surface fire can be beneficial or detrimental in forested ecosystems, depending on the fuel loading and the conditions under which the fire burns.

Territory: As described in USDA Forest Service 2019, territorial owls, including pairs (with young), defend a core geographic use area consistently used for nesting, roosting, and foraging, containing essential habitat for survival and reproduction (Bingham and Noon 1997, Blakesley et al. 2005, Gutiérrez et al. 1995, Rosenberg and McKelvey 1999, Swindle et al. 1999, Williams et al. 2011).. Scientists in the central Sierra Nevada have defined the core area as a radius equal to half the mean-nearest-neighbor distance between the centers of adjacent owl sites (USDA Forest Service 2019). This equates to a distance of 1.1 kilometers (0.7 miles) and an area of 400 hectares (1,000 acres) (Jones et al. 2017, Seamans and Gutiérrez 2007, Tempel et al. 2014a). The 1,000 acres includes the associated PAC.

Threshold of Concern (TOC): The level of watershed disturbance which, if exceeded, could create adverse watershed or water quality effects, in spite of application of best management practices and project design criteria.

Understory burn or Underburn: A fire that consumes surface fuels but not the overstory canopy; prescribed burning under a forest canopy (NWCG Glossary of Wildland Fire [PMS 205] 2020).

Yellow Pine: refers to ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*Pinus jeffreyi*).

APPENDIX E: USING LANDSCAPE CONDITION METRICS AND FORSYS

See Project Website: <https://www.fs.usda.gov/project/?project=56500>

Document Title: Appendix E Using Landscape Condition Metrics and ForSys

APPENDIX F: CALIFORNIA SPOTTED OWL PRE-IMPLEMENTATION PROCESS

California Spotted Owl Site Remapping and Project Requirements Compliance

Step 1. Ensure current survey results are incorporated to identify current activity centers and nest stands and territories prior to implementation.

Step 2. Remap PAC boundaries to avoid overlap with fuelbreak treatment units wherever possible or mitigate by adding acreage to the PAC equivalent to the treated acres using adjacent acres of comparable quality wherever possible.

Step 3. After PAC boundary adjustments have been made, confirm that mechanical treatments in PACS do not exceed 100 acres per PAC. To do so, treatment unit boundaries will be adjusted, or units dropped until ≤ 100 acres are mapped for layout. Use the CSO Departure Index metric to inform which 100 acres are prioritized for treatment within each PAC *and* local knowledge of areas with high severity fire risk or other resource concerns to refine prescriptions or treatment unit boundaries during this process.

Step 4. After or during layout confirm that post-treatment a minimum of 50 percent canopy cover will be maintained, averaged at the PAC scale. If not, then modify the silvicultural prescriptions (or drop additional units for treatment) to maintain the minimum 50% canopy cover as per the CSO Conservation Strategy. Also, within PACs, confirm the CWHR type and modify silvicultural prescriptions if necessary to maintain CWHR classifications of the highest quality nesting and roosting habitat (CWHR 6/5D/5M).

Step 5. CSO Territory Desired Condition Assessment: Determine if the desired condition of the territory will be met following treatment (i.e., 40-60% of the Territory in CWHR 6/5D/5M/4D/4M), by calculating the post-treatment CWHR size and canopy cover classes. Evaluate the proportion of non-FS lands and any reasonably foreseeable actions planned to occur on those non-FS lands during the desired conditions assessment. For a territory that only partially overlaps the SERAL project area, use the entire 1,000-acre territory area for the assessment and use the same data sources for calculating CWHR acres for that territory. If the assessment indicates that the desired condition of a Territory would not be met (i.e., 40-60% of the Territory in CWHR 6/5D/5M/4D/4M)) modify the silvicultural prescriptions (or drop units for treatment) to meet desired condition goals.

APPENDIX G: RESPONSE TO COMMENTS

During the 45-day opportunity to comment on the DEIS, 23 unique individual letters and 41 form plus type letters were submitted from private individuals, organizations, groups, agencies, and industry professionals (Table G.1). Letters included comments expressing support for and / or concerns regarding certain aspects of the proposed actions and other DEIS content. Updates have been made to the FEIS and supporting documentation in response to many of the comments and written responses to each comment, including reference to any updates that were made are provided in FEIS Vol. II Response to Comments.

Table G. 1. List of individuals, groups, organizations, who submitted comments during the 45-day opportunity to comment.

Letter Number	Name of Submitter	Organization / Affiliation	Date Submitted	Type
1	Hoekstra, Bud	Individual	12/16/2021	Unique
2	Peterson, Ken	Camp Sylvester	12/19/2021	Unique
3	Francis, Thomas	Forty Niner Chapter, California Society of American Foresters	01/18/2022	Unique
4	Horn, Jen	Individual	01/18/2022	Unique
5	Grabowski, Hannah	Sierra Pacific Industries	01/20/2022	Unique
6	Westbrook, Lisa	Tuolumne Utilities District	01/21/2022	Unique
7	Peterson, Liz	Tuolumne County	01/21/2022	Unique
8	Buckley, John	CSERC	01/21/2022	Unique
9	Jensen, Jerry	AFRC American Forest Resource Council	01/21/2022	Unique
10	Jensen, Jerry	Registered Professional Forester	01/23/2022	Unique
11	Brink, Steven	California Forestry Association	01/23/2022	Unique
12	Green, Keri	Co-Founder Friends of Pinecrest	01/23/2022	Unique
13	Willits, Margaret	Individual	01/23/2022	Unique
14	Trott, Chris	CT Bioenergy Consulting	01/24/2022	Unique
15	Rodgers, Terrance	Golden State Natural Resources	01/24/2022	Unique
16	Hanvelt, Randy	Associated California Loggers	01/24/2022	Unique
17	Hoffman, Hugo	U.S. EPA, Region 9	01/24/2022	Unique
19	Britting, Susan	Sierra Forest Legacy et al.	01/24/2022	Unique
21	Fiske, Megan	Foothill Conservancy	01/24/2022	Unique
22	Augustine, Justin	Center for Biological Diversity	01/24/2022	Unique
29	Mahr, Darren	Sierra Forest Products	01/24/2022	Unique
30	Littell, S	Individual	01/24/2022	Unique
31	Griffin, Simone	BlueRibbon Coalition	01/24/2022	Unique
32	Beatty, Bekah	BlueRibbon Coalition	01/13/2022	Form Plus
33	CTVA Action Committee-1	BlueRibbon Coalition	01/13/2022	Form Plus
34	Cully, Darryl	BlueRibbon Coalition	01/13/2022	Form Plus
35	Sordi, John	BlueRibbon Coalition	01/13/2022	Form Plus
36	Huberty, Joshua	BlueRibbon Coalition	01/13/2022	Form Plus
37	Winn, Rose	BlueRibbon Coalition	01/13/2022	Form Plus
38	Ramos, William	BlueRibbon Coalition	01/13/2022	Form Plus
39	Tote, Raymond	BlueRibbon Coalition	01/16/2022	Form Plus
40	Fridrich, Brent	BlueRibbon Coalition	01/17/2022	Form Plus
41	McManus, Dan	BlueRibbon Coalition	01/17/2022	Form Plus
42	Green, Danny	BlueRibbon Coalition	01/17/2022	Form Plus
43	Brady, Jeff	BlueRibbon Coalition	01/17/2022	Form Plus
44	Krackl, Jeff	BlueRibbon Coalition	01/17/2022	Form Plus
45	Tucker, Patrick	BlueRibbon Coalition	01/17/2022	Form Plus
46	Baumgarten, Rob	BlueRibbon Coalition	01/17/2022	Form Plus
47	Hejlek, Al	BlueRibbon Coalition	01/18/2022	Form Plus
48	Seonia, Asher	BlueRibbon Coalition	01/18/2022	Form Plus

49	Ranney, Clifford	BlueRibbon Coalition	01/18/2022	Form Plus
50	CTVA Action Committee-2	BlueRibbon Coalition	01/18/2022	Form Plus
51	Flaugh, Darwin	BlueRibbon Coalition	01/18/2022	Form Plus
52	Moore, David	BlueRibbon Coalition	01/18/2022	Form Plus
53	Silbernagel, David	BlueRibbon Coalition	01/18/2022	Form Plus
54	Fennimore, Jack	BlueRibbon Coalition	01/18/2022	Form Plus
55	Schaen, Kyle	BlueRibbon Coalition	01/18/2022	Form Plus
56	Johnson, Ladd	BlueRibbon Coalition	01/18/2022	Form Plus
57	Ewing, Michael	BlueRibbon Coalition	01/18/2022	Form Plus
58	Paniagua, Paul	BlueRibbon Coalition	01/18/2022	Form Plus
59	Trumbly, Terry	BlueRibbon Coalition	01/18/2022	Form Plus
60	Dahlke, Zachary	BlueRibbon Coalition	01/18/2022	Form Plus
61	Kohler, BK	BlueRibbon Coalition	01/19/2022	Form Plus
62	Ramsey, Charlton	BlueRibbon Coalition	01/19/2022	Form Plus
63	Beck, Damon A.	BlueRibbon Coalition	01/19/2022	Form Plus
64	Piper, Robertt	BlueRibbon Coalition	01/19/2022	Form Plus
65	Heiser, Jeri	BlueRibbon Coalition	01/20/2022	Form Plus
66	Delany, John	BlueRibbon Coalition	01/20/2022	Form Plus
67	Whittingham, Steve	BlueRibbon Coalition	01/21/2022	Form Plus
68	Bramer, Judy	BlueRibbon Coalition	01/22/2022	Form Plus
69	Lammers, Kristina	BlueRibbon Coalition	01/24/2022	Form Plus