

# Basic Information Form

**Park Name:** Sequoia & Kings Canyon NP

**PEPC Project ID:** 117498

**Related Project(s):** 107200 and 119393

**Project Status:** Proposed

**Compliance Status:** In Process

**Project Target Start:** 10/11/2023

**Project Title:** Re-establish Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor

**Project Description:** This project will implement a portion of the selected alternative identified within the FONSI for the Re-Establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised Environmental Assessment (EA), as amended, as it pertains to Redwood Mountain Grove and the adjacent fisher proposed critical habitat corridor.

As described below and in alignment with the FONSI, conditions in Redwood Mountain Grove and the adjacent fisher habitat corridor meet the decision tree criteria for taking action to plant sequoias and mixed conifer seedlings in the Grove and mixed conifer seedlings in the fisher habitat corridor.

*Remote Sensing Data Analysis (complete):* Identification of contiguous patches of high severity fire effects in Redwood Mountain Grove and within the adjacent fisher habitat corridor was completed immediately following the KNP Complex Wildfire using the Rapid Assessment of Vegetation Condition after Wildfire, Standardized Composite Burn Index (RAVG 4 category CBI product). This remote sensing tool identified that these areas had suffered high tree mortality and were vulnerable to conversion to shrub habitat. This information served as a basis for the original proposal to replant these areas.

*Mortality and Regeneration Analysis (complete):*

- Redwood Mountain Sequoia Grove: Post-fire field surveys in 2022 found a 90.5% mortality of large sequoias within the area of Redwood Mountain Grove that burned at high-severity in the 2021 KNP Complex Fire (Soderberg et al. 2023, in review). The 2022 survey data from Redwood Mountain Grove (where sequoia and non-sequoia seedlings were both counted) also found an estimated mean of 4,266 sequoia seedlings/acre, equating to a 1.1% probability of being equivalent to the second-year seedling densities measured by Stephenson et al. 2023, in preparation (Soderberg et al. 2023, in review). All sequoia regeneration plots were also resurveyed in July of 2023. The mean seedling density in these 2023 data was lower than the 2022 dataset and failed to meet the standards put forward in the EA (i.e., densities were not equivalent to the Bayesian mean presented in Stephenson et al. 2023, in preparation). The NPS has therefore found that (1) mortality within the proposed action area (as outlined in the EA), is as high as expected—reducing the likelihood of future seed rain and potential regeneration—and (2) actual seedling regeneration within the proposed action area does not meet the 90% probability of meeting the 16,011 median density of sequoia seedlings determined by Stephenson et al. 2023, in preparation. Based on these field surveys and findings, the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout the grove. See EA for additional information and context.
- Adjacent Fisher Habitat: Surveys within this area determined that white fir averaged 27.1 seedlings/acre (67 seedlings/hectare (ha)), sugar pine 0.81 seedlings/acre (2 seedlings/ha), incense cedar 21.8 seedlings/acre (54 seedlings/ha), and ponderosa pine 0.41 seedlings/acre (1 seedling/ha). Forty percent of mixed conifer plots contained zero conifer seedlings and 60% contained a very low density of 20 or fewer seedlings per hectare. These data indicate extremely low densities currently both within and outside of sequoia groves, and the fact that these are large areas with near zero canopy cover indicate that field

observations corroborate the POSTSCRIPT modeling that suggests that these areas are at significant risk of conifer regeneration failure.

*Climate Assessment (complete):* Results of this analysis indicate that these two areas have a high likelihood of continuing to support forest under future climate conditions, although tree densities in some sites may be reduced to reduce future drought stress from lower water availability in the future.

Given the results summarized above, and in alignment with the decision tree outlined in the selected alternative, the NPS will move forward with planting in up to 493 acres in Redwood Mountain Grove and 485 acres in the adjacent fisher proposed critical habitat corridor, though smaller units within these areas that demonstrate high regeneration levels will not be planted. Sequoia and mixed conifer seedlings grown from seed collected both within and outside the local genetic community will be planted at roughly 100-250 seedlings/acre using hand tools according to methods outlined under the selected alternative in the FONSI (which incorporates Alternative 2 in the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment by reference) and as refined under the attached Site Planting Plan for Redwood Mountain Grove and Fisher Habitat.

A total of four crews—two crews with up to 20 people comprised of planters, support staff, and inspectors and two crews of roughly ten people each—will implement the planting plan over the course of approximately 30 days in fall 2023, spread out across the two planting areas (i.e., Grove and fisher habitat). While the total number of workers is 60, the crews will not be working simultaneously nor in the same location; the total number of people at one time between both planting areas (Grove and fisher habitat) will be roughly 45.

While the two smaller crews will be stationed in front-country/developed areas (such as Dorst Campground), the two larger crews will need to stage (and therefore camp) within wilderness given the distance from trailheads. The NPS will therefore establish two administrative campsites near the trail junction of Redwood Mountain Trail and Sugar Bowl Trail. Between these two 90-foot in diameter areas, NPS will clear approximately 3 Large (>27 inches dbh), 15 medium (>12 inches dbh but <20 inches dbh) and roughly 25 small (<12 inches dbh) snags (i.e., dead trees) that otherwise pose a safety hazard to administrative campers (see photos of site conditions and size class/condition of snags). These locations were selected to remove the fewest snags possible while avoiding resources such as surface water and archeological sites. Trees under 12 inches diameter at breast height (dbh) and requiring less than 30 minutes to be safely felled will be felled using handsaws, crosscuts, or axes- whichever tool is determined safest. Trees larger than 12 inches dbh or those otherwise determined unsafe to remove using hand tools will be felled using chainsaws. All use of camp and work areas will follow wilderness minimum impact restrictions. At the end of the planting effort, administrative camps will be naturalized to ensure no trace remains of the camps. All materials and equipment will be removed using a combination of foot traffic and stock.

Crews stationed in wilderness will hike from the Redwood Mountain Trailhead into the administrative camp location to establish the camp and then hike to their respective planting sites each day. Two additional crews staged outside of wilderness will hike from frontcountry staging areas/vehicles to their respective planting sites each day. Tree seedlings, tools, and equipment will be transported via stock to staging areas at or near the administrative camps and along the trail corridors. A range of roughly 15-30 pack stock strings of 8 mules each (a total of roughly 120-240 mules total) will be used for each site (Grove and fisher habitat). Each stock train will travel along existing routes a distance of roughly 4-5.5 miles to reach project sites. Stock will not travel off trail and will not remain in wilderness overnight. From staging sites, planting crews will transport seedlings to their planting locations on foot. All crews will work in planting locations nearest to their staging locations which are spatially distributed across 900-1,000 acres of forest.

The NPS will also establish and implement a long-term monitoring protocol to track survivorship of planted seedlings and continue to understand regeneration within these areas consistent with the selected alternative, as amended. Described further in the attached SEGI Planting Monitoring Plan, this will include the establishment of 100 plots that are planted and 100 control plots (for a total of 100 pots per planting area) (using same plots that

University of California, Davis has been monitoring in Redwood Mountain Grove plus an additional four; these plots will be no plant plots as controls) that will be monitored by crews of up to five people twice in 2024, once per year from 2025-2029, and once every five years thereafter. These crews will access the locations by foot. The NPS anticipates that this monitoring will be completed by outside researchers who will be issued a research permit.

See Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA and FONSI (PEPC 117498) for more information/background.

**Project Leader:** Andrew Bishop

**NEPA Specialist:** Theresa Fiorino

**NHPA Specialist:** Juanita Bonnifield, Linn Gassaway

**Project Type:** Restoration

**Project Category:** Cultural Landscape, Habitat Connectivity, Native Resource, Plant Communities (Vascular and Non-Vascular), Research, Soil, Terrestrial Ecosystem, Threatened and Endangered Species, Vascular Plant, Vegetation, Wilderness, Wildlife

**Locations:** Tulare County, CA

#### **File List**

- Restoration Plan for Redwood Mountain Grove and Adjacent Fisher Habitat Corridor
- SEGI Planting Monitoring Plan

**Last Updated Date:** 10/06/2023

**Last Updated By:** abishop



**Figures 1 and 2.** Images showing proposed camp conditions taken from roughly center of one proposed camping area. Denser trees in background are not proposed for removal. Focal area of camp would reflect conditions closer to grassy/shrubby foreground.

# **Planting Plan for Redwood Mountain Grove and Adjacent Fisher Habitat**

## **Purpose**

This planting plan provides planting prescriptions, including the densities, species mixes, and distribution of those mixes across planting areas as necessary to re-establish tree seedlings in the Redwood Mountain Grove and adjacent fisher habitat, where the decision tree described and approved through the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment (EA)/Finding of No Significant Impact (FONSI) demonstrates insufficient regeneration. Please see attached map of SEKI Planting Units in these areas. We will use these planting prescriptions in conjunction with internal guidance and mitigations outlined in the EA to guide on-site training of planters.

## **Planting Prescriptions**

### **Common to all planting units**

Planting spacing will follow the individuals, clumps, and openings pattern using a field fit approach rather than plantation style planting with set spacing. Within each planting unit, planters will plant 30% of seedlings as scattered individuals and 70% of seedlings in clumps, prioritizing microsites as described below. We will determine clump location, size, and spacing based on microsites. Clumps will typically be made of 3 – 15 individuals of the same species spaced 6 – 24 inches apart depending on the type and size of microsite (e.g., we will put more individuals in larger microsites like wet areas or along larger logs creating shade). Because seedlings planted near shade objects are more likely to die if the object combusts during a fire, roughly 20% of all seedlings (both individuals and clumps) will be planted away from combustible shade objects (e.g., we will plant by boulders and in open areas). Planting scattered individuals and clumps will naturally create openings of different shapes and sizes throughout the planting units. These openings are important in creating heterogenous stand structure rather than a homogenous structure typical of plantation planting. We will not plant in areas that are determined to have significant regeneration (final determination to be verified in the field). We will generally not plant within 50m of a living mature giant sequoia tree that is expected to provide ample seed rain within that range into the future. See attached map of SEKI Planting Units for context of these locations.

We will prioritize planting in microsites including the north side of shade/nurse objects (e.g., snags, logs, stumps, rocks), depressions (e.g., giant sequoia potholes), and wet areas (e.g., stream edges). Shrubs can either facilitate or inhibit seedling establishment dependent on environmental conditions. We will plant some seedlings directly within small shrub patches, on all aspect types, to ensure that seedlings are distributed throughout the landscape and not just on the edges of large shrub patches.

We split the landscape into five (5) landscape units (ridge, canyon bottom/drainage and northeast mid-slope <30 percent, southwest mid-slope <30 percent, southwest mid-slope >30 percent, and northeast mid-slope >30 percent) that have different planting densities (see Tables 1 and 4). We will plant at higher densities in canyon bottom/drainages and northeast aspects and lower densities on ridges and southwest aspects. Transitions zones between aspect types, canyon bottom/drainages to southwest aspects, and ridges to northeast aspects occur across the planting



units, and we will make field-based decisions on planting density in these zones (e.g., plant more individuals in a canyon bottom/drainage and fewer individuals where it transitions to a southwest aspect).

We used the dominant vegetation type, as mapped before these wildfires, to create species mixes (Tables 2 and 3). Together, we used the dominant vegetation and landscape unit to create the planting prescription for each planting unit (Table 4). We will use the attached planting unit map and a field fit approach to plant appropriate species and densities within a planting unit, as there is variation within a planting unit (e.g., transition zones, increasing or decreasing slope, different vegetation types or suitable habitat). For planting units called shrub dominant on the map, we will generally plant at a lower density (100 tree per acre (tpa)). If no snags are present within the shrub patch, we will not plant in the shrubs but rather in areas around the shrub patch, but if snags are present, then we will plant within the shrub patch. Some planting units span both the sequoia grove and fisher corridor planting areas, and we will refer to the sequoia grove boundary on the map as well as make assessments in the field to decide if and where to plant sequoias in these units. We will not plant further than 50m (distance of most seed distribution) from dead giant sequoia trees.

For giant sequoia of nonlocal genotypes, we will only plant within designated locations and mark where they are in the field. We will not mix the nonlocal genotypes throughout the entire landscape but rather have them contained to discrete identifiable locations. We will not mix seedlings of local and nonlocal genotypes at any given location (i.e. they will be planted separately from each other).

## Sequoia Groves: Redwood Mountain

At 2,074 acres pre-fire, Redwood Mountain Grove is the second largest sequoia grove by area with the largest area of old growth and the most mature sequoias in the world. It is located on lands managed by Kings Canyon National Park, Sequoia National Forest, and UC Berkeley (known as Whitaker Forest). The 493 acres of Redwood Mountain Grove that burned at high severity on lands managed by the NPS will be replanted at a density of 100-250 trees per acre with different planting densities and species mixes for the six planting units (see Table 1, 2, and 4 for details).

*Table 1. Planting Acreage, Density, Species Mixes and Proportions for Each Landscape Unit In Redwood Mountain Grove and Fisher Habitat Corridor*

<b>Landscape Unit</b>	<b>Planting Acreage (acres)</b>	<b>Planting Density (tpa)</b>	<b>Species Composition in Comparison to Table 4 Percentages</b>
Canyon bottom/drainage and Northeast mid-slope <30 percent	230	250	More giant sequoia, white fir, and incense cedar
Northeast mid-slope >30 percent	20	200	More giant sequoia, white fir, and incense cedar
Southwest mid-slope <30 percent	214	150	Less white fir and incense cedar, more ponderosa pine
Southwest mid-slope >30 percent	93	100	Less white fir and incense cedar, more ponderosa pine
Ridge	52	100	Less giant sequoia, more Jeffery pine and ponderosa pine

Canyon bottom/drainage and Northeast mid-slope <30 percent	140	250	More white fir and incense cedar
Northeast mid-slope >30 percent	33	200	More white fir and incense cedar
Southwest mid-slope <30 percent	35	150	Less white fir and incense cedar, more ponderosa pine
Southwest mid-slope >30 percent	119	100	Less white fir and incense cedar, more ponderosa pine
Ridge	22	100	More ponderosa and sugar pine
Total	958		

*Table 2. Approximate Species Mixes and Proportions for Different Vegetation Alliances*

<b>Vegetation Alliance</b>	<b>Giant Sequoia</b>	<b>Sugar Pine</b>	<b>Ponderosa Pine</b>	<b>Jeffrey Pine</b>	<b>White Fir</b>	<b>Incense Cedar</b>
Giant Sequoia	66.67%	9.52%	4.76%	9.52%	4.76%	4.76%
White Fir – Sugar Pine	30%	25%	5%	5%	25%	10%

### **Fisher Habitat Corridor Adjacent to Redwood Mountain Grove**

The loss of suitable habitat in the severely burned 485-acre proposed critical habitat corridor will be a barrier to fisher movement across the landscape. The Fisher Habitat Corridor will be replanted at a density of 100-250 trees per acre with different planting densities and species mixes for the six planting units (see Tables 1, 3, and 4 for details).

*Table 3. Approximate Species Mixes and Proportions for Different Vegetation Alliances*

<b>Vegetation Alliance</b>	<b>Sugar Pine</b>	<b>Ponderosa Pine</b>	<b>Jeffrey Pine</b>	<b>White Fir</b>	<b>Incense Cedar</b>
White Fir – Sugar Pine	30%	20%	5%	30%	15%
Ponderosa Pine – Incense Cedar	20%	40%	0%	10%	30%
Oak Alliance	40%	40%	0%	20%	0%

*Table 4. Species Mix Proportions of Different Vegetation Alliances and Landscape Units for Redwood Mountain Grove And Adjacent Fisher Habitat Corridor*

<b>Site</b>	<b>Vegetation Alliance</b>	<b>Landscape Unit</b>	<b>Giant Sequoia</b>	<b>Sugar Pine</b>	<b>Ponderosa Pine</b>	<b>Jeffrey Pine</b>	<b>White Fir</b>	<b>Incense Cedar</b>
Redwood Mountain Grove	Giant Sequoia	Canyon/ NE < 30	66.67%	9.52%	4.76%	9.52%	4.76%	4.76%
Redwood Mountain Grove	Giant Sequoia	NE > 30	66.67%	9.52%	4.76%	9.52%	4.76%	4.76%
Redwood Mountain Grove	Giant Sequoia	SW < 30	66.67%	9.52%	14.29%	9.52%	0.00%	0.00%
Redwood Mountain Grove	Giant Sequoia	SW > 30	66.67%	9.52%	14.29%	9.52%	0.00%	0.00%
Redwood Mountain Grove	Giant Sequoia	Ridge	52.38%	9.52%	14.29%	14.29%	4.76%	4.76%
Redwood Mountain Grove	White Fir-Sugar Pine	Canyon/ NE < 30	30%	25%	5%	5%	25%	10%
Redwood Mountain Grove	White Fir-Sugar Pine	NE > 30	30%	25%	5%	5%	25%	10%
Redwood Mountain Grove	White Fir-Sugar Pine	SW < 30	30%	25%	20%	10%	10%	5%
Redwood Mountain Grove	White Fir-Sugar Pine	SW > 30	30%	25%	20%	10%	10%	5%
Redwood Mountain Grove	White Fir-Sugar Pine	Ridge	25%	25%	20%	15%	10%	5%
Redwood Mountain Grove	Deerbrush shrubland	SW > 30	66.67%	9.52%	14.29%	9.52%	0.00%	0.00%

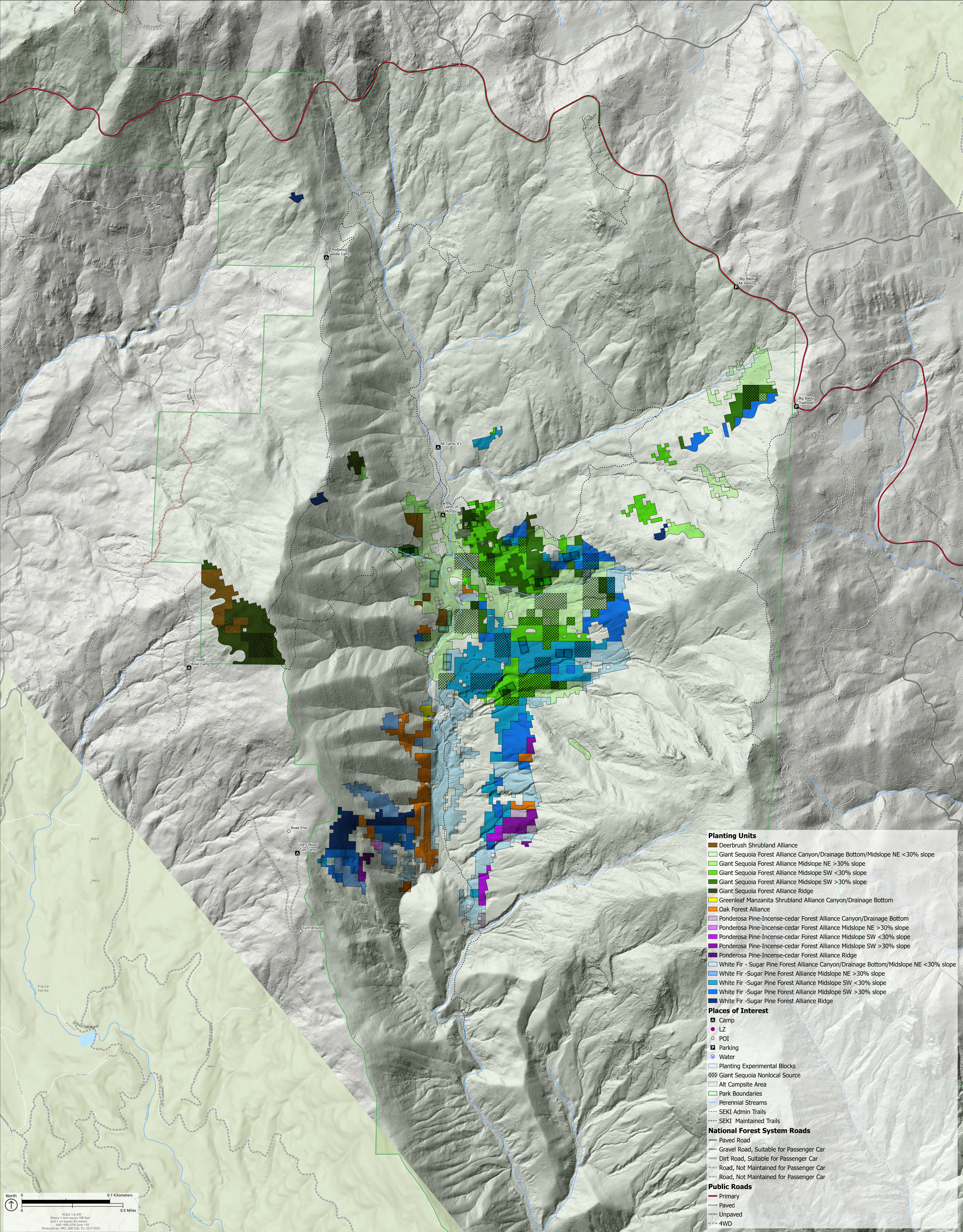
Site	Vegetation Alliance	Landscape Unit	Giant Sequoia	Sugar Pine	Ponderosa Pine	Jeffrey Pine	White Fir	Incense Cedar
Fisher Corridor	White Fir-Sugar Pine	Canyon/ NE < 30	30%	25%	5%	5%	25%	10%
Fisher Corridor	White Fir-Sugar Pine	NE > 30	30%	25%	5%	5%	25%	10%
Fisher Corridor	White Fir-Sugar Pine	SW < 30	30%	25%	20%	10%	10%	5%
Fisher Corridor	White Fir-Sugar Pine	SW > 30	30%	25%	20%	10%	10%	5%
Fisher Corridor	White Fir-Sugar Pine	Ridge	25%	25%	20%	15%	10%	5%
Fisher Corridor	Ponderosa Pine-Incense-cedar	Canyon/ NE < 30	0.00%	20%	40%	0%	10%	30%
Fisher Corridor	Ponderosa Pine-Incense-cedar	NE > 30	0.00%	20%	40%	0%	10%	30%
Fisher Corridor	Ponderosa Pine-Incense-cedar	SW < 30	0.00%	20.00%	55%	0%	5.00%	20%
Fisher Corridor	Ponderosa Pine-Incense-cedar	SW > 30	0.00%	20.00%	55%	0%	5.00%	20%
Fisher Corridor	Ponderosa Pine-Incense-cedar	Ridge	0.00%	20.00%	55%	0%	5.00%	20%
Fisher Corridor	Greenleaf Manzanita	SW > 30	0.00%	20.00%	55%	0%	5.00%	20%
Fisher Corridor	Oak	SW > 30	0%	40%	40%	0%	20%	0%



# SEKI Planting Map

## Redwood Navigation

Sequoia and Kings Canyon National Parks  
National Park Service  
U.S. Department of the Interior



**Planting Units**

- Deerbrush Shrubland Alliance
- Giant Sequoia Forest Alliance Canyon/Drainage Bottom/Midslope NE <30% slope
- Giant Sequoia Forest Alliance Midslope NE >30% slope
- Giant Sequoia Forest Alliance Midslope SW <30% slope
- Giant Sequoia Forest Alliance Midslope SW >30% slope
- Giant Sequoia Forest Alliance Ridge
- Greenleaf Manzanita Shrubland Alliance Canyon/Drainage Bottom
- Oak Forest Alliance
- Ponderosa Pine-Incense-cedar Forest Alliance Canyon/Drainage Bottom
- Ponderosa Pine-Incense-cedar Forest Alliance Midslope NE >30% slope
- Ponderosa Pine-Incense-cedar Forest Alliance Midslope SW <30% slope
- Ponderosa Pine-Incense-cedar Forest Alliance Midslope SW >30% slope
- Ponderosa Pine-Incense-cedar Forest Alliance Ridge
- White Fir - Sugar Pine Forest Alliance Canyon/Drainage Bottom/Midslope NE <30% slope
- White Fir - Sugar Pine Forest Alliance Midslope NE >30% slope
- White Fir - Sugar Pine Forest Alliance Midslope SW <30% slope
- White Fir - Sugar Pine Forest Alliance Midslope SW >30% slope
- White Fir - Sugar Pine Forest Alliance Ridge

**Places of Interest**

- Camp
- LZ
- POI
- Parking
- Water
- Planting Experimental Blocks
- Giant Sequoia Nonlocal Source
- Alt Campsite Area
- Park Boundaries
- Perennial Streams
- SEKI Admin Trails
- SEKI Maintained Trails

**National Forest System Roads**

- Paved Road
- Gravel Road, Suitable for Passenger Car
- Dirt Road, Suitable for Passenger Car
- Road, Not Maintained for Passenger Car
- Road, Not Maintained for Passenger Car

**Public Roads**

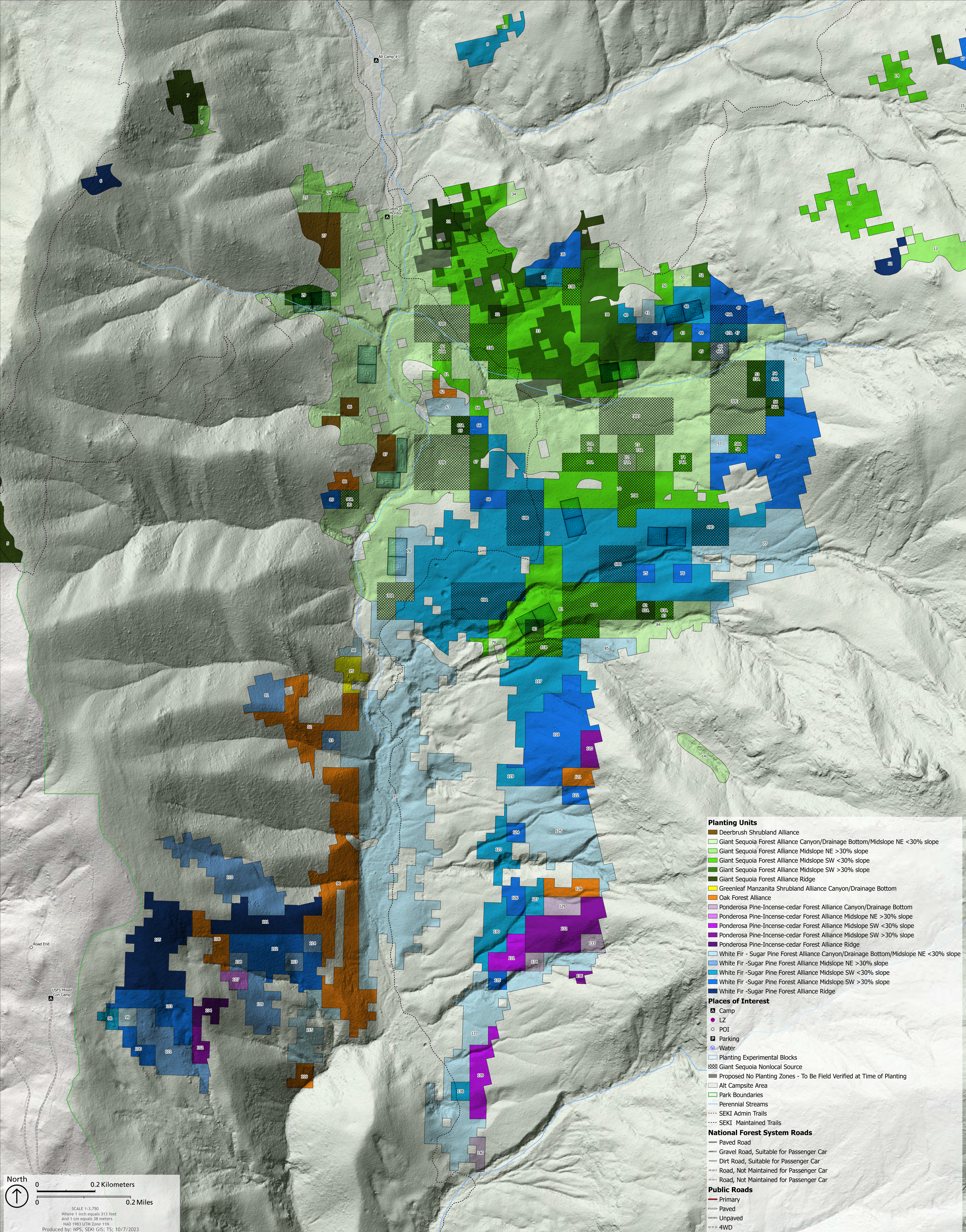
- Primary
- Paved
- Unpaved
- 4WD



# SEKI Planting Map

## Redwood Mountain

Sequoia and Kings Canyon National Parks  
National Park Service  
U.S. Department of the Interior





# SEGI PLANTING MONITORING PLAN FOR REDWOOD MOUNTAIN GROVE AND ADJACENT FISHER HABITAT CORRIDOR

Kristen Shive, UC Berkeley  
9/18/2023

## Purpose

The purpose of this monitoring plan is to:

1. Evaluate success of planting based on criteria established in the EA;
2. Based on #1 above, determine if additional planting is necessary (looking for at least 70% survivorship in year one and less than 10% mortality in years 2-4);
3. Gain understanding the mechanisms of survival and growth in these novel post-fire environments.

## Sampling Scheme

In each project area (Redwood Mountain Grove and adjacent fisher habitat), we will establish 50 plots within the planting area and 50 control plots (using same plots that University of California, Davis has been monitoring plus an additional four; these plots will be no plant plots as controls), using GRTS to identify plot locations, for a total of 200 plots. We will stratify by aspect and will exclude areas >50% slope for safety reasons.

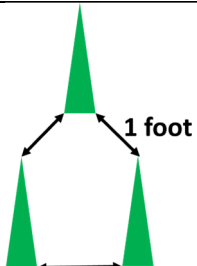
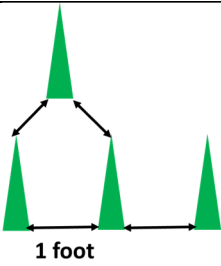
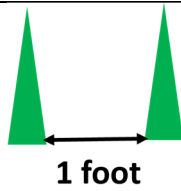
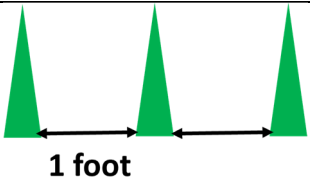
For each plot location, if at least five planted seedlings are not included in the plot, the plot will be moved successively in 10m increments across cardinal directions until at least five are captured. If a plot is otherwise not accessible for safety reasons, crews should follow the same protocol for moving the plot until it lands in a safe location.

## Plot Design

We will sample in a 1/10<sup>th</sup> acre plot (11.35m radius), defined by two transect tapes running N-S and E-W, with a rebar at plot center. All data on planted seedlings will be recorded by quadrant to help with future seedling relocation. Each planted seedling will also be tagged at their base.

## Data Collection within Plots

Crews will record species, live/dead status, seedling diameter at base and seedling height for all planted seedlings in the plot. They will identify seedling clumps in the plot by clump or gap, defining clumps as at least three seedlings that are separated by no more than one foot from at least two other seedlings (see examples below). If time permits in the future, we will map the seedlings so that we can better identify clumps using spatial analyses.

Clump	Clump	Not a clump	Not a clump
			



Crews will also estimate ground cover and cover of other vegetation in a 0.5m x 0.5m quadrat and a 2meter circle surrounding the focal seedling (note: we are using two scales here to accommodate microsite effects and broader effects, particularly since the smaller area will become less relevant as the seedlings age). We will also note whether the seedling occurs in a clump, and if so, how many seedlings are in the clump. They will also attempt to determine microsite conditions – for example, if the seedling was planted under a log or shrub, in a depression, etc.

We will also use a densiometer to record canopy openness at each seedling or clumps of seedlings.

Crews will take photos at each cardinal direction at transect ends, looking toward plot center.

### **Additional Data Collection**

Crews will tag and GPS (with high resolution GPS) a sample of seedlings outside plots that are planted adjacent to shrubs, in clumps or away from any other vegetation and will also install up to 100 hobo pendants (to measure soil temperature and light as a proxy for snow melt) and 60 moisture sensors near these identified seedlings in each project area (Redwood Mountain Grove and adjacent fisher habitat corridor). Measuring these seedlings will enable us to better understand how shrub cover and cluster planting effects seedlings survivorship and growth for both sequoias as well as pines which are more sensitive to shrub competition.

Crews will record live/dead status, seedling diameter at base and seedling height for all tagged seedlings, and data from hobo pendants and moisture sensors will be captured.

### **Read Schedule**

Funding permitting, we will revisit the plots and other tagged seedlings in the spring and fall of 2024, to determine which seedlings survived the winter and be able to differentiate them from those that did not survive the summer drought. Thereafter we will re-visit the plots through up to year 6 (2029) and then every five years thereafter.

### **Field Gear needed**

1 rebar for each plot (200 total)

Plant tags (roughly 27 per plot and 150 per block (18 blocks total))

2 30m plot tapes

2 calipers

2 folding rulers

2 small DBH tapes

Arrow GPS unit

iPad for data recording

2 quadrats

Densiometer

100 Hobo pendants (1.75 x 2.88 x 1.41 inches) (<https://www.onsetcomp.com/products/data-loggers/mx2203>)

60 Tomst moisture sensors (29cm long) <https://tomst.com/web/en/systems/tms/tms-4/>

### **Disclaimer**

Minor alterations of this study design may occur in the field.



## ENVIRONMENTAL SCREENING FORM (ESF)

Updated Sept 2015 per NPS NEPA Handbook

### A. PROJECT INFORMATION

Project Title: Re-establish Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor  
PEPC Project #: 117498  
Project Type: Restoration  
Location:  
County, State: Tulare, California  
Project Leader: Andrew Bishop

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*Remote Sensing Data Analysis (complete):* Identification of contiguous patches of high severity fire effects in Redwood Mountain Grove and within the adjacent fisher habitat corridor was completed immediately following the KNP Complex Wildfire using the Rapid Assessment of Vegetation Condition after Wildfire, Standardized Composite Burn Index (RAVG 4 category CBI product). This remote sensing tool identified that these areas had suffered high tree mortality and were vulnerable to conversion to shrub habitat. This information served as a basis for the original proposal to replant these areas.

*Mortality and Regeneration Analysis (complete):*

- Redwood Mountain Sequoia Grove: Post-fire field surveys in 2022 found a 90.5% mortality of large sequoias within the area of Redwood Mountain Grove that burned at high-severity in the 2021 KNP Complex Fire (Soderberg et al. 2023, in review). The 2022 survey data from Redwood Mountain Grove (where sequoia and non-sequoia seedlings were both counted) also found an estimated mean of 4,266 sequoia seedlings/acre, equating to a 1.1% probability of being equivalent to the second-year seedling densities measured by Stephenson et al. 2023, in preparation (Soderberg et al. 2023, in review). All sequoia regeneration plots were also resurveyed in July of 2023. The mean seedling density in these 2023 data was lower than the 2022 dataset and failed to meet the standards put forward in the EA (i.e., densities were not equivalent to the Bayesian mean presented in Stephenson et al. 2023, in preparation). The NPS has therefore found that (1) mortality within the proposed action area (as outlined in the EA), is as high as expected—reducing the likelihood of future seed rain and potential regeneration—and (2) actual seedling regeneration within the proposed action area does not meet the 90% probability of meeting the 16,011

median density of sequoia seedlings determined by Stephenson et al. 2023, in preparation. Based on these field surveys and findings, the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout the grove. See EA for additional information and context.

- Adjacent Fisher Habitat: Surveys within this area determined that white fir averaged 27.1 seedlings/acre (67 seedlings/hectare (ha)), sugar pine 0.81 seedlings/acre (2 seedlings/ha), incense cedar 21.8 seedlings/acre (54 seedlings/ha), and ponderosa pine 0.41 seedlings/acre (1 seedling/ha). Forty percent of mixed conifer plots contained zero conifer seedlings and 60% contained a very low density of 20 or fewer seedlings per hectare. These data indicate extremely low densities currently both within and outside of sequoia groves, and the fact that these are large areas with near zero canopy cover indicate that field observations corroborate the POSTSCRPT modeling that suggests that these areas are at significant risk of conifer regeneration failure.

*Climate Assessment (complete):* Results of this analysis indicate that these two areas have a high likelihood of continuing to support forest under future climate conditions, although tree densities in some sites may be reduced to reduce future drought stress from lower water availability in the future.

Given the results summarized above, and in alignment with the decision tree outlined in the selected alternative, the NPS will move forward with planting in up to 493 acres in Redwood Mountain Grove and 485 acres in the adjacent fisher proposed critical habitat corridor, though smaller units within these areas that demonstrate high regeneration levels will not be planted. Sequoia and mixed conifer seedlings grown from seed collected both within and outside the local genetic community will be planted at roughly 100-250 seedlings/acre using hand tools according to methods outlined under the selected alternative in the FONSI (which incorporates Alternative 2 in the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment by reference) and as refined under the attached Site Planting Plan for Redwood Mountain Grove and Fisher Habitat.

A total of four crews—two crews with up to 20 people comprised of planters, support staff, and inspectors and two crews of roughly ten people each—will implement the planting plan over the course of approximately 30 days in fall 2023, spread out across the two planting areas (i.e., Grove and fisher habitat). While the total number of workers is 60, the crews will not be working simultaneously nor in the same location; the total number of people at one time between both planting areas (Grove and fisher habitat) will be roughly 45.

While the two smaller crews will be stationed in front-country/developed areas (such as Dorst Campground), the two larger crews will need to stage (and therefore camp) within wilderness given the distance from trailheads. The NPS will therefore establish two administrative campsites near the trail junction of Redwood Mountain Trail and Sugar Bowl Trail. Between these two 90-foot in diameter areas, NPS will clear approximately 3 Large (>27 inches dbh), 15 medium (>12 inches dbh but <20 inches dbh) and roughly 25 small (<12 inches dbh) snags (i.e., dead trees) that otherwise pose a safety hazard to administrative campers (see attached photo of site conditions and size class/condition of snags). These locations were selected to remove the fewest snags possible while avoiding resources such as surface water and archeological sites. Trees under 12 inches diameter at breast height (dbh) and requiring less than 30 minutes to be safely felled will be felled using handsaws, crosscuts, or axes- -whichever tool is determined safest. Trees larger than 12 inches dbh or those otherwise determined unsafe to remove using hand tools will be felled using chainsaws. All use of camp and work areas will follow wilderness minimum impact restrictions. At the end of the planting effort, administrative camps will be naturalized to ensure no trace remains of the camps. All materials and equipment will be removed using a combination of foot traffic and stock.

Crews stationed in wilderness will hike from the Redwood Mountain Trailhead into the administrative camp location to establish the camp and then hike to their respective planting sites each day. Two additional crews staged outside of wilderness will hike from frontcountry staging areas/vehicles to their respective planting sites each day. Tree seedlings, tools, and equipment will be transported via stock to staging areas at or near the administrative camps and along the trail corridors. A range of roughly 15-30 pack stock strings of 8 mules each (a total of roughly 120-240 mules total) will be used for each site (Grove and fisher habitat). Each stock train will

travel along existing routes a distance of roughly 4-5.5 miles to reach project sites. Stock will not travel off trail and will not remain in wilderness overnight. From staging sites, planting crews will transport seedlings to their planting locations on foot. All crews will work in planting locations nearest to their staging locations which are spatially distributed across 900-1,000 acres of forest.

The NPS will also establish and implement a long-term monitoring protocol to track survivorship of planted seedlings and continue to understand regeneration within these areas consistent with the selected alternative, as amended. Described further in the attached SEGI Planting Monitoring Plan, this will include the establishment of 100 plots that are planted and 100 control plots (for a total of 100 pots per planting area) (using same plots that University of California, Davis has been monitoring plus an additional four; these plots will be no plant plots as controls) that will be monitored by crews of up to five people twice in 2024, once per year from 2025-2029, and once every five years thereafter. These crews will access the locations by foot. The NPS anticipates that this monitoring will be completed by outside researchers who will be issued a research permit.

See Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA and FONSI (PEPC 117498) for more information/background.

#### C. RESOURCE IMPACTS TO CONSIDER:

Resource	Potential for Impact	Potential Issues & Impacts
<b>Air</b> Air Quality	None	
<b>Biological</b> Migratory birds	Potential	See impacts to wildlife, below.
<b>Biological</b> Nonnative or Exotic Species <i>Invasive Species and Soil Pathogens</i>	Potential	Issue: Introductions of invasives and pathogens through planting and workers.  Impact: Minor potential negative effects are expected to be as described in the Revised EA (page 11; as applicable only to Redwood Mountain Grove and adjacent fisher habitat). Mitigations will be implemented to minimize the potential for any impacts.
<b>Biological</b> Sequoias <i>Sequoia Recovery and Resilience</i>	Potential	Issue: Planting of sequoia grove.  Impact: Beneficial effects are expected to be as described in the Revised EA (pages 54-56; as applicable only to Redwood Mountain Grove and adjacent fisher habitat).
<b>Biological</b> Species of Special Concern or Their Habitat <i>Fisher</i>	Potential	Issue: Replanting of fisher habitat.  Impact: Beneficial effects are expected to be as described in the Revised EA (pages 61-62; as applicable only to Redwood Mountain Grove and adjacent fisher habitat).
<b>Biological</b> Species of Special Concern or Their Habitat <i>Fisher</i>	Potential	Issue: Removal of trees and disturbance.  Impact: Minor potential negative effects are expected to be as described on pages 12-15 of the revised EA (as applicable only to Redwood Mountain Grove and adjacent fisher habitat) with the exception that impacts described for helicopter use will not occur in these areas. In

		addition, only 3 large snags (which are most valuable for fisher) and 15 medium snags (>12 inches dbh but <20 inches dbh) will be removed to establish a safe crew camp—which is slightly less than were anticipated to have been necessary to establish a safe landing zone for helicopter. The U.S. Fish and Wildlife Service was consulted for large tree removal and disturbance factors, and mitigations will be implemented to minimize, if not avoid, potential impacts. The removal of roughly 25 smaller trees (<12" dbh) would have no effect fisher. See OCC.
<b>Biological</b> Vegetation <i>Understory</i> <i>Vegetation—</i> <i>Including Special</i> <i>Status Plants or</i> <i>Shrub Communities</i>	Potential	Issue: Work crews moving through project site and replanting seedlings.  Impact: Minor negative and beneficial effects are expected to be as described on pages 16-17 of the revised EA (as applicable only to Redwood Mountain Grove and adjacent fisher habitat). Mitigations will be implemented to avoid or minimize, impacts.
<b>Biological</b> Wildlife and/or Wildlife Habitat including terrestrial and aquatic species <i>Wildlife Disturbance</i> <i>and General</i> <i>Wildlife Habitat</i>	Potential	Issue: Presence of Mules and Work Crews. Removal of Trees.  Impact: Potential for minor negative impacts as described on pages 12-15 of the revised EA (as applicable only to Redwood Mountain Grove and adjacent fisher habitat) with the exception that impacts associated with helicopter use will not occur. In addition, large snag removal will be limited to rather than the estimated 20 in the EA (10 per site), though the duration of disturbance from chainsaws will remain similar to that discussed in the E due to the removal of 1 snags 10 dbh and removal of small snags (<1 dbh) via hand tool
<b>Cultural</b> Archeological Resources	Potential	Issue: Fifteen archaeological sites are present in the combined project area. All sites will be avoided during implementation of the project. Impacts are expected to be consistent with those described on page 10 of the revised EA.
<b>Cultural</b> Cultural Landscapes	None	
<b>Cultural</b> Ethnographic Resources	None	
<b>Cultural</b> Museum Collections	None	
<b>Cultural</b> Prehistoric/historic structures	None	
<b>Geological</b> Cave Resources	None	
<b>Geological</b> Geologic Features <i>Soils and Soil</i> <i>Erosion</i>	Potential	Issue: Foot traffic and planting.  Impact: Minor negative and beneficial impacts are anticipated, consistent with those described on pages 11-12 of the EA (as applicable only to

		Redwood Mountain Grove and adjacent fisher habitat), as amended. Mitigations will be implemented to minimize, if not avoid, these potential impacts.
<b>Geological</b> Geologic Processes	None	
<b>Lightscares</b> Lightscares	None	
<b>Other</b> Human Health and Safety	Potential	Impact: There are inherent risks associated with working in the wilderness. Particularly when working in areas recently burned by wildfire. These risks will be mitigated to the maximum extent feasible through training and mitigations such as PPE.
<b>Paleontological</b> Paleontological Resources	None	
<b>Socioeconomic</b> Land Use	None	
<b>Socioeconomic</b> Minority and low-income populations, size, migration patterns, etc.	None	
<b>Socioeconomic</b> Socioeconomic	None	
<b>Soundscapes</b> Soundscapes <i>Soundscapes</i>	Potential	See impacts to wilderness quality: Opportunities for Solitude or Primitive and Unconfined Recreation.
<b>Viewsheds</b> Viewsheds	None	
<b>Visitor Use and Experience</b> Recreation Resources	None	
<b>Visitor Use and Experience</b> Visitor Use and Experience	Potential	See impacts to wilderness quality: Opportunities for Solitude or Primitive and Unconfined Recreation.
<b>Water</b> Floodplains	None	
<b>Water</b> Water Quality or Quantity	None	
<b>Water</b> Wetlands	None	

<b>Wilderness</b> Wilderness <i>Natural Quality</i>	Potential	<p>Issue: Planting tree seedlings across close to 1,000 acres of wilderness.</p> <p>Impact: Long term beneficial impacts are anticipated to be consistent with those described on pages 68-69 of the revised EA (as applicable only to Redwood Mountain Grove and the adjacent fisher habitat corridor) and in the site specific MRA. The cumulative effects to wilderness character within the Sequoia-Kings Canyon wilderness are consistent with the EA.</p>
<b>Wilderness</b> Wilderness <i>Opportunities for Solitude or Primitive and Unconfined Recreation</i>	Potential	<p>Issue: Sights and sounds of ongoing project work.</p> <p>Impact: Temporary negative impacts are anticipated to be consistent with those described on page 70 of the revised EA (as applicable only to Redwood Mountain Grove and the adjacent fisher habitat corridor), as amended, and as further refined in the site specific MRA-Alternative 2 except that impacts from helicopters would not occur, and chainsaws would be used for a shorter period, thereby reducing the impacts estimated in the EA as it pertains to these project areas. Cumulative impacts within the Sequoia-Kings Canyon wilderness are likewise generally consistent with the EA also with the exception that helicopter and motorized tool use will not cumulatively contribute to negative impacts to solitude as they would not occur.</p>
<b>Wilderness</b> Wilderness <i>Undeveloped Quality</i>	Potential	<p>Issue: Motorized and Mechanized Tools, Tree wells, and Monitoring.</p> <p>Impact: Temporary negative impacts are anticipated to be consistent with those described on pages 69-70 of the revised EA (as applicable only to Redwood Mountain Grove and the adjacent fisher habitat corridor), as amended, and as further refined in the site specific MRA- Alternative 2. However, impacts to the undeveloped quality from helicopter use as described in the EA will not occur. Cumulative impacts within the Sequoia-Kings Canyon wilderness are generally consistent with the EA, as amended.</p>
<b>Wilderness</b> Wilderness <i>Untrammeled Quality</i>	Potential	<p>Issue: Planting tree seedlings across 1,000 acres of wilderness.</p> <p>Impact: Temporary negative impacts are anticipated to be consistent with those described on page 68 of the revised EA (as applicable only to Redwood Mountain Grove and the adjacent fisher habitat corridor) and as further refined in the site specific MRA-Alternative 2. Cumulative impacts would be as described in the EA.</p>





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## Memo To File

### A. Project Information

**Park Name:** Sequoia and Kings Canyon National Parks

**PEPC Project Number:** 117498

**Project Title:** Re-establish Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor

**Project Location:**

**County, State:** Tulare, California

**Project Leader:** Andrew Bishop

### B. Description of the Current Action (Project Description)

In alignment with the decision tree outlined in the selected alternative within the FONSI associated with Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA, the NPS will move forward with planting in up to 493 acres in Redwood Mountain Grove and 485 acres in the adjacent fisher proposed critical habitat corridor, though smaller units within these areas that demonstrate high regeneration levels will not be planted. Sequoia and mixed conifer seedlings grown from seed collected both within and outside the local genetic community will be planted at roughly 100-250 seedlings/acre using hand tools according to methods outlined under the selected alternative in the FONSI (which incorporates Alternative 2 in the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment by reference) and as refined under the attached Site Planting Plan for Redwood Mountain Grove and Fisher Habitat.

A total of four crews—two crews with up to 20 people comprised of planters, support staff, and inspectors and two crews of roughly ten people each—will implement the planting plan over the course of approximately 30 days in fall 2023, spread out across the two planting areas (i.e., Grove and fisher habitat). While the total number of workers is 60, the crews will not be working simultaneously nor in the same location; the total number of people at one time between both planting areas (Grove and fisher habitat) will be roughly 45.

While the two smaller crews will be stationed in front-country/developed areas (such as Dorst Campground), the two larger crews will need to stage (and therefore camp) within wilderness given the distance from trailheads. The NPS will therefore establish two administrative campsites near the trail junction of Redwood Mountain Trail and Sugar Bowl Trail. Between these two 90-foot in diameter areas, NPS will clear approximately 3 Large (>27 inches dbh), 15 medium (>12 inches dbh but <20 inches dbh) and roughly 25 small (<12 inches dbh) snags (i.e., dead trees) that otherwise pose a safety hazard to administrative campers (see photos of site conditions and size class/condition of snags). These locations were selected to remove the fewest snags possible while avoiding resources such as surface water and archeological sites. Trees under 12 inches diameter at breast height (dbh) and requiring less than 30 minutes to be safely felled will be felled using handsaws, crosscuts, or axes- whichever tool is determined safest. Trees larger than 12 inches dbh or those otherwise determined unsafe to remove using hand tools will be felled using chainsaws. All use of camp and work areas will follow wilderness minimum impact restrictions. At the end of the planting effort, administrative camps will be naturalized to ensure no trace remains of the camps. All materials and equipment will be removed using a combination of foot traffic and stock.

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The NPS will also establish and implement a long term monitoring protocol to track survivorship of planted seedlings and continue to understand regeneration within these areas consistent with the selected alternative, as amended. Described further in the attached SEGI Planting Monitoring Plan, this will include the establishment of 100 plots that are planted and 100 control plots (for a total of 200 plots per planting area) (using same plots that the University of California, Davis has been monitoring plus an additional four; these plots will be no plant plots as controls) that will be monitored by crews of up to five people twice in 2024, once per year from 2025-2029, and once every five years thereafter. These crews will access the locations by foot. The NPS anticipates that this monitoring will be completed by outside researchers who will be issued a research permit.

See Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA and FONSI (PEPC 117498) for more information/background.

### C. Description of Previous Compliance Documentation

**Decision Document Name:** FONSI associated with Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA, as amended by CE 3.3.B.1 Changes or amendments to an approved action when such changes would cause no or only minimal environmental impact

**Decision Document PEPC ID:** 117498 (FONSI) and 119393 (amendment)

**Decision Document Approval Date:** October 4, 2023, amended October 10, 2023

### D. Notes

This project will implement a portion of the selected alternative identified within the FONSI for the Re-Establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised Environmental Assessment (EA), as amended, as it pertains to Redwood Mountain Grove and the adjacent fisher proposed critical habitat corridor. As described below and in alignment with the FONSI, conditions in Redwood Mountain Grove and the adjacent fisher habitat corridor meet the decision tree criteria for taking action to plant sequoias and mixed conifer seedlings in the Grove and mixed conifer seedlings in the fisher habitat corridor.

*Remote Sensing Data Analysis (complete):* Identification of contiguous patches of high severity fire effects in Redwood Mountain Grove and within the adjacent fisher habitat corridor was completed immediately following the KNP Complex Wildfire using the Rapid Assessment of Vegetation Condition after Wildfire, Standardized Composite Burn Index (RAVG 4 category CBI product). This remote sensing tool identified that these areas had suffered high tree mortality and were vulnerable to conversion to shrub habitat. This information served as a basis for the original proposal to replant these areas.

*Mortality and Regeneration Analysis (complete):*

- **Redwood Mountain Sequoia Grove:** Post-fire field surveys in 2022 found a 90.5% mortality of large sequoias within the area of Redwood Mountain Grove that burned at high-severity in the 2021 KNP Complex Fire (Soderberg et al. 2023, in review). The 2022 survey data from Redwood Mountain Grove (where sequoia and non-sequoia seedlings were both counted) also found an estimated mean of 4,266

sequoia seedlings/acre, equating to a 1.1% probability of being equivalent to the second-year seedling densities measured by Stephenson et al. 2023, in preparation (Soderberg et al. 2023, in review). All sequoia regeneration plots were also resurveyed in July of 2023. The mean seedling density in these 2023 data was lower than the 2022 dataset and failed to meet the standards put forward in the EA (i.e., densities were not equivalent to the Bayesian mean presented in Stephenson et al. 2023, in preparation). The NPS has therefore found that (1) mortality within the proposed action area (as outlined in the EA), is as high as expected—reducing the likelihood of future seed rain and potential regeneration—and (2) actual seedling regeneration within the proposed action area does not meet the 90% probability of meeting the 16,011 median density of sequoia seedlings determined by Stephenson et al. 2023, in preparation. Based on these field surveys and findings, the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout the grove. See EA for additional information and context.

- Adjacent Fisher Habitat: Surveys within this area determined that white fir averaged 27.1 seedlings/acre (67 seedlings/hectare (ha)), sugar pine 0.81 seedlings/acre (2 seedlings/ha), incense cedar 21.8 seedlings/acre (54 seedlings/ha), and ponderosa pine 0.41 seedlings/acre (1 seedling/ha). Forty percent of mixed conifer plots contained zero conifer seedlings and 60% contained a very low density of 20 or fewer seedlings per hectare. These data indicate extremely low densities currently both within and outside of sequoia groves, and the fact that these are large areas with near zero canopy cover indicate that field observations corroborate the POSTSCRPT modeling that suggests that these areas are at significant risk of conifer regeneration failure.

*Climate Assessment (complete)*: Results of this analysis indicate that these two areas have a high likelihood of continuing to support forest under future climate conditions, although tree densities in some sites may be reduced to reduce future drought stress from lower water availability in the future.

## E. Conclusion

I certify that the existing NPS NEPA documentation (EA, FONSI, and CE amendment) has been reviewed and there are no substantive differences between the current proposal and its associated environmental impacts and the proposal and impacts (as pertinent to a subset of the proposal within Redwood Mountain Grove and the adjacent fisher habitat corridor) as described in the existing NEPA documents and associated decision documents but for reduced impacts from no mechanized transportation and reduced use of motorized equipment that were otherwise anticipated in the NEPA documentation.

Superintendent: \_\_\_\_\_  
Clayton F. Jordan



# ASSESSMENT OF ACTIONS HAVING AN EFFECT ON HISTORIC PROPERTIES

## A. DESCRIPTION OF UNDERTAKING

1. **Park:** Sequoia and Kings Canyon National Parks

### 2. **Project Description:**

**Project Name:** Re-establish Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor

**Prepared by:** Linn Gassaway **Date Prepared:** 09/28/2023

**PEPC Project Number:** 117498

#### **Locations:**

County, State: Tulare, CA

#### **Describe project:**

This project will implement a portion of the selected alternative identified within the FONSI for the Re-Establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised Environmental Assessment (EA), as amended, as it pertains to Redwood Mountain Grove and the adjacent fisher proposed critical habitat corridor.

As described below and in alignment with the FONSI, conditions in Redwood Mountain Grove and the adjacent fisher habitat corridor meet the decision tree criteria for taking action to plant sequoias and mixed conifer seedlings in the Grove and mixed conifer seedlings in the fisher habitat corridor.

*Remote Sensing Data Analysis (complete):* Identification of contiguous patches of high severity fire effects in Redwood Mountain Grove and within the adjacent fisher habitat corridor was completed immediately following the KNP Complex Wildfire using the Rapid Assessment of Vegetation Condition after Wildfire, Standardized Composite Burn Index (RAVG 4 category CBI product). This remote sensing tool identified that these areas had suffered high tree mortality and were vulnerable to conversion to shrub habitat. This information served as a basis for the original proposal to replant these areas.

#### *Mortality and Regeneration Analysis (complete):*

- Redwood Mountain Sequoia Grove: Post-fire field surveys in 2022 found a 90.5% mortality of large sequoias within the area of Redwood Mountain Grove that burned at high-severity in the 2021 KNP Complex Fire (Soderberg et al. 2023, in review). The 2022 survey data from Redwood Mountain Grove (where sequoia and non-sequoia seedlings were both counted) also found an estimated mean of 4,266 sequoia seedlings/acre, equating to a 1.1% probability of being equivalent to the second-year seedling densities measured by Stephenson et al. 2023, in preparation (Soderberg et al. 2023, in review). All sequoia regeneration plots were also resurveyed in July of 2023. The mean seedling density in these 2023 data was lower than the 2022 dataset and failed to meet the standards put forward in the EA (i.e., densities were not equivalent to the Bayesian mean presented in Stephenson et al. 2023, in preparation). The NPS has therefore found that (1) mortality within the proposed action area (as outlined in the EA), is as high as expected—reducing the likelihood of future seed rain and potential regeneration—and (2) actual seedling regeneration within the proposed action area does not meet the 90% probability of meeting the 16,011

median density of sequoia seedlings determined by Stephenson et al. 2023, in preparation. Based on these field surveys and findings, the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout the grove. See EA for additional information and context.

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*Climate Assessment (complete):* Results of this analysis indicate that these two areas have a high likelihood of continuing to support forest under future climate conditions, although tree densities in some sites may be reduced to reduce future drought stress from lower water availability in the future.

Given the results summarized above, and in alignment with the decision tree outlined in the selected alternative, the NPS will move forward with planting in up to 493 acres in Redwood Mountain Grove and 485 acres in the adjacent fisher proposed critical habitat corridor, though smaller units within these areas that demonstrate high regeneration levels will not be planted. Sequoia and mixed conifer seedlings grown from seed collected both within and outside the local genetic community will be planted at roughly 100-250 seedlings/acre using hand tools according to methods outlined under the selected alternative in the FONSI (which incorporates Alternative 2 in the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment by reference) and as refined under the attached Site Planting Plan for Redwood Mountain Grove and Fisher Habitat.

A total of four crews—two crews with up to 20 people comprised of planters, support staff, and inspectors and two crews of roughly ten people each—will implement the planting plan over the course of approximately 30 days in fall 2023, spread out across the two planting areas (i.e., Grove and fisher habitat). While the total number of workers is 60, the crews will not be working simultaneously nor in the same location; the total number of people at one time between both planting areas (Grove and fisher habitat) will be roughly 45.

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See Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA and FONSI (PEPC 117498) for more information/background.

### **Area of potential effects (as defined in 36 CFR 800.16[d])**

The Area of Potential Effect (APE) for the proposed Undertaking, including direct and indirect effects, is determined to be up to the 493 acres of the high severity burn area in Redwood Mountain Grove, up to the 485 acres of habitat corridor within Fisher Core Habitat Area south of Redwood Mountain Grove, and the proposed camping sites outside the planting areas. The total is up to approximately 1,100 acres with a 6-inch subsurface depth.

### **3. Has the area of potential effects been surveyed to identify historic properties? Yes.**

**Source or reference:** Groark, Kevin P., and Colleen Hulbert 2023 Cultural Resources Assessment For The Redwood Mountain And Fisher Habitat Replanting Project, Sequoia And Kings Canyon National Parks, Tulare County, California (SEKI2023J1); Clevenger et al. 2023 Archeological Survey for the Replanting of Giant Sequoias and Mixed Conifer in Redwood Canyon (SEKI2023J2); Hull, Kathleen L. 1990 Archaeological Reconnaissance of Portions of the Dry, Eshom, Buck, and Huckleberry Timber Compartments Hume Lake Ranger District, Fresno and Tulare Counties, Sequoia National Forest, California; Purves, Susan 1975 An Archaeological Survey of Proposed Development Areas in Sequoia-Kings Canyon National Park; Martin, Carol A. 1987 Archaeological Clearance for the Buena Vista Prescribed Burn Fire Line, Redwood Canyon, General Grant Grove Section, Sequoia-Kings Canyon National Parks, California; Clevenger et al. 2022 Archaeological Investigation for the KNP Complex Fire Tree Hazard Mitigation Project (SEKI2022W); Roper Wickstrom, C. Kristina et. al. 1987 SEKI1987G\_Buena Vista, Redwood Canyon, and Grant Grove Prescribed Burn; Hamm, Keith 2005 SEKI2005B\_Hart Meadow and Redwood Canyon Prescribed Burn; Hamm, Keith 2017 SEKI2017L\_Redwood Canyon Soil Survey

### **4. Potentially Affected Resource(s):**

**Archeological Resources Present:** Yes

**Archeological Resources Notes:**

[REDACTED]

**Historical Structures/Resources Present:** No

**Cultural Landscapes Present:** No

**Ethnographic Resources Present:** No

**5. The proposed action will: (check as many as apply)**

Y/N	Scope of Action
No	Destroy, remove, or alter features/elements from a historic structure
No	Replace historic features/elements in kind
No	Add non-historic features/elements to a historic structure
No	Alter or remove features/elements of a historic setting or environment (inc. terrain)
No	Add non-historic features/elements (inc. visual, audible, or atmospheric) to a historic setting or cultural landscape
No	Disturb, destroy, or make archeological resources inaccessible
No	Disturb, destroy, or make ethnographic resources inaccessible
No	Potentially affect presently unidentified cultural resources
No	Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnographic resources
No	Involve a real property transaction (exchange, sale, or lease of land or structures)

**6. Supporting Study Data:**

**(Attach if feasible; if action is in a plan, EA or EIS, give name and project or page number.)**

**B. REVIEWS BY CULTURAL RESOURCE SPECIALISTS**

The park 106 coordinator requested review by the park's cultural resource specialist/advisors as indicated by check-off boxes or as follows:

---

**[ X ] 106 Advisor**

**Name:** Linn Gassaway

**Date:** 09/06/2023

**Check if project does not involve ground disturbance [ ]**

**Assessment of Effect:** \_\_\_No Potential to Cause Effect \_\_\_No Historic Properties Affected   X  No Adverse Effect \_\_\_Adverse Effect \_\_\_Streamlined Review

**Recommendations for conditions or stipulations:**

**Doc Method:** Standard 4-Step Process

---

**[ X ] Archeologist**

**Name:** Juanita Bonnifield

**Date:** 09/29/2023

**Comments:** For the purposes of this Undertaking, all sites would be assumed to be properties eligible for NRHP listing as allowed under 36 CFR 800.4 (c)(1). These sites will need to be fully evaluated for eligibility in the future.



**Check if project does not involve ground disturbance [ ]**

**Assessment of Effect:** ☐ No Potential to Cause Effect ☐ No Historic Properties Affected ☒ No Adverse Effect ☐ Adverse Effect ☐ Streamlined Review

**Recommendations for conditions or stipulations:** All sites would be avoided during implementation. Site boundaries would be demarcated using physical markings (e.g. flagging), Global Positioning System method such as geofencing, and/or monitoring for avoidance during implementation. The site location and boundary demarcation information would be conveyed to appropriate Park Service administrators or employees responsible for project implementation. This pertinent information would subsequently be incorporated into planning and implementation documents and contract or agreement documents.

**Doc Method:** Standard 4-Step Process

---

**[ X ] Historical Architect**

**Name:** Elle Farias

**Date:** 09/29/2023

**Comments:** There are no historic buildings within the APE for this undertaking.

**Check if project does not involve ground disturbance [ ]**

**Assessment of Effect:** ☐ No Potential to Cause Effect ☐ No Historic Properties Affected ☒ No Adverse Effect ☐ Adverse Effect ☐ Streamlined Review

**Recommendations for conditions or stipulations:**

**Doc Method:** Standard 4-Step Process

## **C. PARK SECTION 106 COORDINATOR'S REVIEW AND RECOMMENDATIONS**

### **1. Assessment of Effect:**

<b>Y/N</b>	<b>Assessment of Effect</b>
	No Potential to Cause Effects
	No Historic Properties Affected
Yes	No Adverse Effect
	Adverse Effect

### **2. Documentation Method:**

**[ X ] A. Standard 36 CFR Part 800 Consultation**

Further consultation under 36 CFR Part 800 is needed.

**[ ] B. Streamlined Review Under the 2008 Servicewide Programmatic Agreement (PA)**

The above action meets all conditions for a streamlined review under section III of the 2008 Servicewide PA for Section 106 compliance.

**Applicable Streamlined Review Criteria**

(Specify 1-16 of the list of streamlined review criteria.)

**[ ] C. Undertaking Related to Park Specific or Another Agreement**

The proposed undertaking is covered for Section 106 purposes under another document such as a park, region or statewide agreement established in accord with 36 CFR 800.7 or 36 CFR 800.14.

[ ] **D. Combined NEPA/NHPA Process**

Process and documentation required for the preparation of an EA/FONSI or an EIS/ROD to comply with Section 106 is in accord with 36 CFR 800.8.c.

[ ] **E. Memo to Project File**

**3. Consultation Information**

**SHPO Required:** Yes

**SHPO Sent:** Aug 31, 2023

**SHPO Received:** Sep 26, 2023

**THPO Required:**

**THPO Sent:**

**THPO Received:**

**SHPO/THPO Notes:** Therefore, NPS proposes a Finding of No Adverse Effect. After reviewing the information submitted, the SHPO offers the following comments. • This project constitutes an undertaking with the potential to affect historic properties. • The APE is sufficient to take direct and indirect effects of the undertaking on historic properties into account. • Identification and evaluation efforts are sufficient. • Based upon the information submitted, the SHPO has no objection to the proposed Finding of No Adverse Effect for this undertaking. • Please be advised that under certain circumstances, such as unanticipated discovery or a change in project description, NPS may have additional future responsibilities for this undertaking under 36 CFR Part 800.

**Advisory Council Participating:** No

**Advisory Council Notes:**

**Additional Consulting Parties:** No

**4. Stipulations and Conditions:** Following are listed any stipulations or conditions necessary to ensure that the assessment of effect above is consistent with 36 CFR Part 800 criteria of effect or to avoid or reduce potential adverse effects.

- See mitigations/treatments measures below.

**5. Mitigations/Treatment Measures:** For the proposed project actions to be within compliance requirements during construction and/or project implementation, the following mitigations must be adhered to:

- All sites would be avoided during implementation. Site boundaries would be demarcated using physical markings (e.g. flagging), Global Positioning System method such as geofencing, and/or monitoring for avoidance during to implementation. The site location and boundary demarcation information would be conveyed to appropriate Park Service administrators or employees responsible for project implementation. This pertinent information would subsequently be incorporated into planning and implementation documents and contract or agreement documents.
- Should previously unknown historic or prehistoric resources be unearthed during project implementation, work will be halted in the discovery area, the site secured, and SEKI's Cultural Resources Program Manager will be notified. A qualified cultural resource management specialist will examine the area as soon as possible and will follow the procedures of 36 CFR Part 800.13[c].
- In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during project activities, the regulations implementing the Native American Graves Protection and Repatriation Act (43 CFR Part 10) will be followed.
- Ensure that all project workers are instructed on how to respond to an inadvertent discovery.

- Ensure that all project workers are informed of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties.
- See Appendix A of EA for additional mitigations.

#### **6. Assessment of Effect Notes:**

Based on the application of the Criteria of Adverse Effect 36 CFR 800.5(a)(1) NPS-SEKI has determined the Plant Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat project to be a No Adverse Effect to historic properties.

#### **D. RECOMMENDED BY PARK SECTION 106 COORDINATOR**

**Compliance Specialist:**

**NHPA Specialist**

**Juanita Bonnifield** \_\_\_\_\_

#### **E. SUPERINTENDENT'S APPROVAL**

The proposed work conforms to the NPS *Management Policies* and *Cultural Resource Management Guideline*, and I have reviewed and approve the recommendations, stipulations, or conditions noted in Section C of this form.

**Superintendent Signature**

\_\_\_\_\_  
Clayton F. Jordan



## Other Compliance/Consultations Form

**Park Name:** Sequoia and Kings Canyon National Parks

**PEPC Project Number:** 117498

**Project Title:** Re-establish Tree Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor

**Project Type:** Restoration

**Project Location:**

**County, State:** Tulare, CA

**Project Leader:** Andrew Bishop

### ESA

**Any Federal Species in the project Area?** Yes

**If species in area:** Not Likely to Adversely Affect

**Was Biological Assessment prepared?** Yes

**Sent to FWS:** Jul 7, 2023

**FWS Response:** Aug 21, 2023

**If Biological Assessment prepared, concurred?** Yes

**Formal Consultation required?** No

**General Notes:** The NPS initiated Section 7 consultation for proposed actions related to this proposal that may affect the endangered fisher on July 7, 2023. The USFWS responded on August 21, 2023, concurring with the determination that the project (which includes potential action in 5 other areas) may affect but is not likely to adversely affect fisher for the following reasons: 1) The proposed project area currently does not contain suitable fisher habitat due to the impacts of recent fires, and therefore, fishers are not expected to be present in the project area. 2) The small scope of noise disturbance from creating safety zones and delivering supplies via helicopter will not cause long-term disturbance in the planting areas. Fishers in the vicinity of these areas may avoid the immediate area for a short time, but they would use other areas available during this time and this is not expected to result in a disruption of necessary foraging and other activities. 3) Although denning fishers are not expected in the project area, the limited operating period for felling of trees with den features will further ensure no adverse impacts to denning fishers occur. 4) Restoration of habitat connectivity and fire-resilient forest conditions is expected to provide an overall benefit to fisher (FWS-2023-0111204-S7-001). The impacts from removal of trees for campsites as described in the project description are commensurate with those identified through consultation with S

**Data Entered By:** Theresa Iorino ES

**Date:** October 6, 2023

ES Mitigations See Appendix A of EA.

## Floodplains/Wetlands/§404 Permits

Question	Yes	No	Details
A.1. Is project in 100- or 500-year floodplain or flash flood hazard area?		No	Not in floodplain or flash flood hazard area.
A.2. Is Project in wetlands as defined by NPS/DOI?		No	Not in wetland as defined by NPS/DOI.
B. COE Section 404 permit needed?		No	No placement of fill in waters of the United States.
C. State 401 certification?		No	
D. State Section 401 Permit?		No	Issue Date: Expiration Date:
E. Tribal Water Quality Permit?		No	
F. CZM Consistency determination needed?		No	Date Review Requested: Date Reply Received: Date State Concurred:
G. Erosion & Sediment Control Plan Required?		No	
H. Any other permits required?		No	Permit Information:
Other Information:			

Data Entered By: Theresa Fiorino

Date: October 6, 2023

## Floodplains & Wetlands Mitigations

No Floodplains & Wetlands mitigations are associated with this project.

## Wilderness

Question	Yes	No	
A. Does this project occur in or adjacent to Designated, Recommended, Proposed, Study, Eligible, or Potential Wilderness?	Yes		
B. Is the only place to conduct this project in wilderness?	Yes		
C. Is the project necessary for the administration of the area as wilderness?	Yes		
D. Would the project or any of its alternatives adversely affect (directly or indirectly) Designated, Recommended, Proposed, Study, Eligible, or Potential Wilderness? (If Yes, Minimum Requirements Analysis required)	Yes		
E. Does the project or any of its alternatives involve the use of any of the Wilderness Act Section 4(c) prohibited uses: commercial enterprise, permanent road, temporary road, motor vehicles, motorized equipment, motorboats, landing of aircraft, mechanical	Yes		

transport, structure, or installation? (If Yes, Minimum Requirements Analysis required)			
If the answer to D or E above is "Yes" then a Minimum Requirements Analysis is required. Describe the status of this analysis in the column to the right.			<b>See MRA</b>
Other Information:			

**Data Entered By:** Theresa Fiorino

**Date:** October 6, 2023

### Other Permits/Laws

Question	Yes	No
C. Wild and scenic river concerns exist?		No
D. National Trails concerns exist?		No
E. Air Quality consult with State needed?		No
F. Consistent with Architectural Barriers, Rehabilitation, and Americans with Disabilities Acts or not Applicable? (If N/A check Yes)	Yes	
G. Other:		No

**Data Entered By:** Theresa Fiorino

**Date:** October 6, 2023



# MINIMUM REQUIREMENTS ANALYSIS FRAMEWORK WORKBOOK

*"...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."*

— Section 4(c), Wilderness Act of 1964

Plant Tree Seedlings in Redwood Mountain Sequoia Grove and Adjacent Fisher Habitat  
(2024-MRA-03)

## Step 1: Determine If Administrative Action May Be Necessary

### Issue Statement

In 2021, the KNP Complex (KNP) wildfire burned across roughly 73,427 acres within the Sequoia-Kings Canyon Wilderness. 20,068 (3% of the area) acres—including those where the Redwood Mountain Grove and adjacent fisher habitat is located—burned at high severity with severe impacts to these forests and the areas wilderness character. See pages 61-64 and Appendix C: Evaluating Ecological Intervention Proposals in Wilderness in the EA for further information and background, see Figures 1 and 6 of EA for fire severity map of the area.

A total of 741 acres of Redwood Mountain Grove burned at high severity during the KNP. Out of this a total, roughly 650 acres occurs in wilderness. Post-fire assessments within Redwood Mountain Grove show total mortality of large sequoias in Redwood Mountain Grove estimated at over 1,000 individual large trees with roughly 24% percent grove loss. Additionally, areas with large high severity patches are beyond the distance that the majority of sequoia seed in particular disperse. In high severity patches, a combination of factors (low natural seedling densities and lack of living trees), indicated that these areas are highly vulnerable to conversion from forest to fire-initiated shrub-dominated communities in the long term. See page 46 of the EA for further information on the affected environment for Redwood Mountain grove.

In addition to sever fire effects in sequoia groves, approximately 11,260 acres of proposed fisher critical habitat within the Sequoia-Kings Canyon Wilderness and other park Wilderness areas burned at high severity during recent wildfires. This includes a roughly 485-acre proposed critical habitat corridor within Fisher Core Habitat Area 3 south of Redwood Mountain Grove that occurs entirely within wilderness that burned at high severity during the KNP (see also pages 6 and 56-58 of the EA). Post-fire modeling and assessments determined that roughly 1,725 acres of Fisher Core Habitat Area 3 south of Redwood Mountain Grove, like the sequoia groves, is highly vulnerable to long-term conversion from forest to fire-initiated shrub-dominated communities (Postfire Spatial Conifer Reforestation Planning Tool (PostSCRPT) Modeling). Of that area, 485 acres were identified as a high value habitat corridor vital for fisher.

In applying the Decision Tree outlined in selected alternative in the Finding of No Significant Impact (FONSI) decision for the EA (see page 20 and Figure 7 of the EA), the NPS has determined, as follows, that regeneration is likely insufficient to restore a self-sustaining population of sequoia



throughout Redwood Mountain Grove and the fisher habitat is likewise vulnerable to type conversion to a shrub-dominated community long-term.

- Remote Sensing Data Analysis (complete):
  - Identification of contiguous patches of high severity fire effects in Redwood Mountain Grove and within the adjacent fisher habitat corridor was completed immediately following the KNP Complex Wildfire using the Rapid Assessment of Vegetation Condition after Wildfire, Standardized Composite Burn Index (RAVG 4 category CBI product). This remote sensing tool identified that these areas had suffered high tree mortality and were vulnerable to conversion to shrub habitat. This information served as a basis for the original proposal to replant these areas.
- Mortality and Regeneration Analysis (complete):
  - Redwood Mountain Sequoia Grove: Post-fire field surveys in 2022 found a 90.5% mortality of large sequoias within the area of Redwood Mountain Grove that burned at high-severity in the 2021 KNP Complex Fire (Soderberg et al. 2023, in review). The 2022 survey data from Redwood Mountain Grove (where sequoia and non-sequoia seedlings were both counted) also found an estimated mean of 4,266 sequoia seedlings/acre, equating to a 1.1% probability of being equivalent to the second-year seedling densities measured by Stephenson et al. 2023, in preparation (Soderberg et al. 2023, in review). All sequoia regeneration plots were also resurveyed in July of 2023. The mean seedling density in these 2023 data was lower than the 2022 dataset and failed to meet the standards put forward in the EA (i.e., densities were not equivalent to the Bayesian mean presented in Stephenson et al. 2023, in preparation). The NPS has therefore found that (1) mortality within the proposed action area (as outlined in the EA), is as high as expected—reducing the likelihood of future seed rain and potential regeneration—and (2) actual seedling regeneration within the proposed action area does not meet the 90% probability of meeting the 16,011 median density of sequoia seedlings determined by Stephenson et al. 2023, in preparation. Based on these field surveys and findings, the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout the grove. See EA for additional information and context.
  - Adjacent Fisher Habitat: Surveys within this area determined that white fir averaged 27.1 seedlings/acre (67 seedlings/hectare (ha)), sugar pine 0.81 seedlings/acre (2 seedlings/ha), incense cedar 21.8 seedlings/acre (54 seedlings/ha), and ponderosa pine 0.41 seedlings/acre (1 seedling/ha). Forty percent of mixed conifer plots contained zero conifer seedlings and 60% contained a very low density of 20 or fewer seedlings per hectare. These data indicate extremely low densities currently both within and outside of sequoia groves, and the fact that these are large areas with near zero canopy cover indicate that field observations corroborate the POSTSCRPT modeling that suggests that these areas are at significant risk of conifer regeneration failure.
- Climate Assessment (complete):

- Results of this analysis indicate that these two areas have a high likelihood of continuing to support forest under future climate conditions, although tree densities in some sites may be reduced to reduce future drought stress from lower water availability in the future.

As described above, conditions in Redwood Mountain Sequoia Grove and adjacent fisher habitat corridor meet the decision tree criteria for taking action in these areas in alignment with the Minimum Requirement Analysis (MRA) (see Appendix D of EA) and FONSI to Establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Critical Habitat in Sequoia and Kings Canyon National Parks. See these documents, along with the EA, for more information/background.

This MRA refines and further considers the minimum requirement for replanting sequoia and other mixed conifer seedlings in Board Camp Grove as a supplement to the MRA that was prepared to evaluate the larger planting proposal (see Appendix D of EA).

## Options Outside of Wilderness

***Can the issue be resolved or addressed outside of wilderness?***

☐ YES

**STOP – EXPLAIN BELOW AND DO NOT TAKE ACTION**

☒ NO

**EXPLAIN BELOW AND PROCEED TO THE NEXT SECTION**

Of the 516 acres of Redwood Mountain Grove that burned at high severity, 493 of which is considered for replanting, 475 occur within wilderness. Likewise, of the 485-acre habitat corridor that burned at high severity and proposed for replanting, all 485 acres occur within wilderness. Therefore, taking action outside of wilderness would not address the low seedling regeneration in these areas.

## Criteria for Determining Necessity

Based on the legal requirements in Section 4(c) of the Wilderness Act, one or more of the factors A-D below must be met for any action to be considered.

***Do any of the criteria below apply?***

### A. Wilderness Character

*Based on the Issue Statement, are any of the qualities of wilderness character degraded, impaired, or threatened to a degree that it is necessary to analyze potential action otherwise prohibited by Section 4(c) to address the issue?*

untrammelled

☐ YES   ☒ NO

This quality is currently not degraded in the action area.

undeveloped

☐ YES ☒ NO

This quality is currently not degraded in the action area.

natural

☒ YES ☐ NO

Giant sequoia is an attribute of the natural quality of wilderness character for the Sequoia-Kings Canyon Wilderness. High severity fire during the recent fire events (2020 Castle and 2021 KNP Complex wildfires) has contributed to the death of thousands of individual large (> 4 feet in diameter) sequoia trees and reduced the intact acreage of Redwood Mountain Grove; resulting in diminished natural quality of wilderness character. A documented lack of seedling regeneration leaves affected areas highly vulnerable to long-term type conversion to shrub-dominated systems. Because sequoia already have limited distribution (as recognized in the parks' enabling legislation), taking action is necessary to prevent conversion of this grove to non-forest and direct this area—over a period of centuries—toward recovery of pre-fire distribution and population levels of large giant sequoias, thus preserving in the long term, the natural quality of wilderness character. Fisher is a forest-dependent carnivore which is federally endangered. The area where action is proposed is within a habitat corridor for proposed fisher critical habitat. Restoration of this area would help speed up the return of tree cover and suitability for fisher movement, thus facilitating dispersal and associated gene flow vital to the species conservation. As this species is a natural component of the wilderness areas where they are located, restoring areas such that natural dispersal and gene flow can continue is therefore also necessary to preserve the natural quality of wilderness character.

outstanding opportunities for solitude or primitive and unconfined recreation

☐ YES ☒ NO

This quality is currently not degraded in the action area.

other features of value

☐ YES ☒ NO

This quality is currently not degraded in the action area.

## B. Valid Existing Rights

*Is action necessary to satisfy a valid existing right? If so, cite the specific right, terms and conditions, and source.*

☐ YES ☒ NO

### C. Special Provisions of Wilderness Legislation

*Is action necessary to satisfy a special provision in wilderness legislation (i.e., Section 4(d) of the Wilderness Act of 1964 or subsequent wilderness-enabling laws) that requires action? Cite law and section.*

☐ YES    ☒ NO

Though not necessary to conform with a special provision, Section 4(a) of the Wilderness Act establishes that the supplemental purposes of wilderness shall not lower the standards evolved for use and preservation of national park units established under the Organic Act: "Nothing in this Act shall modify the statutory authority under which units of the national park system are created. ... Further, the designation... as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with section 100101(b)(1)...of Title 54, United States Code, [or] the statutory authority under which the area was created..." The proposed action serves to preserve Giant Sequoias; both Sequoia and Kings Canyon National Parks were designated in large part for the protection of this species.

### D. Requirements of Other Federal Laws

*Not including special provisions found in wilderness-enabling laws, does another Federal law, by itself or as implemented or interpreted through EO, court order, etc., **require** action? Cite law and section.*

☒ YES    ☐ NO

Yes. The persistence of mature giant sequoia and preservation of fisher habitat connectivity is required to meet the park enabling legislation and other federal laws governing the National Park Service as follows.

#### 1890 Enabling Legislation of General Grant National Park

Designed to protect "all timber, mineral deposits, natural curiosities, or wonders within the parks, and to retain their natural conditions." General Grant National Park, the predecessor to Kings Canyon National Park, was similarly set aside for the purposes of protecting "wonders" [sequoias] within the park, specifically the General Grant Tree and surrounding trees.

#### The NPS Organic Act of 1916 (54 USC 100101(a))

The Organic Act directs the NPS to "...conserve the scenery and natural and historic objects and the wildlife therein...by such means as will leave them unimpaired for the enjoyment of future generations".

#### The 1978 Amendment to the NPS Organic Act (54 USC 100101(b)(2))

This amendment clarified and enhanced the protective functions of the National Park Service and states:

"Congress further reaffirms, declares, and directs that the promotion and regulation of the various areas of the National Park System, as defined in section 1c of this title, shall be consistent with and founded in the purpose established by section 1 of this title [the Organic Act provision quoted above], to the common benefit of all the people of the United States. The authorization of activities shall be construed, and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

The Organic Act and amendments direct the NPS to conserve "natural objects and wildlife therein" in an unimpaired manner. Sequoias and fisher are natural objects and wildlife naturally occurring within the park boundaries. Sequoias in particular are specifically referred to in the park's enabling legislation thus a resource that is necessary to fulfill identified park purposes. Both species are key to the natural integrity of the parks, though sequoia, in particular, holds special significance for park management and public enjoyment.

As well, both species are under threat of habitat loss due to recent high-severity fire. The threats to sequoias directly relate to a loss of occupied land area and associated total population decline which would remain diminished should affected areas convert in the long term to shrub communities. While overall populations of fisher may not have declined due to recent fire (this is unknown however as NPS does not have data on direct fisher mortality during the fires), loss of habitat connectivity in the identified area (Core Area 3) restricts natural gene flow necessary for long-term species survival.

As current conditions threaten the natural distribution and survival of both species, the NPS is obligated to conserve these species in a manner consistent with the Act in order to prevent degradation through a long-term, if not permanent, loss of these resources within these areas.

### Kings Canyon Enabling Act of 1940

"That the National Park Service shall... administer for public recreational purposes the lands withdrawn." and "to insure (sic) the permanent preservation of the wilderness character of the Kings Canyon National Park." (Sec. 3.) Lands designated under this legislation include, the Redwood Canyon area (both Sequoias and fisher habitat) and the Redwood Mountain Grove area is specifically referred to in the congressional Report as one of the finest large sequoia groves remaining in private ownership.

### California Wilderness Act – Public Law 98-425 (September 28, 1984):

The California wilderness designated the 736,980-acre Sequoia-Kings Canyon Wilderness inclusive of the Redwood Canyon Area. Among other resources, sequoias have been specifically identified as an attribute of the natural quality of wilderness character in the Sequoia-Kings Canyon Wilderness. The park's enabling legislation directs the NPS to act to direct areas diminished by recent high severity impacts toward recovery in order to preserve or restore wilderness character—specifically the natural quality of which fisher and sequoias are a component—in areas where it is currently diminished.

### Endangered Species Act (16 USC 1536(c))

"(1) The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this chapter. All other Federal agencies shall, in consultation with

and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 1533 of this title.” The Southern Sierra Nevada distinct population segment of fisher is a federally endangered species under the Endangered Species Act (Federal Register 85, 28532-29589) and the proposal to designate critical habitat was released in October of 2021 and is expected to be finalized by fall of 2023 (FWS-R8-ES-2021-0060). The NPS’ use of agency authorities to restore fisher habitat connectivity lost to high severity fire directly serves the NPS’ obligations to conserve this species and its habitat.

### **Step 1: Determination – Is Administrative Action Necessary in Wilderness?**

☒ YES

**EXPLAIN BELOW AND COMPLETE STEP 2 OF THE MRAF**

☐ NO

**STOP – EXPLAIN BELOW AND DO NOT TAKE ACTION**

The Redwood Mountain Grove and adjacent fisher habitat primarily occur within wilderness. The ecological, natural conditions in these areas have been degraded and acting entirely outside of wilderness would not address the lack of seedling regeneration in affected areas. Conservation is a public purpose of the Wilderness Act (16 U.S.C. § 1133(b)). Thus, actions taken to preserve, protect or conserve, natural resources, such as those analyzed in the associated EA, further this purpose of the Act.

The Organic Act directs the NPS to “conserve the scenery, natural and historic objects, and wildlife” in units of the National Park System “...in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (54 U.S.C. § 100101(a)). The enabling legislation for the parks demonstrates that they were created in order to conserve their natural resources, in particular sequoia trees. The NPS determined that the persistence of mature giant sequoia and preservation of fisher habitat connectivity is required to meet the parks’ enabling legislation and other applicable laws, including the Endangered Species Act (16 U.S.C. § 1536(c)). NPS Management Policies (which are the agency’s official interpretation of its Organic Act and provide specific and detailed guidance regarding the NPS’s preservation obligations under the Organic Act) also require the NPS to maintain natural population processes and strive to protect a full range of native plant and animal genotypes. They also require that the NPS meet its obligations under the Organic Act and Endangered Species Act to protect threatened or endangered species and their habitat. Consistent with these policies, the NPS may manipulate landscapes and plant or animal populations if necessary to correct excessive disturbance caused by past human actions and when such actions would not cause unacceptable impacts. Park management plans and the Parks’ Foundation Document also provide for the conservation of giant sequoia and fisher habitat.

## Step 2: Determine the Minimum Activity

### Other Direction

*Is there “special provisions” language in legislation or other congressional direction that explicitly allows consideration of (but does not require) a prohibited use? (Step 1 has a similar question in Section C, but that question is specific to other legislation requiring action in wilderness; this question is specific to other legislation addressing consideration of prohibited uses). **AND/OR** Has the issue been addressed or prescribed in agency policy, management plans, or legal directive (e.g., treaty, EO, court order, or other binding agreement with federal, state, or local agencies or authorities)?*

☒ YES

**DESCRIBE OTHER DIRECTION**

☐ NO

**SKIP TO “UNCONTROLLABLE TIMING REQUIREMENTS” BELOW**

#### NPS Management Policies 2006

NPS Management Policies (MP) require the NPS maintain natural population processes (MP 4.4.1.1) and strive to protect a full range of native plant and animal genotypes (MP 4.4.1.2) such as those that would be protected and preserved under this proposed action. These policies also require that the NPS meet its obligations under the Organic Act and Endangered Species Act to protect threatened or endangered species and their habitat (MP 4.4.2.3). Further, these policies permit the NPS to manipulate landscapes and plant or animal populations if necessary to correct excessive disturbance caused by past human actions (MP 4.4.2.4) and when such actions would not cause unacceptable impacts to the species in question or the ecosystem in question (MP 4.4.2). The parks' internal management guidance further directs the parks to re-establish the function of human disturbed natural systems (NPS 2007, Vegetation: desired conditions).

In accordance with these management policies, the NPS manages the natural resources of parks to maintain them in an unimpaired condition for present and future generations in accordance with NPS-specific statutes, including the NPS Organic Act and the National Parks Omnibus Management Act of 1998; general environmental laws such as the Clean Air Act, the Clean Water Act, the Endangered Species Act of 1973, the National Environmental Policy Act, and the Wilderness Act; executive orders; and applicable regulations.

#### 1.4.5 What Constitutes Impairment of Park Resources and Values

“An impact to any park resource or value may, but does not necessarily, constitute an impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or

- identified in the park's general management plan or other relevant NPS planning documents as being of significance."

#### 1.4.6 What Constitutes Park Resources and Values

- "the park's scenery, natural and historic objects, and wildlife, and the processes and condition that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; 11 water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structure, and objects; museum collections; and native plants and animals;
- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- any additional attributes encompassed by the specific values and purposes for which the park was established."

##### 4.4.1.1 Plant and Animal Population Management Principles

"The Service *will* adopt park resource preservation... strategies that are intended to *maintain the natural population fluctuations and processes* that influence the dynamics of individual plant and animal populations, groups of plant and animal populations, and migratory animal populations in parks" (emphasis added).

##### 4.4.1.2 Genetic Resource Management Principles

"The Service *will strive to* protect the full range of genetic types (genotypes) of native plant and animal populations in the parks by perpetuating natural evolutionary processes and minimizing human interference with evolving genetic diversity" (emphasis added).

"The need to maintain appropriate levels of genetic diversity *will guide decisions on what actions to take to manage isolated populations of species or to enhance the recovery of populations of rare, threatened, or endangered species*" (emphasis added).

#### 4.4.2 Management of Native Plants and Animals

"Whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. The Service may intervene to manage individuals or populations of native species only when such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them."



#### 4.4.2.3 Management of Threatened or Endangered Plants and Animals

“The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species.”

Further, the NPS will “manage designated critical habitat, essential habitat, and recovery areas to maintain and enhance their value for the recovery of threatened and endangered species.”

#### 4.4.2.4 Management of Natural Landscapes

“Natural landscapes disturbed by natural phenomena, such as... fires, will be allowed to recover naturally *unless manipulation is necessary to (1) mitigate for excessive disturbance caused by past human effects...*” (emphasis added).

#### Sequoia and Kings Canyon National Parks General Management Plan (NPS 2007)

Parks Mission: “protect forever the greater Sierran ecosystem – including the sequoia groves and high Sierra regions of the parks – and its natural evolution, and to provide appropriate opportunities to present and future generations to experience and understand park resources and values” (Page 1).

Management Prescription: “The giant sequoia groves — particularly Giant Forest — and the ecosystems they occupy are restored, maintained, and protected” (NPS 2007, Page 53).

#### *Desired Conditions*

- *Vegetation (including Sequoia Groves):*
  - “Intervention in natural biological or physical processes will be allowed only (1) when directed by Congress, (2) in some emergencies when human life and property are at stake, or (3) *to restore native ecosystem functioning that has been disrupted by past or ongoing human activities*” (emphasis added) (NPS 2007, Page 13).
  - “The National Park Service *will* re-establish natural functions and processes in human-disturbed natural systems in the parks unless otherwise directed by Congress” (emphasis added) (NPS 2007, Page 14).
- *Wildlife:*
  - “Populations of native plant and animal species function in as natural a condition as possible except where special management considerations are warranted” (NPS 2007, Page 15).

#### Sequoia and Kings Canyon National Parks Wilderness Stewardship Plan (NPS 2015)

The Executive Summary of the parks’ Wilderness Stewardship Plan (Page v.) outlines the following desired conditions:

“The natural quality of wilderness would be preserved by mitigating the impacts of modern civilization on ecosystem structure, function, and processes. The NPS aspires to minimize or localize adverse impacts caused by visitor use and administrative activities. In the wilderness, natural processes would dominate:

- *ecosystem structure and function* (emphasis added)
- *native biodiversity* (emphasis added)
- water quality and quantity
- decomposition nutrient cycling, and soil forming processes
- meadow and wetland productivity
- *fire regimes* (emphasis added)
- and soundscapes, dark skies, and viewsheds”

#### Sequoia and Kings Canyon National Parks Resource Stewardship Strategy (NPS 2017)

The parks’ Resource Stewardship Strategy (RSS) outlines the following goals associated with sequoia protection:

1. “Maximize persistence of large, living giant sequoias.
2. Maximize persistence of structurally and compositionally complex giant sequoia groves that are sustainable, resilient (to drought, fire, insects, etc.), and support native biodiversity.
3. Manage for ecological functions essential to giant sequoia groves (fire, hydrology).
4. Prepare for potential shifts in giant sequoia distribution to enable its persistence in the broader Sierra Nevada landscape.
5. Prioritize persistence of giant sequoia in areas of highest social value” (NPS 2017, Page 41).

At the time of its writing, the RSS stated that only 20% of sequoia groves in the Parks were within desired fire return interval and that small trees were overly dense in most groves. Both of these stressors were identified as moderate concern just five years ago (NPS 2017, Page 41).

Finally, the Parks’ RSS identified such direct management priorities to “...include continuing and expanding the use of fire and fuels treatments, reducing other stressors like invasive plants, establishing seed banks, and research with new or expanded treatments that may increase resistance and resilience to climate change, drought, insects, disease, and uncharacteristically severe fires” (NPS 2017, Page 84).

The RSS also listed monitoring, protecting, and restoring (when feasible) terrestrial wildlife as a high priority for the NPS. “Contribute to/review species recovery plans and evaluate opportunities to facilitate recovery of T&E and candidate species and other species of concern (Sierra Nevada bighorn sheep, California spotted owl, California condor, Pacific fisher)” (NPS 2017, Page 94).

#### NPS Climate Change Response Strategy (NPS 2010)

Under the Climate Change Response Strategy, the NPS will analyze potential climate change impacts and adaptively apply the information to improve planning, resource conservation, and visitor experience.

- Goal 2: Collaborate with partners to develop, test, and appropriately apply climate change models to NPS activities (NPS 2010, Page 12).
  - Objective 2.3: Facilitate development of models that can be used by managers to plan for and adapt to climate change impacts (NPS 2010, Page 14).
- Goal 6: Implement adaptation strategies that promote ecosystem resilience and enhance restoration, conservation, and preservation of park resources (NPS 2010, Page 15).
  - Objective 6.1: Collaborate with federal, state, and local partners and programs to acquire, evaluate, and develop tools, such as vulnerability assessments and scenario

- planning, to inform the development of adaptation plans at appropriate scales (NPS 2010, Page 14).
- Objective 6.3: Collaborate to develop cross jurisdictional conservation plans to protect and restore connectivity and other landscape scale components of resilience (NPS 2010, Page 14).

NPS Guidelines for Ecological Intervention in Wilderness Reference Manual 41 (RM41 2022)  
(Included as Appendix C: Evaluating Ecological Intervention Proposal in Wilderness of the EA)

As of 2022, Reference Manual (RM) 41 includes an analytical tool, *Guidelines for Evaluating Ecological Intervention Proposals in National Park Service Wilderness*, developed to assist NPS unit managers in applying the provisions of NPS management policy and other guidance when determining whether or not intervention is or is not favored in wilderness. The parks' analysis of the eight factors outlined within this guidance document found that six factors in this analysis favor intervention while the other two neither strongly favored nor dis-favored intervention. These factors are more fully explained in Appendix C and are summarized in Appendix B of the EA.

### **Uncontrollable Timing Requirements**

*What, if any, are the considerations that would dictate timing of the action?*

Acting now, when Redwood Mountain Grove and fisher habitat are at their closest to post-fire conditions, enables planted seedlings to compete with surrounding shrubs as they regenerate within proposed planting areas and more closely mimics what re-establishment would have occurred naturally. As well, acting sooner would allow more time for seedlings to grow to a size where they will be resilient to fire prior to the next fire interval. Finally, conversion to fire-initiated shrub communities, if not halted by timely intervention, is likely to exacerbate a high severity fire cycle and increase the likelihood of degradation that could occur should high severity fire spread from these new shrub communities to other areas, including remnant portions of the grove.

Once shrub communities become dominant, this degradation would likely be self-perpetuating and irreversible without substantial intervention (e.g. mastication, herbicide). Although conifers are most often planted in spring, with hotter, drier summers becoming more frequent (see Stephenson et al. 2023 in preparation), fall may be a more effective planting time since it avoids the summer drought. For this reason, planting in fall is preferred in this area.

### **Workflow Components**

*What are the distinct components or phases of the action?*

Component 1	<i>Preparation and establishment of administrative camping areas</i>
Component 2	<i>Transportation of personnel to and from the project site</i>
Component 3	<i>Transportation of seedlings and tools to and from the project site</i>
Component 4	<i>Seedling planting</i>
Component 5	<i>Demobilization</i>

## Step 2: Alternatives

### Alternative 1: No Planting; Monitor Only

#### Component Methods

Component	Workflow Components	Component Methods for this Alternative
1	<i>Preparation and establishment of administrative camping areas</i>	No administrative camping areas
2	<i>Transportation of personnel to and from the project site</i>	No site access beyond monitoring (which is not evaluated here)
3	<i>Transportation of seedlings and tools to and from the project site</i>	No equipment needed beyond that which is associated with monitoring (which is not evaluated here)
4	<i>Seedling planting</i>	No planting would occur
5	<i>Demobilization</i>	No action

#### Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken? Provide a complete narrative description of the Component Methods identified above.*

The decision tree outlined in the Selected Alternative within the FONSI, as supported by the MRA in Appendix D of the EA, points the NPS toward planting; this no action/monitor only alternative is not consistent with the FONSI and MRA nor the conservation purposes of wilderness; rather it is outlined for the purposes of comparison for the analysis. Under Alternative 1, the NPS would take no action to plant in Redwood Mountain Grove or adjacent Fisher Habitat. The NPS would continue to monitor post-fire conditions within former sequoia grove and adjacent mixed conifer footprints. Notably: a monitoring design has not been finalized and would be considered under a separate MRA. Because monitoring (in general) would be common to all alternatives but more information/details are needed to thoughtfully review and determine the minimum requirement for monitoring and identify the more specific impacts associated with that tool (e.g., such as beyond assuming no more than the roughly 600 installations outlined in the EA), it is not further analyzed here.

## Wilderness Character

Component Number	For each component number, indicate the impact the <b>method for this alternative</b> will have on each of the five qualities of Wilderness:  Positive = P, Negative = N, No Effect = 0  <i>Describe in detail the impacts to each of the five qualities in the narrative section below</i>	Untrammeled	Undeveloped	Natural	Solitude or Primitive and Unconfined Recreation	Other Features of Value
	<i>No Action</i>					
1	No administrative camping areas	0	0	0	0	0
2	No site access beyond monitoring (which is not evaluated here)	0	0	0	0	0
3	No equipment needed beyond that which is associated with monitoring (which is not evaluated here)	0	0	0	0	0
4	No planting would occur	0	0	N	0	0
5	No action	0	0	0	0	0

What is the effect of each Component Method on the qualities of wilderness character?  
What mitigation measures will be taken? Include cumulative impacts in the explanation.

See Appendix A of the EA for a full list of all mitigation measures that would be implemented.

**UNTRAMMELED:** Explain the intensity of the action that would intentionally control, manipulate, or hinder the conditions or processes of ecological systems:

No impacts identified.

**UNDEVELOPED:** Explain the effects to this quality in terms of how “the imprint of man’s work [would] remain substantially unnoticeable,” and how wilderness will continue to be in contrast with other areas of “growing mechanization”:

No impacts identified.

**NATURAL:** Explain the effects to this quality in terms of protection, degradation, or restoration of natural conditions:

Sequoia mixed conifer and mixed conifer seedlings are expected to remain either absent or at densities below that needed to support forest recovery in these areas. Based on current assessments, roughly 500 acres of the Redwood Mountain Grove and roughly 500 acres of adjacent fisher critical habitat would remain highly vulnerable to conversion from giant sequoia/mixed conifer forest to disturbance related/maintained shrub community. Should sequoia and mixed conifer remain either absent or at densities below that needed to support recovery of Redwood Mountain Grove and the adjacent fisher habitat, as would be the most likely to occur under this alternative than any action alternative (see Chapter 3 of EA), the total acreage of Redwood Mountain Grove could remain diminished by as much as 493 acres in the long term (close to 24% of the Grove). Due to type conversion and high severity fire feedback loops, this timeframe would be expected to be indefinite. Likewise, the total number of sequoias within the Sequoia-Kings Wilderness, including the total number of potential future large sequoias, may also be reduced in the long term—again, expected to be indefinite.

Because giant sequoia is a primary attribute of wilderness character in the Sequoia-Kings Canyon Wilderness, the diminished grove footprint would adversely affect the natural quality of wilderness and contribute to the overall trajectory toward less natural. As well, the natural quality could further deteriorate if cycles of high severity fire resulting from the conversion to shrub-dominated systems spread to other nearby areas—including remnant sequoia grove.

As mentioned above, fisher is a federally endangered forest dependent species and, though not specifically identified in the parks' wilderness character assessment, is a component of the natural quality of wilderness character in these parks. The area where action is proposed is within a habitat linkage for critical habitat core area 3. Should this area convert, fisher dispersal to suitable habitat found on either side of the burn patch would be severely limited, restricting gene flow between these two areas. To the extent that the loss of this critical habitat linkage reduces the NPS' ability to preserve the species, natural quality would be adversely affected.

#### **OUTSTANDING OPPORTUNITIES FOR SOLITUDE OR PRIMITIVE and**

**UNCONFINED RECREATION:** Explain how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or degraded. As appropriate, describe solitude, primitive recreation, and unconfined recreation separately:

No impacts identified.
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**OTHER FEATURES OF VALUE:** Explain any effects to features of scientific, educational, scenic, or historical value that are not accounted for in the above qualities, including cultural and paleontological resources that are integral to wilderness character:

No impacts identified.
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**Alternative 2: Replant Seedlings Using Seed Propagated from Seed Collected from both the Local Genetic Community and Other Source Populations; Support Project Using Stock and Foot Travel. Stage Crews in Wilderness.**

**Component Methods**

*How will each of the components of the action be performed under this alternative?*

Component	<u>Workflow Components</u>	Component Methods for this Alternative
1	<i>Preparation and establishment of administrative camping areas</i>	Remove tree hazards that could fall on campers. Trees would be felled with hand tools, explosives, or chainsaw depending on size and complexity.
2	<i>Transportation of personnel to and from the project site</i>	Workers walk to camp and work sites and hike out at the end of implementation.
3	<i>Transportation of seedlings and tools to and from the project site</i>	Seedlings and tools transported via stock. Some equipment may be carried by workers.
4	<i>Seedling planting</i>	Seedlings, including 20% grown from seed outside the local genetic community would be planted by hand using hand tools. A small well would be created to capture incidental moisture.
5	<i>Demobilization</i>	Post project, any camping areas would be naturalized.

**Description of the Alternative**

*What are the details of this alternative? When, where, and how will the action occur? What mitigation measures will be taken? Provide a complete narrative description of the Component Methods identified above.*

Given the results summarized in the issue statement, and in alignment with the decision tree outlined in the selected alternative, the NPS would move forward with planting in up to 493 acres in Redwood Mountain Grove (475 of which is within wilderness) and 485 acres in the adjacent fisher proposed critical habitat corridor, though smaller units within these areas that demonstrate high regeneration levels will not be planted. Sequoia and mixed conifer seedlings grown from seed collected both within and outside the local genetic community would be planted at roughly 100-250 seedlings/acre using hand tools according to methods outlined under the selected alternative in the FONSI (which incorporates Alternative 2 in the Re-establish Tree Seedlings in Severely Burned

Giant Sequoia Groves and Adjacent Fisher Habitat Environmental Assessment by reference) and as refined under the attached Site Planting Plan for Redwood Mountain Grove and Fisher Habitat.

A total of four crews—two crews with up to 20 people comprised of planters, support staff, and inspectors and two crews of roughly ten people each—would implement the planting plan over the course of approximately 30 days in fall 2023, spread out across the two planting areas—Redwood Mountain Grove and the adjacent fisher habitat. While the total number of workers is 60, the crews would not be working simultaneously nor in the same location; the total number of people at one time between both planting areas (Grove and fisher habitat) would be roughly 45.

While the two smaller crews would be stationed in front-country/developed areas (such as Dorst Campground), the two larger crews would need to stage (and therefore camp) within wilderness given the distance from trailheads (the overall action area is across close to 1,000 acres, some of which are further disconnected). The NPS would therefore establish two administrative campsites near the trail junction of Redwood Mountain Trail and Sugar Bowl Trail. Between these two 90-foot in diameter areas, NPS would clear approximately 3 large (>27 inches dbh), 15 medium (>12 inches dbh but <20 inches dbh) and roughly 25 small (<12 inches dbh) snags (i.e., dead trees) that otherwise pose a safety hazard to administrative campers (see attached photo of site conditions and size class/condition of snags). These locations were selected to remove the fewest snags possible while avoiding resources such as surface water and archeological sites. Trees under 12 inches diameter at breast height (dbh) and requiring less than 30 minutes to be safely felled would be felled using handsaws, crosscuts, or axes—whichever tool is determined safest. Trees larger than 12 inches dbh or those otherwise determined unsafe to remove using hand tools would most likely be felled using chainsaws. All use of camp and work areas would follow wilderness minimum impact restrictions. At the end of the planting effort, administrative camps would be naturalized to ensure no trace remains of the camps. All materials and equipment would be removed using a combination of foot traffic and stock.

Crews stationed in wilderness would hike from the Redwood Mountain Trailhead into the administrative camp location to establish the camp and then hike to their respective planting sites each day. Two additional crews staged outside of wilderness would hike from frontcountry staging areas/vehicles to their respective planting sites each day. Tree seedlings, tools, and equipment would be transported via stock to staging areas at or near the administrative camps and along the trail corridors. A range of roughly 15-30 pack stock strings of 8 mules each (a total of roughly 120-240 mules total) would be used for each site (Grove and fisher habitat). Each stock train would travel along existing routes a distance of roughly 4-5.5 miles to reach project sites. Stock would not travel off trail and would not remain in wilderness overnight. From staging sites, planting crews would transport seedlings to their planting locations on foot. All crews would work in planting locations nearest to their staging locations which are spatially distributed across 900-1,000 acres of forest.



**Figures 1 and 2.** Images showing proposed camp conditions taken from roughly center of one proposed camping area. Denser trees in background are not proposed for removal. Focal area of camp would reflect conditions closer to grassy/shrubby foreground.



## Wilderness Character

Component Number	For each component number, indicate the impact the <b>method for this alternative</b> will have on each of the five qualities of Wilderness:  Positive = P, Negative = N, No Effect = 0  <i>Describe in detail the impacts to each of the five qualities in the narrative section below</i>	Untrammeled	Undeveloped	Natural	Solitude or Primitive and Unconfined Recreation	Other Features of Value
	<i>Example: Workers walk to work site.</i>	0	0	0	0	0
1	Remove tree hazards that could fall on campers. Trees would be felled with hand tools, explosives, or chainsaw depending on size and complexity.	N	N	0	N	0
2	Workers walk to camp and work sites and hike out at the end of implementation.	0	0	0	N	0
3	Seedlings and tools transported via stock. Some equipment may be carried by workers.	0	0	0	N	0
4	Seedlings, including 20% grown from seed outside the local genetic community would be planted by hand using hand tools. A small well would be created to capture incidental moisture.	N	N	P	0	0
5	Post project, any camping areas would be naturalized.	0	0	0	P	0

*What is the effect of each Component Method on the qualities of wilderness character?  
What mitigation measures will be taken? Include cumulative impacts in the explanation.*

See Appendix A of the EA for mitigation measures.

**UNTRAMMELED:** Explain the intensity of the action that would intentionally control, manipulate, or hinder the conditions or processes of ecological systems:

Untrammeled quality would be negatively affected by planting tree seedlings across just under 1,000 acres in wilderness (475 acres of sequoia grove and 485 acres of fisher habitat) as well as across the administrative camp areas roughly 90 feet in diameter where roughly 3 Large (>27 inches dbh), 15 medium (>12 inches dbh but <20 inches dbh) and roughly 25 small (<12 inches dbh) snags (i.e., dead trees) that otherwise pose a safety hazard to administrative campers would be felled.

The degree of trammeling actions would also be influenced by the introduction of up to 20% non-local genetic material which would result in a different genetic makeup than was present prior to

the fire. These trammeling actions would occur for the duration of the project (roughly 30 days) while actions are actively being implemented. The untrammeled quality would return to pre-project levels such that the untrammeled quality would be preserved in the long term.

**UNDEVELOPED:** Explain the effects to this quality in terms of how “the imprint of man’s work [would] remain substantially unnoticeable,” and how wilderness will continue to be in contrast to other areas of “growing mechanization”:

The undeveloped quality would be negatively affected by chainsaw use, evidence of cut stumps, and creation of small tree wells as follows:

Chainsaw use (if determined the safest method to remove hazards) at the two administrative camps would negatively affect the undeveloped quality for roughly 2-3 hours as the administrative camps were being established. The degree of impact on undeveloped would be less than one hour at each site if explosives or handsaws are determined safe methods to remove trees. Where hand tools or chainsaws, rather than explosives, are used to fell snags, stumps would be flush cut with the ground and otherwise camouflaged to minimize visual impacts. However, evidence of cut stumps would still result in additional, though minimal, negative effects on undeveloped quality until stumps deteriorate naturally—a period of 10-20 years, depending on stump diameter and tree species.

The small tree wells created around each planted seedling (100-400 per acre across 1,000 acres) would likewise have a minor negative effect on undeveloped quality until the wells are no longer evident on the landscape—a period of one to two years post planting.

Despite these temporary impacts the undeveloped quality would be preserved in the long term.

**NATURAL:** Explain the effects to this quality in terms of protection, degradation, or restoration of natural conditions:

Replanting the Redwood Mountain Grove and adjacent fisher critical habitat would have a greater likelihood than no action of restoring sequoia and mixed conifer seedlings on just under 1,000 acres of wilderness. Were the restoration to be successful, this alternative would be expected to direct the trajectory of severely burned areas toward forest recovery to their pre-fire conditions, beneficially affecting sequoia grove recovery and proposed fisher critical habitat and connectivity. The NPS anticipates that once seedlings were established, natural and dynamic post-fire recovery processes would continue, and the seedlings would mature over a period of centuries, such that large sequoias would be the dominant feature within most, if not the entire, grove footprints.

Similarly, over a period of 50-100 years and beyond, stand structure would continue to improve and habitat value would continue to increase across the 485-acre fisher habitat corridor project area which would, in turn, facilitate fisher movement dispersal and associated gene flow vital to the species conservation and meet fisher habitat requirements for foraging, resting, denning, and predator avoidance. These impacts would thereby long-term restore and beneficially affect, the currently diminished natural quality of wilderness character in planting areas. This alternative would also be more likely than Alternative 1 to prevent the long-term conversion of these forests to shrub-dominated communities and the transition to a fire regime typical of these communities—one that is characterized by more frequent, high severity fire. In doing so, this alternative would have a greater likelihood of maintaining the fire regime of this fisher habitat corridor and reducing the

chances that high severity fire from shrub-dominated communities travels to and through the adjacent sequoia grove (Redwood Mountain) and other nearby mixed conifer forests that remain intact.

While speculative in terms of benefit to natural quality of wilderness character specifically, seedlings propagated from a variety of sources may demonstrate increased survival capacity, increasing the likelihood of success and long-term resilience to climate change. Should seedlings grown from other sources prove key to successful replanting of these areas, this would beneficially affect natural quality of wilderness character; though the characteristics of the population would be different from what would otherwise be present.

**OUTSTANDING OPPORTUNITIES for SOLITUDE or PRIMITIVE and UNCONFINED**

**RECREATION:** Explain how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or degraded. As appropriate, describe outstanding opportunities for solitude or primitive and unconfined recreation separately:

Project components would not affect opportunities for primitive and unconfined recreation. However, the sound of up to three hours of chainsaw use would negatively affect solitude over the course of one to two days during removal of snags during each camp establishment. The presence of roughly eight stock traveling along the trail for 5-6 hours every 2 to 3 days to deliver and backhaul equipment and seedlings, two work crews (between 10 and 20 individuals per planting location), and two administrative camps will further negatively affect the opportunities for solitude for a total of roughly 15 days per area.

Outstanding opportunities for solitude will remain throughout the surrounding wilderness to a similar degree as typical within these wilderness areas. Post project, opportunities for solitude or primitive and unconfined recreation would return to pre-project levels, and opportunities for solitude would be preserved in the long term. As opportunities for primitive and unconfined recreation would not be affected by this project, this quality as a whole would likewise be preserved in the long term.

**OTHER FEATURES OF VALUE:** Explain any effects to features of scientific, educational, scenic, or historical value that are not accounted for in the above qualities, including cultural and paleontological resources that are integral to wilderness character:

No impacts identified
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## Additional Alternatives

### Step 2: Alternatives Considered but Dismissed

*What alternatives were considered but dismissed? Why were they dismissed?*

#### Explain:

The NPS considered but dismissed a number of alternatives in the EA that are dismissed for similar reasons within this MRA, specifically as they do not align with the conservation purposes of taking action to address the Issue Statement and/or clearly entail more impacts to wilderness character. These include the following. Please see the EA for a discussed on why these alternatives are dismissed:

1. Plant Only Outside Wilderness
2. Plant Only Sequoia Seedlings in Sequoia Groves
3. Sow Seed to Re-establish Seedlings
4. Remove Existing Fuels either via Manual Thinning or Prescribed Burning Prior to Planting
5. Complete Site Preparation Including Herbicide and Crushing of Vegetation
6. Plant Understory Vegetation in Addition to Sequoia Mixed-Conifer Seedlings
7. Monitor Regeneration and Take Action at a Later Time if Necessary

The NPS also dismissed the following applicable alternatives and alternative components within the MRA that accompanies the EA as Appendix D (see this MRA for additional discussion):

8. *Allow cross-country travel of stock to re-planting sites to transport seedlings and tools (and related alternative components of stock access in areas without accessible stock trails)*

Under this alternative, stock would travel from existing access routes cross-country in trail-less areas to deliver seedlings and tools. This alternative was dismissed outright as trail-less areas where planting would occur in these areas are too rugged to allow for safe stock travel and may damage seedlings that are naturally regenerating. The NPS furthermore identified an alternative (crews carry seedlings and equipment) that is less invasive.

9. Use Only Non-Motorized Tools (i.e., Hand Saw, Crosscut Saw, or Axe) or Explosives to Clear Snags from Administrative Camp

Tree felling is consistently one of the top five most dangerous jobs in America (BLS 2020); when requiring crews to complete this type of work, safety must be of utmost concern. NPS often uses the Severity, Probability, Exposure (SPE) model of risk as described further below:

- **Severity:** Tree falling mishaps are easily fatal; there's only so much risk personal protective equipment (PPE) can mitigate. The choice of tool does not change *severity*.
- **Probability:** Method of mitigation affects skill needed, with greater *probability* of mishap when the required skill level is high. Felling trees with non-motorized tools or explosives is a highly technical skill, and though skill can be partially mitigated through training and crew selection firefighters available to complete the work, most staff do not have the skills to safely fall trees with these tools. Complexity of

the surrounding environment further increases the *probability* of mishap. As action areas are located within high severity burn scars, there are other numerous dead/dying trees and some may be over 100 feet in height and/or would have a high dbh, complexity, and therefore *probability*, of mishap is likely to be high in locations where trees would require felling depending on the density of trees.

- **Exposure:** *Exposure* is the factor most influenced by the choice of tool or methods. Given that felling a tree that may exceed 100 feet in height with a crosscut saw would take roughly 2-4 hours to complete and would require additional staff to complete the cuts, the risk/exposure to crews of falling objects (i.e., “widow-makers”) during this extended period of stationary work would be considerable. In comparison, cutting a single tree with a chainsaw would take an estimated 5-10 minutes or 17% of the time needed to use a crosscut saw. Felling the tree with explosives would require 30 minutes to an hour to set up the blast.

Due to the conditions in the action area, we cannot assume that all snags within administrative camping areas could be safely felled with hand tools alone and will not impose this requirement on staff when the work could be completed more safely (via substantially less exposure to surrounding hazards) with a chainsaw. The exclusive use of hand tools to fell snags was therefore dismissed from further consideration as it may not always be safe to do so.

Conducting blasting in a forest where numerous snags exist would be technically challenging, and in some cases would present a high level of safety and operational risk—as experienced by NPS staff in previous situations within the parks, though explosives may be the safer tool in some cases where snags are extremely decayed and rigging cannot be employed, it is not always recommended as a reasonable and safe alternative for all situations (Ned Aldrich personal communication September 2022). Furthermore, trees felled with explosives can easily catch fire in the process, increasing risk for additional wildfire within the project areas. Given these safety concerns, explosives are not often recommended as the safest tool for felling snags particularly in light of the high density of snags and other dead/dying trees in the project areas and the susceptibility of the project areas to future high severity fire. Given these considerations, an alternative to only use explosives was also dismissed from further consideration as it may not always recommended as a reasonable alternative from a safety standpoint.

Finally, the NPS considered the following alternative as part of the EA and MRA that accompanied the EA.

#### 10. Replant Seedlings Grown from Seed Collected from the Local Genetic Community of Each Replanted Area.

Under this Alternative all methods would be as described in Alternative 2 with the exception that the NPS would not add genetic diversity to Board Camp Grove by sourcing cones/seed from arid groves and from groves with known higher levels of genetic diversity within the seed zone. Instead, all seed would be collected only from within the local genetic community (or neighborhood.) This alternative was already considered in the previous MRA and in the associated EA and was not considered again in this MRA as the EA and previous MRA documented the short-term negative effects to the untrammelled quality and potentially long-term positive effects to the natural quality of wilderness character should these seedlings increase the likelihood that the intervention would be successful and

enough giant sequoia would grow to full maturity and become monarchs over centuries as described further in the impacts from Alternative 2 in the EA (see Chapter 3: Affected Environment and Environmental Consequences).

## Step 2: Determination – What is the Minimum Activity?

### Selected Alternative

Alternative 2: Replant Seedlings Using Seed Propagated from Seed Collected from both the Local Genetic Community and Other Source Populations; Support Project Using Stock and Foot Travel. Stage Crews in Wilderness.

Explain rationale for selection, including a comparison of the selected alternative with other alternatives:

Under Alternative 1, no action, impacts to untrammelled, undeveloped, and opportunities for solitude or primitive and unconfined recreation would not occur. However, this Alternative would be expected to result in continued diminished natural quality in the long-term (a period of centuries) and is not consistent with the conservation purposes of wilderness, the Organic Act, NPS legislation. In contrast, while Alternative 2 will result in temporary impacts to the untrammelled, undeveloped, and opportunities for solitude or primitive and unconfined recreation, in the short term (a period of weeks) this alternative is anticipated to limit potential for further degradation of natural quality typically caused by high severity fire cycles. In the long term, Alternative 2 is anticipated to result in long-term (again centuries) restoration of natural quality currently diminished by high severity fire effects and in the short term is anticipated to limit potential for further degradation of natural quality that typically caused by high severity fire cycles within shrub-dominated communities. Thus Alternative 2 aligns with the conservation purposes of wilderness, and better meets the NPS' obligations to preserve wilderness character, sequoias, and endangered species, in the long term as forests recover. For more information, including cumulative effects, see Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat EA and FONSI.

Approved?	Prohibited Use	Quantity, Timing, Frequency, or Duration
<input type="checkbox"/>	Mechanical Transport:	N/A
<input checked="" type="checkbox"/>	Motorized Equipment:	Chainsaw for up to roughly three hours over the course of one day.
<input type="checkbox"/>	Motor Vehicles:	N/A
<input type="checkbox"/>	Motorboats:	N/A
<input type="checkbox"/>	Landing of Aircraft:	N/A
<input type="checkbox"/>	Temporary Roads:	N/A
<input type="checkbox"/>	Structures:	N/A

Approved?	Prohibited Use	Quantity, Timing, Frequency, or Duration
<input checked="" type="checkbox"/>	Installations:	Roughly 100-400 per acre raised earthen tree wells (3 inches in height) on the downhill slope of each seedling. Anticipated to no longer be visible/functional after 1-2 years.

Describe mitigation measures as well as monitoring and reporting requirements, if appropriate:

Follow up reporting form on total duration of chainsaw use to be submitted upon project completion. See Appendix A of Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat for mitigation list.

## Approvals

**Project Title** (from page 2):

Re-Establish Tree Seedlings in Redwood Mountain Sequoia Grove and Adjacent Fisher Habitat

Refer to agency policies for the following signature authorities:

### Prepared by:

**Name:** Theresa Fiorino :Environmental Protection Specialist

### Reviewed by:

**Name:** Christy Brigham :Chief of Resource Management and Science

Click or tap here to enter reviewer comments.

### Approved by:

**Name** Clayton F. Jordan: Superintendent

Signature \_\_\_\_\_



# MINIMUM REQUIREMENTS ANALYSIS FRAMEWORK WORKBOOK

*"...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."*

— Section 4(c), Wilderness Act of 1964

Monitor Post-Fire Regeneration and Planted Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor (2024-MRA-04)

## Step 1: Determine If Administrative Action May Be Necessary

### Issue Statement

At 2,074 acres pre-fire, Redwood Mountain Grove is the second largest sequoia grove by area with the largest area of old growth and the most mature sequoias in the world. It is located on lands managed by Kings Canyon National Park, Sequoia National Forest, and UC Berkeley (known as Whitaker Forest). The grove ranges from 5,000 feet to 7,200 feet in elevation. It is one of the only groves which has a maintained trail to and through the grove that is accessible by foot and stock. Prior to the 2021 KNP Complex Wildfire (KNP), according to the STI, there were 95,939 living sequoias, with 17,052 over 1' dbh, 5,959 at least 4' dbh, 5,358 at least 5' dbh, and 2,697 over 10' dbh. Four-hundred-ninety-three acres (24%) of this grove burned at high severity during the KNP. Post-fire, samples in high-severity fire areas of Redwood Mountain Grove recorded 90.5% mortality of sequoias and measured sequoia seedling densities at a mean of 4,266 sequoia seedlings per acre; well below the numbers typically seen after fire and associated with a stable sequoia population (citations removed in this document; found in EA). Similarly, the NPS and partners identified a 485-acre proposed fisher critical habitat corridor adjacent to the grove that experienced high severity fire effects from the KNP, has near zero canopy cover, and has very low regeneration as well. After applying the Decision Tree outlined in selected alternative in the Finding of No Significant Impact (FONSI) decision for the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised Environmental Assessment (EA) (see page 20 and Figure 7 of the EA), the NPS has determined that regeneration is likely insufficient to restore a self-sustaining population of sequoia throughout Redwood Mountain Grove and both areas are at significant risk of conifer regeneration failure. Subsequently the NPS has decided to move forward with planting, consistent with the FONSI, EA, and two other minimum requirements analyses—one associated with a broader proposal to consider planting six groves and an adjacent fisher habitat corridor (scope of EA) that is found in Appendix D of the EA and one related to planting seedlings specific to Redwood Mountain Grove and the adjacent fisher habitat following the implementation of the decision tree.

Now that the NPS is moving forward with planting in Redwood Mountain Grove and the adjacent fisher habitat corridor, there is a scientific need to (1) Evaluate success of planting based on criteria established in the EA, and (2) Determine if additional planting is necessary (looking for at least 70% survivorship in year one and less than 10% mortality in years 2-4). There is also an opportunity in these areas, particularly due to their size and species composition (namely, mixed conifer forest) to gain a better understanding of the mechanisms of survival and growth of sequoia and other mixed



conifer species in these novel post-fire environments. The purpose and need for monitoring is further documented within the EA (page 35) and is further supported by the extensive public comments received on the EA that questioned the science behind, most notably, sequoia ecology and regeneration.

See the Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised Environmental Assessment and Appendix D: Minimum Requirement Analysis for more background detail as well as the accompanying documentation (including MRA) associated with planting within these areas.

## Options Outside of Wilderness

**Can the issue be resolved or addressed outside of wilderness?**

☐ YES

**STOP – EXPLAIN BELOW AND DO NOT TAKE ACTION**

☒ NO

**EXPLAIN BELOW AND PROCEED TO THE NEXT SECTION**

Of the 516 acres of Redwood Mountain Grove that burned at high severity (493 of which is considered for replanting), 475 occur within wilderness. Likewise, the entirety of the 485-acre fisher habitat corridor that burned at high severity and which is proposed for replanting occurs within wilderness. Therefore, monitoring the impact of these fires or the success of planting outside of wilderness would not address where the fire impacts or planting occurred and would not provide a robust data set to understand regeneration and seedling survivorship and growth across the planting area. Intentionally not monitoring is also contrary to the scientific and conservation purposes of wilderness, particularly in these novel post-fire environments (section 4(b) of the Act).

## Criteria for Determining Necessity

**Do any of the criteria below apply?**

### A. Wilderness Character

*Based on the Issue Statement, are any of the qualities of wilderness character degraded, impaired, or threatened to a degree that it is necessary to analyze potential action otherwise prohibited by Section 4(c) to address the issue?*

UNTRAMMELED

☐ YES

☒ NO

This quality is currently not degraded in the action area.

UNDEVELOPED

☐ YES

☒ NO

This quality is currently not degraded in the action area.

## NATURAL

☒ YES   ☐ NO

Giant sequoia is an attribute of the natural quality of wilderness character for the Sequoia-Kings Canyon Wilderness and fisher are an endangered species. High severity fire during the KNP has contributed to the death of thousands of individual large (> 4 feet in diameter) sequoia trees and reduced the intact acreage of Redwood Mountain Grove as well as resulted in the loss of thousands of acres of fisher habitat; resulting in diminished natural quality of wilderness character. Monitoring the affected areas is critical for directing management actions that are both reactive and preventative, including informing if supplemental planting is needed (based on survivorship of planted seedlings) and best management practices for any other subsequent planting (based on survivorship and growth of seedlings under differing environmental conditions, particularly shrubs). The plot network, which is designed with statistically valid rigor and captures baseline forest information useful for a diversity of questions, will also act as a resource for other researchers in the parks to inform other conservation needs.

## OUTSTANDING OPPORTUNITIES FOR SOLITUDE or PRIMITIVE and UNCONFINED RECREATION

☐ YES   ☒ NO

Monitoring is not necessary to protect outstanding opportunities for solitude or primitive and unconfined recreation.

## OTHER FEATURES OF VALUE

☐ YES   ☒ NO

The Redwood Mountain area has long been used as a sequoia regeneration study area. Continued and expanded monitoring in these areas under unprecedented conditions resulting from recent wildfire provides a novel scientific opportunity to study both natural and planted seedling survival as well as provide managers with data necessary to gauge success of management actions and provide a basis for future management decisions.

### B. Valid Existing Rights

*Is action necessary to satisfy a valid existing right? If so, cite the specific right, terms and conditions, and source.*

☐ YES   ☒ NO

### C. Special Provisions of Wilderness Legislation

*Is action necessary to satisfy a special provision in wilderness legislation (i.e., Section 4(d) of the Wilderness Act of 1964 or subsequent wilderness-enabling laws) that requires action? Cite law and section.*

☐ YES    ☒ NO

This action is not necessary to satisfy a special provision.

### D. Requirements of Other Federal Laws

*Not including special provisions found in wilderness-enabling laws, does another Federal law, by itself or as implemented or interpreted through EO, court order, etc., require action? Cite law and section.*

☒ YES    ☐ NO

Monitoring planting results and regeneration will inform whether the planting action effectively supports the persistence of mature giant sequoia and preservation of forest habitat in the area and will ensure the NPS makes future decisions about these conservation goals that are informed by the best available science—required to meet the park enabling legislation and other federal laws governing the National Park Service as follows.

#### The Organic Act of the National Park Service:

The Organic Act directs us "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The 1978 Amendment (a.k.a. Redwoods Act) strengthened the protective functions of the NPS and influenced recent decisions regarding resource impairment. "...the protection, management, and administration of these areas shall be conducted in the light of the high public value and integrity of the NPS and shall not be exercised in derogation of the values and purposes for which these various areas have been established..."

The research is necessary to inform management of degraded forest ecosystems and alterations of community functioning. Without this information managers do not have the tools "to conserve the scenery and the natural and historic objects and the wildlife therein..."

#### The National Park Service Omnibus Management Act of 1998:

The National Park Service Omnibus Management Act of 1998 directs the Secretary of the Interior "to assure that management of units of the National Park System is enhanced by the availability and utilization of a broad program of the highest quality science and information."

It established the framework for fully integrating natural resource monitoring into the management process of the NPS. Section 5934 of the Act requires the Secretary of the Interior to develop a program of "inventory and monitoring of NPS resources to establish baseline information and to provide information on the long-term trends in the condition of the National Park System

resources.” The message of the Parks Omnibus Management Act of 1998 was reinforced by Congress in the FY 2000 Appropriations bill.

The data collected through these studies will serve as the foundation for informing changes through time and providing critical data for assessing the long-term effects of unprecedented fire and the results of NPS’ ecological intervention. This research also provides scientific information that can be used in managing resources in SEKI and other national parks.

## **Step 1: Determination – Is Administrative Action Necessary in Wilderness?**

- ☒ YES      **EXPLAIN BELOW AND COMPLETE STEP 2 OF THE MRAF**
- ☐ NO      **STOP – EXPLAIN BELOW AND DO NOT TAKE ACTION**

The sequoia groves and fisher habitat corridor covered in this project primarily occur in wilderness. The ecological, natural conditions in these areas have been degraded and monitoring is necessary to ensure the planting actions meet the conservation and scientific purpose of wilderness, the purposes of NPS under the Organic Act, the purposes of Sequoia and Kings Canyon National Parks under park enabling legislation, and the NPS Organic Act (consistent with section 4(a) of the Wilderness Act), and to restore habitat for the endangered fisher consistent with the Endangered Species Act.

The Organic Act directs the NPS to “conserve the scenery, natural and historic objects, and wildlife” in units of the National Park System “...in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (54 U.S.C. § 100101(a)). The enabling legislation for the parks demonstrates that they were created in order to conserve their natural resources, in particular sequoia trees. The NPS determined that the persistence of mature giant sequoia and preservation of fisher habitat connectivity is required to meet the parks’ enabling legislation and other applicable laws, including the Endangered Species Act (16 U.S.C. § 1536(c)). NPS Management Policies (which are the agency’s official interpretation of its Organic Act and provide specific and detailed guidance regarding the NPS’s preservation obligations under the Organic Act) also require the NPS to maintain natural population processes and strive to protect a full range of native plant and animal genotypes. They also require that the NPS meet its obligations under the Organic Act and Endangered Species Act to protect threatened or endangered species and their habitat.

Without rigorous monitoring of the regeneration and restoration efforts, the NPS cannot adequately fulfill its legal mandates as explained above.

## Step 2: Determine the Minimum Activity

### Other Direction

*Is there “special provisions” language in legislation or other congressional direction that explicitly allows consideration of (but does not require) a prohibited use? (Step 1 has a similar question in Section C, but that question is specific to other legislation requiring action in wilderness; this question is specific to other legislation addressing consideration of prohibited uses). AND/OR Has the issue been addressed or prescribed in agency policy, management plans, or legal directive (e.g., treaty, EO, court order, or other binding agreement with federal, state, or local agencies or authorities)?*

☒ YES

**DESCRIBE OTHER DIRECTION**

☐ NO

**SKIP TO “UNCONTROLLABLE TIMING REQUIREMENTS” BELOW**

#### NPS Management Policies 2006: 4.2 Studies and Collections

“The Service will encourage appropriately reviewed natural resource studies whenever such studies are consistent with applicable laws and policies. These studies support the NPS mission by providing the Service, the scientific community, and the public with an understanding of park resources, processes, values, and uses that will be cumulative and constantly refined. This approach will provide a scientific and scholarly basis for park planning, development, operations, management, education, and interpretive activities.”

#### NPS Management Policies 2006: 6.3.6 Scientific Activities in Wilderness

“Even those scientific activities (including inventory, monitoring, and research) that involve a potential impact to wilderness resources or values (including access, ground disturbance, use of equipment, and animal welfare) should be allowed when the benefits of what can be learned outweigh the impacts on wilderness resources or values... In every park containing wilderness, the conditions and long-term trends of wilderness resources will be monitored to identify the need for or effects of management actions.”

#### 2015 Wilderness Stewardship Plan

“Scientific investigations would continue to be conducted in wilderness to enable the NPS to meet its mission requirements and the ecological, geological, scientific, conservation, and historic purposes of the Wilderness Act.”

### Uncontrollable Timing Requirements

*What, if any, are the considerations that would dictate timing of the action?*

Planting is proposed to begin the fall of 2023. It is essential to establish monitoring plots immediately after planting so that the initial condition can be assessed and compared to future conditions. After initial plots are established, it would be important to monitor frequently in the first few years to understand regeneration as close to the fire as possible and survivorship of

planted seedlings as the first few years of growth are when seedlings are the most vulnerable. After the initial years, it would be important to monitor in consistent intervals that are less frequent given the reduced concerns about survivorship but not too long to miss key changes, trends, or conditions.

## Workflow Components

*What are the distinct components or phases of the action?*

Component 1	<i>Transportation of personnel and gear to and from monitoring plots</i>
Component 2	<i>Establish Monitoring Plots</i>
Component 3	<i>Identify Planted Seedlings within Plots</i>
Component 4	<i>Track Survivorship and Growth Adjacent to Shrubs</i>
Component 5	<i>Frequency of Monitoring</i>

## Step 2: Alternatives

**Alternative 1: Establish Plots via GPS Only. Monitor Plots via Foot. Do Not Complete Additional Monitoring of Seedling Survivorship.**

### Component Methods

*How will each of the components of the action be performed under this alternative?*

<b>Component</b>	<b>Workflow Components</b>	<b>Component Methods for this Alternative</b>
1	<i>Transportation of personnel and gear to and from monitoring plots</i>	Transportation of personnel and gear to and from monitoring plots via foot
2	<i>Establish Monitoring Plots</i>	Establish Monitoring Plots with GPS Points Only
3	<i>Identify Planted Seedlings within Plots</i>	No Identification of Planted Seedlings or Installation of Monitoring Equipment.
4	<i>Track Survivorship and Growth Adjacent to Shrubs</i>	Do not Track Survivorship and Growth Adjacent to Shrubs
5	<i>Frequency of Monitoring</i>	Monitor two times in first year and one per year for at least three years post-planting (if completed); monitor once every five years thereafter

## Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur?  
What mitigation measures will be taken? Provide a complete narrative description of the Component Methods identified above.*

Described further in the attached SEGI Planting Monitoring Plan, the NPS and partners would establish and implement a long-term monitoring protocol to track survivorship of planted seedlings and continue to understand regeneration within both Redwood Mountain Grove and the adjacent fisher habitat corridor. This would include the establishment of 100 (22.7 meter in diameter) plots that are planted and 100 (roughly 22.7 meter in diameter) control plots (for a total of 100 pots per planting area) (using same plots that University of California, Davis has been monitoring plus an additional four; these plots will be no plant plots as controls). Plot centers would be established using high resolution GPS. Monitoring crews of up to five people would monitor these plots twice in 2024, once per year from 2025-2029, and once every five years thereafter. These crews would access the locations by foot and would be on site for no more than a few weeks during each monitoring period. The NPS anticipates that this monitoring would be completed by outside researchers who would be issued a research permit. No monitoring markers or equipment would be installed.

## Wilderness Character

Component Number	For each component number, indicate the impact the <b>method for this alternative</b> will have on each of the five qualities of Wilderness:  Positive = P, Negative = N, No Effect = 0  <i>Describe in detail the impacts to each of the five qualities in the narrative section below</i>	Untrammeled	Undeveloped	Natural	Solitude or Primitive and Unconfined Recreation	Other Features of Value
1	Transportation of personnel and gear to and from monitoring plots via foot	0	0	0	N	0
2	Establish Monitoring Plots with GPS Points Only	0	0	P	0	P
3	No Identification of Planted Seedlings or Installation of Monitoring Equipment.	0	0	0	0	0
4	Do not Track Survivorship and Growth Adjacent to Shrubs	0	0	0	0	0
5	Monitor two times in first year and one per year for at least three years post-planting (if	0	0	P	N	P

Component Number	<p>For each component number, indicate the impact the <b>method for this alternative</b> will have on each of the five qualities of Wilderness:</p> <p>Positive = P, Negative = N, No Effect = 0</p> <p><i>Describe in detail the impacts to each of the five qualities in the narrative section below</i></p>	Untrammeled	Undeveloped	Natural	Solitude or Primitive and Unconfined Recreation	Other Features of Value
	completed); monitor once every five years thereafter					

*What is the effect of each Component Method on the qualities of wilderness character? What mitigation measures will be taken? Include cumulative impacts in the explanation.*

See Appendix A of the revised EA for a full list of all mitigation measures that would be implemented.

**UNTRAMMELED:** Explain the intensity of the action that would intentionally control, manipulate, or hinder the conditions or processes of ecological systems:

No impacts anticipated.

**UNDEVELOPED:** Explain the effects to this quality in terms of how “the imprint of man’s work [would] remain substantially unnoticeable,” and how wilderness will continue to be in contrast with other areas of “growing mechanization”:

No impacts anticipated.

**NATURAL:** Explain the effects to this quality in terms of protection, degradation, or restoration of natural conditions:

Monitoring would have positive impacts on the natural quality of wilderness to the extent that it provides actionable information to managers on changes to these areas over time. This said, even high-resolution GPS is not precise enough at this time to identify precise/consistent boundaries of plots which can result in slight changes in seedling numbers within a plot; small changes in numbers of seedlings in a plot result in large changes in seedling density per acre and survivorship, thereby creating more “noise” in the resulting data sets. This alternative would also not track survivorship to inform whether or not supplemental plantings may be necessary or inform best management practices for future plantings in any other areas as lessons would not be learned about how seedlings survive and grow under differing environmental conditions (such as location adjacent to shrubs).



## OUTSTANDING OPPORTUNITIES FOR SOLITUDE OR PRIMITIVE and

**UNCONFINED RECREATION:** Explain how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or degraded. As appropriate, describe solitude, primitive recreation, and unconfined recreation separately:

Solitude would be negatively affected from researchers visiting these sites up to two times annually for the first year, once for the five years following, and every five years thereafter for up to 40 years. Each monitoring trip would last roughly one to two weeks. Outstanding opportunities for solitude will remain in the surrounding wilderness during monitoring activities. After the annual monitoring action, opportunities for solitude will return to pre-project levels.

**OTHER FEATURES OF VALUE:** Explain any effects to features of scientific, educational, scenic, or historical value that are not accounted for in the above qualities, including cultural and paleontological resources that are integral to wilderness character:

Monitoring in this area will contribute to beneficial effects on the scientific value of the Sequoia-Kings Canyon Wilderness. These benefits will continue to be realized in the long term.

## Alternative 2: Establish Plots Using Rebar and Tags. Monitor Plots via Foot. Complete Additional Monitoring of Seedling Survivorship.

*How will each of the components of the action be performed under this alternative?*

### Component Methods

*How will each of the components of the action be performed under this alternative?*

Component	Workflow Components	Component Methods for this Alternative
1	<i>Transportation of personnel and gear to and from monitoring plots</i>	Transportation of personnel and gear to and from monitoring plots via Foot and Stock
2	<i>Establish Monitoring Plots</i>	Establish Monitoring Plots with Rebar
3	<i>Identify Planted Seedlings within Plots</i>	Tag Seedlings within Plots
4	<i>Track Survivorship and Growth Adjacent to Shrubs</i>	Install Monitoring Equipment and associated plant tags to track survivorship and growth adjacent (or not) to shrubs
5	<i>Frequency of Monitoring</i>	Monitor two times in first year and one per year for at least three years post-planting (if completed); monitor once every five years thereafter

## Description of the Alternative

*What are the details of this alternative? When, where, and how will the action occur?*

*What mitigation measures will be taken? Provide a complete narrative description of the Component Methods identified above.*

This alternative would be the same as Alternative 1 except plots would be marked using one rebar stake to mark the center of each plot (for a total of 200 pieces of rebar), and each planted seedling within the plot would be tagged using a metal plant tag. The NPS estimates that roughly 27 plant tags would be needed within each of the 100 planting (not control) plots, for a total of approximately 2,700 plant tags within the planting area (specific to monitoring plots). Outside these plots, a further 2,700 seedlings would be tagged in experimental areas (marked with high resolution GPS as precise boundaries is not as critical) to evaluate the role of shrub competition, clumped planting, and source grove on survival and growth (1,800 in Redwood Mountain and 900 in the fisher habitat corridor).

As part of this additional monitoring to evaluate the role of environmental factors, a maximum of 100 hobo pendants (to measure soil temperature and light as a proxy for snow melt, with 50 in Redwood mtn and 50 in the fisher habitat corridor) and 60 soil moisture sensors near these identified seedlings (30 in Redwood mtn and 30 in fisher habitat corridor) (for a total of 160 monitoring devices) would be installed. The sensors are approximately 1.75 x 2.88 x 1.41 inches and would be installed ~1 inch below the soil surface (a lesser amount will be used to establish statistical power). (For more information on monitoring equipment please see:

<https://www.onsetcomp.com/products/data-loggers/mx2203>.

<https://tomst.com/web/en/systems/tms/tms-4/>.) Hobos and moisture sensors would be installed for a period of roughly three years. Associated plant tags would remain until either the marked seedling/tree suffers mortality or a total period of roughly three years.

All other plant tags (associated with plots) would remain until either the marked seedling/tree suffers mortality or is no longer necessary. While the NPS assumes many plant tags would be removed within 20 years, plot markers could remain in wilderness for up to 40 years. However, researchers would test high resolution GPS to determine if a high enough level of accuracy can be achieved so as to make rebar unnecessary; in which case rebar could be removed before the end of the monitoring (~40 years).

All monitoring equipment would be carried to the project area via stock and foot in fall 2023, which are transporting all equipment and seedlings associated with the planting effort. No additional stock, beyond those considered in the MRA associated with planting would be necessary.

Like Alternative 1, these monitoring plots would be monitored by crews of up to 5 people twice in 2024, once per year from 2025-2029, and once every five years thereafter. These crews would access the locations by foot. The NPS anticipates that this monitoring would be completed by outside researchers who would be issued a research permit.

## Wilderness Character

Component Number	For each component number, indicate the impact the <b>method for this alternative</b> will have on each of the five qualities of Wilderness:  Positive = P, Negative = N, No Effect = 0  <i>Describe in detail the impacts to each of the five qualities in the narrative section below</i>	Untrammeled	Undeveloped	Natural	Solitude or Primitive and Unconfined Recreation	Other Features of Value
1	Transportation of personnel and gear to and from monitoring plots via Foot and Stock	0	0	0	N	0
2	Establish Monitoring Plots with Rebar	0	N	P	0	P
3	Tag Seedlings within Plots	0	N	P	0	P
4	Install Monitoring Equipment and associated plant tags to track survivorship and growth adjacent (or not) to shrubs	0	N	P	0	P
5	Monitor two times in first year and one per year for at least three years post-planting (if completed); monitor once every five years thereafter	0	0	P	N	P

*What is the effect of each Component Method on the qualities of wilderness character?*

*What mitigation measures will be taken? Include cumulative impacts in the explanation.*

See Appendix A of the revised EA for a full list of all mitigation measures that would be implemented.

**UNTRAMMELED:** Explain the intensity of the action that would intentionally control, manipulate, or hinder the conditions or processes of ecological systems:

There will be no effect on the untrammeled quality.

**UNDEVELOPED:** Explain the effects to this quality in terms of how “the imprint of man’s work [would] remain substantially unnoticeable,” and how wilderness will continue to be in contrast to other areas of “growing mechanization”:

The up to 160 small (measured in inches) hobos and moisture sensors and associated approximate 2,700 plant tags would affect the undeveloped quality for roughly three years (<3,000 minute temporary installations).

The other 2,700 plant tags would also negatively affect undeveloped quality until either the marked seedling/tree suffers mortality or for a period of up to roughly three years (roughly 2,700 minor and temporary installations). Plot markers would continue to negatively affect the undeveloped quality for up to 40 years or until high precision GPS can reliably relocate all plots (roughly 200 minor installations). All impacts to undeveloped quality would cease after a period of between 5 and 40 years (or less if high precision GPS proves effective) depending on monitoring component such that wilderness quality would be preserved in the long term.

**NATURAL:** Explain the effects to this quality in terms of protection, degradation, or restoration of natural conditions:

The action would have primarily positive impacts on the natural quality of wilderness by providing the most scientifically valid and actionable information to managers on how to best manage the ecological changes caused by past and future wildfires within the parks and throughout the Sierra Nevada. In addition to describing current conditions, the study would be able to accurately describe how these conditions change over time. Specifically, in physically marking plots, the NPS is able to more precisely replicate plot boundaries and reduce “noise” associated with any slight change in seedling numbers from imprecise boundary identification. In addition, by marking individual seedlings, the NPS can track survivorship and growth of planted seedlings which can be used to inform whether or not a supplemental planting may be appropriate (which has implications on the natural quality). This data is otherwise not obtainable. Finally, in evaluating the role of shrub competition, clumped planting, and source grove on survival and growth, the NPS will be able to better inform any other future planting effort, including those being considered within other portions of the Sequoia-Kings and John Krebs Wilderness Areas consistent with the FONSI for Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA to best ensure seedling survivorship in the future.

**OUTSTANDING OPPORTUNITIES for SOLITUDE or PRIMITIVE and UNCONFINED**

**RECREATION:** Explain how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or degraded. As appropriate, describe outstanding opportunities for solitude or primitive and unconfined recreation separately:

Negative effects would be as described under Alternative 1.

**OTHER FEATURES OF VALUE:** Explain any effects to features of scientific, educational, scenic, or historical value that are not accounted for in the above qualities, including cultural and paleontological resources that are integral to wilderness character:

Beneficial effects would be as described under Alternative 1 but would provide a significant increase in scientific rigor and reliability with the addition of tree tags, and monitoring equipment. As well, marking the plots with rebar will ensure that plots can be accurately tracked over time, improving the robustness of the scientific data collected. See additional detail under “natural” above.

## **Step 2: Determination – What is the Minimum Activity?**

### **Selected Alternative**

Alternative 2: Establish Plots Using Rebar and Tags. Monitor Plots via Foot. Complete Additional Monitoring of Seedling Survivorship.

Explain rationale for selection, including a comparison of the selected alternative with other alternatives:

Alternative #1 (collecting data from a network of plots without installing rebar or other monitoring equipment) would only partially meet the scientific and conservation purposes of monitoring outlined in Step 1. While it avoids installing permanent plot markers, tree tags, or monitoring equipment, the value of the data would be comparatively and substantially less than Alternative #2 because GPS has not shown to be precise enough to ensure consistent boundaries of plots which can result in slight changes in seedling numbers; small changes in numbers of seedlings in a plot result in large changes in seedling density per acre and survivorship. What may seem like minute inaccuracies can have substantive effects on the quality of the data collected. Plot monitoring without identifying specific seedlings would also prevent the NPS from understanding seedling survivorship and growth, which is critical to (1) Evaluating success of planting based on criteria established in the EA; (2) Determining if additional planting is necessary (looking for at least 70% survivorship in year one and less than 10% mortality in years 2-4). Data collection without marking plot center with rebar and tagging seedlings would therefore result in subpar data quality that would not meet the rigors of peer-review, and would therefore be less able to inform future management decisions.

In addition, this alternative would not provide information on how changes to forest conditions in an unprecedented postfire environment for giant sequoia impacts seedling survival. Redwood Mountain Grove and the adjacent fisher habitat corridor are the largest areas where planting is proposed and would provide the most robust data set for monitoring survivorship in alignment with novel onsite conditions, including soil moisture and soil temperature. Understanding survivorship, particularly in mixed conifer seedlings, in relation to these altered postfire conditions is necessary for the long-term conservation and preservation of the natural quality of wilderness character. This alternative would therefore only partially achieve the scientific purpose of wilderness by not taking full advantage of an opportunity to add to the collective understanding of forest regeneration and changing conditions after unprecedented wildfire.

Alternative #2 (establishing a long-term plot network) meets the goals of Step 1 and though it involves an increased number of installations it will best assist managers in tracking results of ecological intervention, specifically by tracking a plot-based (rebar) sample of planted seedlings (seedling tags) as well as natural regeneration of sequoias and changing forest conditions over time (soil moisture, temperature, snow melt timing). Without randomly installed plots where planted

seedlings are individually tracked, researchers will be unable to provide a robust assessment of seedling survival, growth and their relation to on-site conditions. If high accuracy GPS units can achieve necessary level of accuracy, rebar would be removed. The installations and negative impacts to the undeveloped quality of wilderness character are therefore the minimum required (in number and duration) necessary to preserve the natural quality of wilderness character and meet the scientific and conservation purposes of wilderness.

Installing the additional 160 pieces of small monitoring equipment and associated plant tags would also enable the NPS to better understand the role of shrub competition, clumped planting, and source grove on survival and growth to inform any other future planting effort, including those being considered within other portions of the Sequoia-Kings and John Krebs Wilderness Areas consistent with the FONSI for Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat Revised EA to best ensure seedling survivorship in the future. The common understanding for foresters is that shrubs always compete with planted seedlings, yet some evidence shows that those shrubs can also facilitate survival and growth through shading and increased soil moisture. Through this study, the degree to which shrubs are altering these conditions using climate sensors across a range of site conditions and proximity to shrubs can be measured, and linked with the data on survival and growth. As fires increase in the future, knowing when and where shrubs may act as facilitators vs competitors is critical to inform planting designs, particularly in these novel postfire environments. As with the monitoring plots, if seedlings are not tagged, researchers will not be able to track them through time, which means survival or growth cannot be documented. Multiple sites within each forest type are necessary for statistical replication, which will enable credible and actionable results.

As outlined in the EA and as supported by Appendix D in the EA and the MRA associated with planting in Board Camp specifically, wilderness character would be preserved in the long term.

Approved?	Prohibited Use	Quantity, Timing, Frequency, or Duration
<input type="checkbox"/>	Mechanical Transport:	N/A
<input type="checkbox"/>	Motorized Equipment:	N/A
<input type="checkbox"/>	Motor Vehicles:	N/A
<input type="checkbox"/>	Motorboats:	N/A
<input type="checkbox"/>	Landing of Aircraft:	N/A
<input type="checkbox"/>	Temporary Roads:	N/A
<input type="checkbox"/>	Structures:	N/A

Approved?	Prohibited Use	Quantity, Timing, Frequency, or Duration
<input checked="" type="checkbox"/>	Installations:	200 rebar stakes, roughly 5,400 tree tags, 160 total monitoring sensors. Tags and monitoring installations would remain for a period of approximately 3 years. Plot markers (rebar) would remain until they can be replaced with high precision GPS or up to 40 years.

Describe mitigation measures as well as monitoring and reporting requirements, if appropriate:

See Appendix A of Re-establish Tree Seedlings in Severely Burned Giant Sequoia Groves and Adjacent Fisher Habitat for mitigation list. Submit monitoring reports to research and monitoring program. In addition: Monitoring installations would be removed as soon as possible: all hobos and moisture sensors and associated tags would be removed within approximately 3 years; all monitoring plot markers would be moved if high resolution GPS improves to such an extent that physical markers are no longer required for precisely identifying plot boundaries, and plant tags would be removed as seedlings/trees die, grow to a size such that a plant tag is no longer needed to identify precise individual, or if high resolution GPS improves to such an extent that physical markers are no longer required for precisely identifying the individual seedling/tree that is monitored.

## Approvals

### Project Title

Monitor Post-Fire Regeneration and Planted Seedlings in Redwood Mountain Grove and Adjacent Fisher Habitat Corridor

### Prepared by:

**Name:** Theresa Fiorino :Environmental Protection Specialist

### Recommended by:

**Name:** Christy Brigham :Chief of Resource Management and Science

Click or tap here to enter reviewer comments.

### Approved by:

**Name** Clayton F. Jordan: **Superintendent**

Signature \_\_\_\_\_