



Thinning treatments reduced the density of small trees, retained large trees, and increased pine regeneration. Treatments also maintained >50% of the HRCA in mature size classes with moderate to high canopy cover (>40%).

Evaluating the effects of thinning treatments on forest structure and composition in spotted owl Home Range Core Areas (HRCAs)

The purpose of this project was to evaluate the effectiveness of thinning treatments at meeting project-specific desired conditions and objectives. We established 40 field plots (0.1-acre) in the Whittington and North 49 project areas and collected data before and after treatment. Treatments, which included commercial and precommercial thinning, were implemented in 2018 (North 49 Project) and 2020 (Whittington Project). Our monitoring focused on treatment areas that overlapped spotted owl Home Range Core Areas (HRCAs).

Key Findings

Thinning treatments:

- Significantly reduced tree basal area; however post-treatment values remained higher than the project-specific objective.
- Resulted in tree densities that met desired conditions, with the greatest reductions occurring in the smallest tree size classes (trees < 11" DBH).
- Retained large trees greater than 30" DBH.
- Reduced the proportion of white fir in the stand (i.e., from 72% to 60%); however it remained a dominant species after treatment.
- Increased pine regeneration and decreased white fir regeneration.
- Maintained 51-92% of the HRCA in mature size classes (>11" DBH) with moderate to high canopy cover (>40%).
- Maintained an average of 16 snags/acre (> 6" DBH) after treatment.

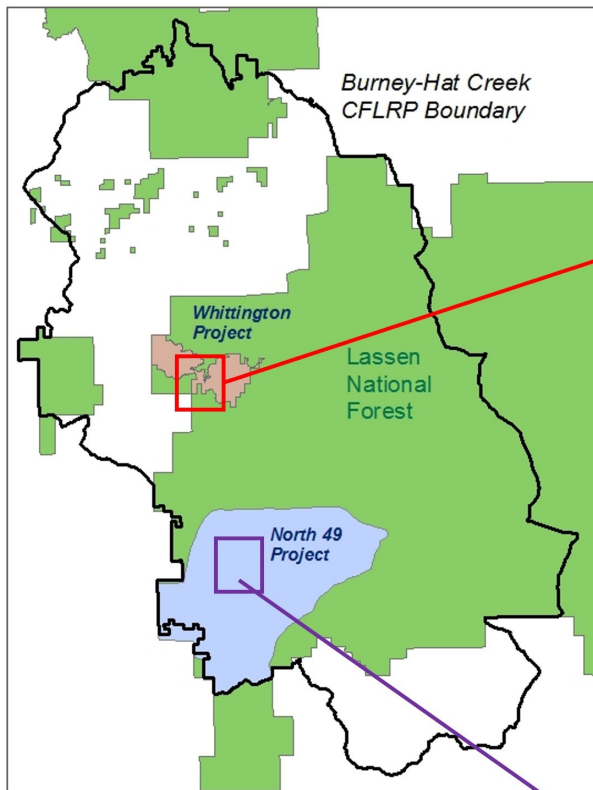


The North 49 project area before (left) and after (right) thinning treatments were completed in 2018.

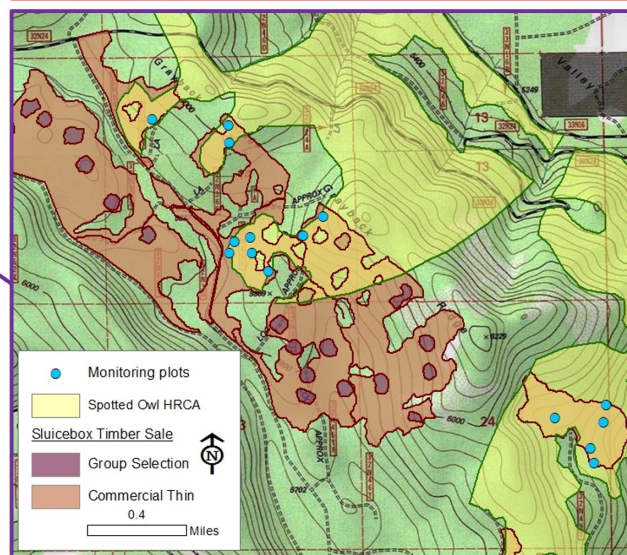
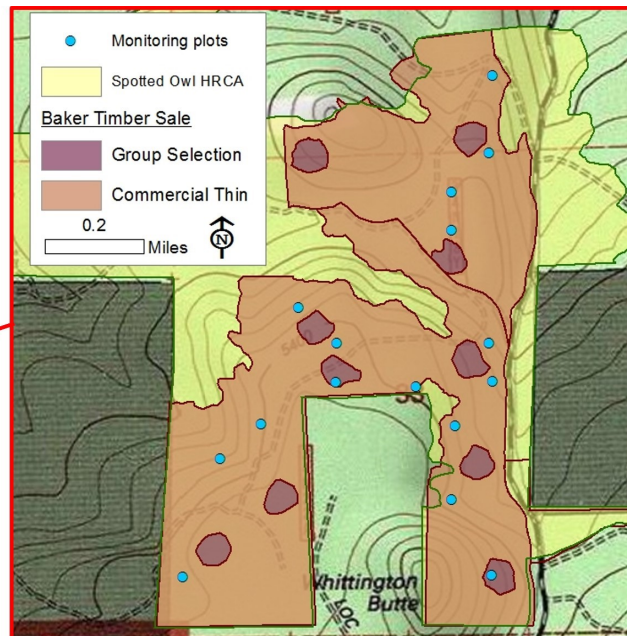


Project Location

The North 49 and Whittington projects are within the Burney-Hat Creek Collaborative Forest Landscape Restoration Program (CFLRP) area, a 364,250-acre planning area established in 2012 that spans public, private and tribal lands. The purpose of the CFLRP is to encourage collaborative, science-based ecosystem restoration of priority forest landscapes. The North 49 and Whittington projects were developed to improve fire-resiliency, forest health and diversity on the Hat Creek Ranger District of the Lassen NF. The treatments that were evaluated included commercial thinning, precommercial thinning, and in some cases piling and burning of fuels. Treatments were implemented in 2018 (Shooter Timber Sale, North 49 Project) and 2020 (Baker Timber Sale, Whittington Project). We focused our sampling on areas where treatments overlapped with spotted owl Home Range Core Areas (HRCAs).



Location of the North 49 and Whittington project areas within the Burney Hat Creek CFLRP on the Lassen NF (left) and location of monitoring plots in the Baker (top) and Sluicebox (bottom) timber sales. on the right.



This project addressed the following question from the Burney-Hat Creek CFLRP Monitoring Strategy: *WL.1.1. Do thinning and prescribed fire treatments within spotted owl home range core areas (HRCAs) and northern goshawk protected activity centers (PACs) create, retain, or enhance key habitat features?*



Treatment Objectives

The North 49 and Whittington projects identified the following specific treatment objectives:

Metric	Post-treatment desired condition		Natural Range of Variation (NRV) ¹
	North 49	Whittington	
Canopy Cover	45%	50%	17-50%
Basal area	150-165 ft ² /acre	120-180 ft ² /acre	91-235 ft ² /acre (mean 152)
Average tree size	12 - 20" DBH	15 - >30" DBH	
Species composition	Increase in shade-intolerant species (e.g., pine); decrease in shade tolerant species (e.g., white fir)		Ratio of shade intolerant to shade tolerant = 60:40

¹NRV values were obtained from Safford and Stevens (2017) for Sierra Nevada yellow pine and mixed conifer forests

Monitoring Overview

A total of 40 common stand exam plots were established in 2018, prior to treatment, within the North 49 and Whittington treatment units. These plots were remeasured after treatment in 2021. These repeated measures allowed us to assess whether or not treatments were successful in meeting project-specific objectives and whether resulting post-treatment conditions were within or closer to **NRV**.

What is the Natural Range of Variation (NRV)?

NRV describes the range of conditions in ecosystem characteristics (e.g., trees per acre, species composition, etc.) that would have occurred under historic disturbance regimes. The NRV can provide baseline information that, when compared to current conditions, can be used to determine the degree of departure from a natural or reference condition.

Historic photographs taken by Albert Wieslander in the vicinity of the North 49 Project Area between 1920-1941. Photos obtained from UC Berkeley Vegetation Type Mapping (VTM) Project (<http://vtm.berkeley.edu/#/data/photos>)



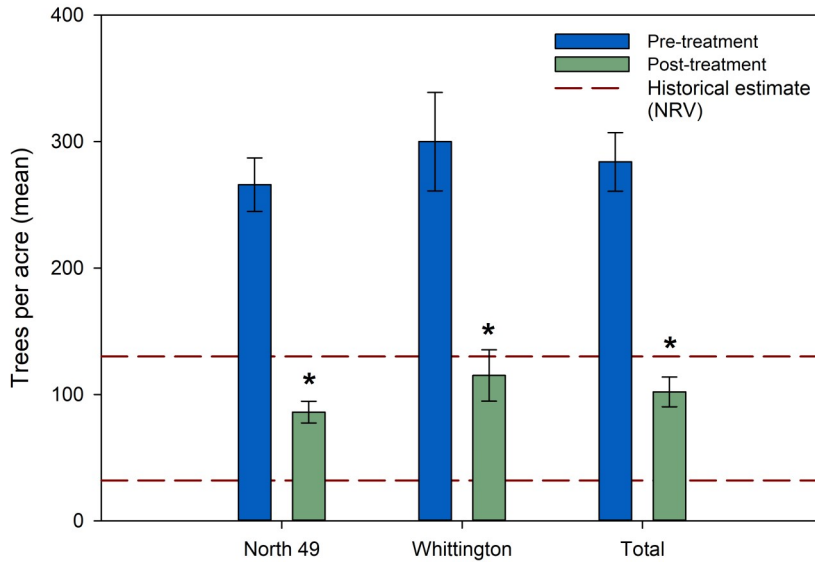
1.5 miles east of Ash Pan Butte (in the North 49 Project Area). Note the abundant pine regeneration in the foreground and widely spaced trees in the background.



Old growth-young growth stand of pine 1.5 miles southeast of Summit Lake (~ 6 miles east of the North 49 Project Area).

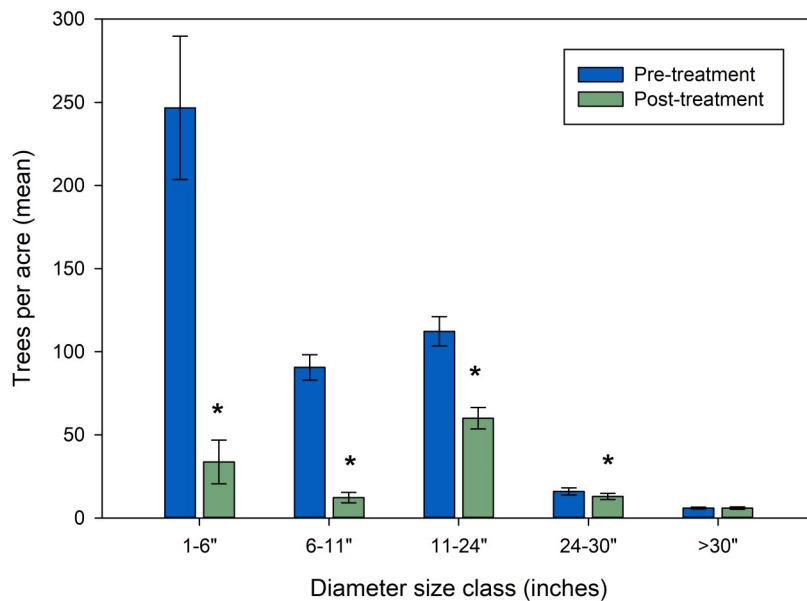


Monitoring Results



Tree density

Treatments significantly reduced tree density from an average of 284 trees/acre to 102 trees/acre. Post-treatment density values fall within the natural range of variation (NRV) for yellow pine and mixed conifer forest types. Asterisks indicate significant differences between pre- and post-treatment values.



Tree size class distribution

The largest reduction in density occurred in the smallest size classes (trees 1-11" DBH). Treatments had no significant impact on the density of large trees (> 30" DBH). Treatments shifted the distribution of size classes from a reverse J-shape distribution (i.e., a dominance of trees in smaller size classes) to a more even or hump-shaped distribution. This post-treatment distribution is closer to what would be expected under NRV or presettlement conditions.

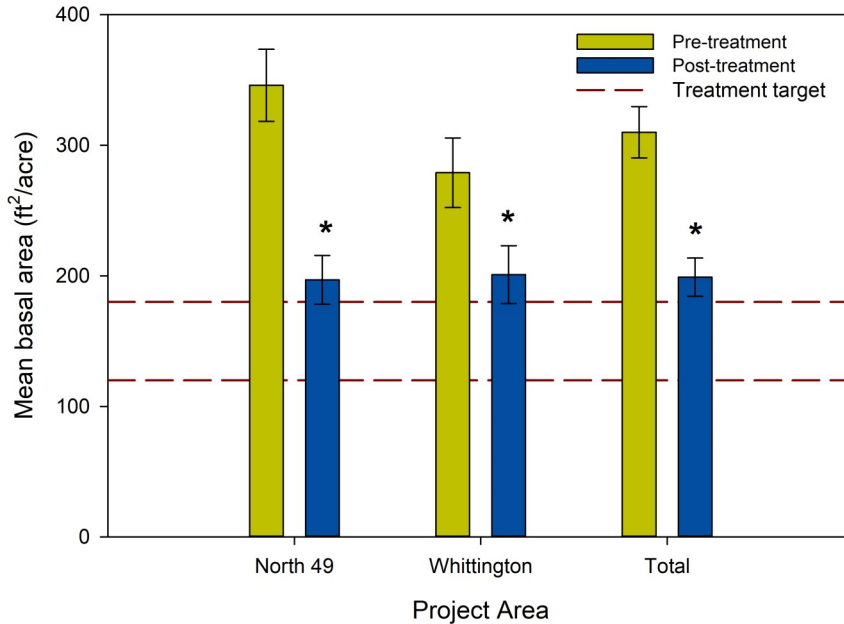
Mean tree diameter

Removal of trees in the smallest size classes increased the mean diameter of trees from an average of 13" DBH (pre-treatment) to 18" DBH (post-treatment). The project objective was 12-20" DBH in the North 49 Project and greater than 15" in the Whittington Project.



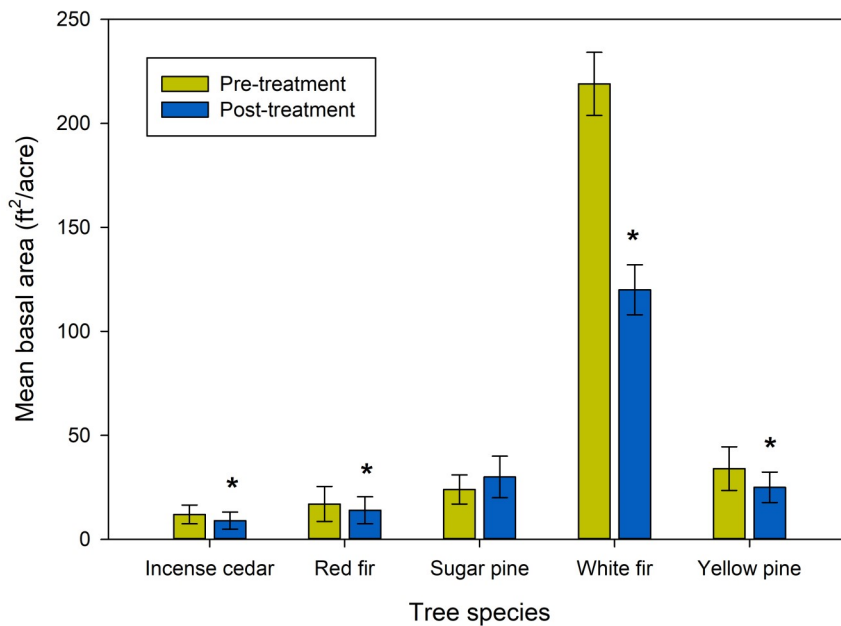


Monitoring Results



Basal area

Treatments significantly reduced basal area; however post-treatment values remain above the treatment target, which was 150-165 ft²/acre (North 49 Project) and 120-180 ft²/acre (Whittington Project). Asterisks indicate significant differences between pre- and post-treatment values.



Species composition

Treatments reduced the density of white fir; however it remains dominant in post-treatment stands. The mean proportion of white fir decreased from 72% (pre-treatment) to 60% (post-treatment) in our plots. In contrast, the proportion of pine (including yellow pine and sugar pine) increased from 17% to 28% in our plots.

Regeneration

The number of pine seedlings increased significantly following treatment, while the density of shade intolerant (e.g., incense cedar and fir) seedlings decreased.





Monitoring Results

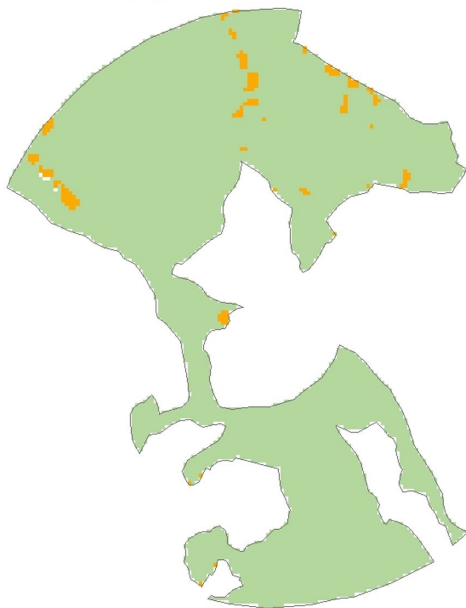
The thinning treatments in our monitoring project overlapped with four spotted owl Home Range Core Areas (HRCAs). The proportion of the HRCAs that were treated ranged from 6% to 78%.

The management objective in these areas is to **maintain 40-60% of the HRCA in mature size classes (>11" DBH) with moderate to high canopy cover (>40%)**. A comparison of pre- and post-treatment canopy cover and tree size class data (F3) indicates that this objective was met for all four HRCAs (see table).

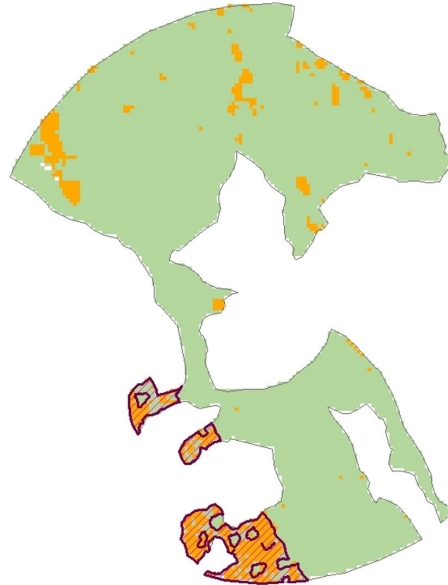
Project	Percent of HRCA with > 40% canopy cover in mature size classes*	
	Pre-treatment	Post-treatment
North 49	98%	92%
	100%	95%
Whittington	99%	51%
	96%	56%

* Mature size classes are trees > 11" DBH

Pre-treatment

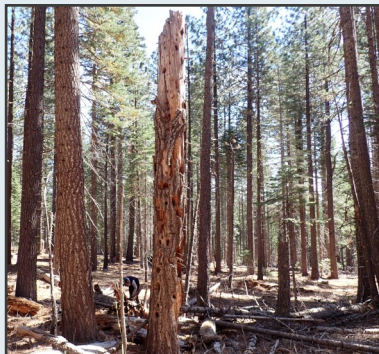


Post-treatment



Canopy cover in HRCAs

The figure to the left shows one of the HRCAs that was partially treated in the North 49 Project. Treatments (in purple hatch) occurred in 14% of the HRCA. Mean canopy cover within the treated area decreased from 56% to 35% after treatment. The proportion of the HRCA that supported mature trees (> 11" DBH) with moderate to high (> 40%) canopy cover (shown in green) decreased from 98% before treatment to 95% after treatment. Areas in orange represent areas with < 40% canopy cover.



Snags

The mean density of snags (> 6" DBH) after treatment was 16 snags/acre. The target snag density is approximately 3-5 snags per acre (NRV).