COLORADO FOREST RESTORATION INSTITUTE
COLORADO STATE UNIVERSITY

Ophir Monitoring Summary

Goals and Objectives

Ophir was a fuels reduction project near Frisco, CO that focused on reducing fire hazard in lodgepole pine-dominated stands with high tree mortality from mountain pine beetle. Additional objectives included increasing forest resilience to disturbances, watershed health, and improving habitat for wildlife species. Management actions in monitored units consisted of non-sawtimber cutting and removal of designated live and dead lodgepole pine, while limiting residual coarse woody fuel loading to 5-15 tons/acre. Colorado Forest Restoration Institute (CFRI) installed monitoring plots in Ophir South Unit 1 to track changes in stand structure, woody fuels, and predicted fire behavior before and one year following treatment.

Table 1. Project Information Table

Implementation Agency	USFS, White River RD
Ownership	USFS
Year Completed	2019
Acres Monitored	41 (Ophir South Unit 1)
Years Monitored	2018, 2020
Forest Type	Lodgepole pine
Implementation Method	Non-sawtimber cutting and removal
Slash Treatment	Removal, lop and scatter residual

Highlights

The treatment removed most of the forest canopy and significantly increased fine woody surface fuels. Coarse woody fuel loading was not significantly impacted by the treatment and remained slightly below the target of 5 tons/acre. A large number of germinant seedlings brought the total seedlings per acre from 2,042 to 3,042 following treatment. Continued monitoring of seedling survival over time will give insight into forest recovery and treatment longevity for post-beetle outbreak lodgepole pine forests. Following treatment, only scattered smaller trees remained, which are likely to be killed by fire. However, the significant reduction in canopy cover means the treated areas are less likely to carry fire through tree crowns.

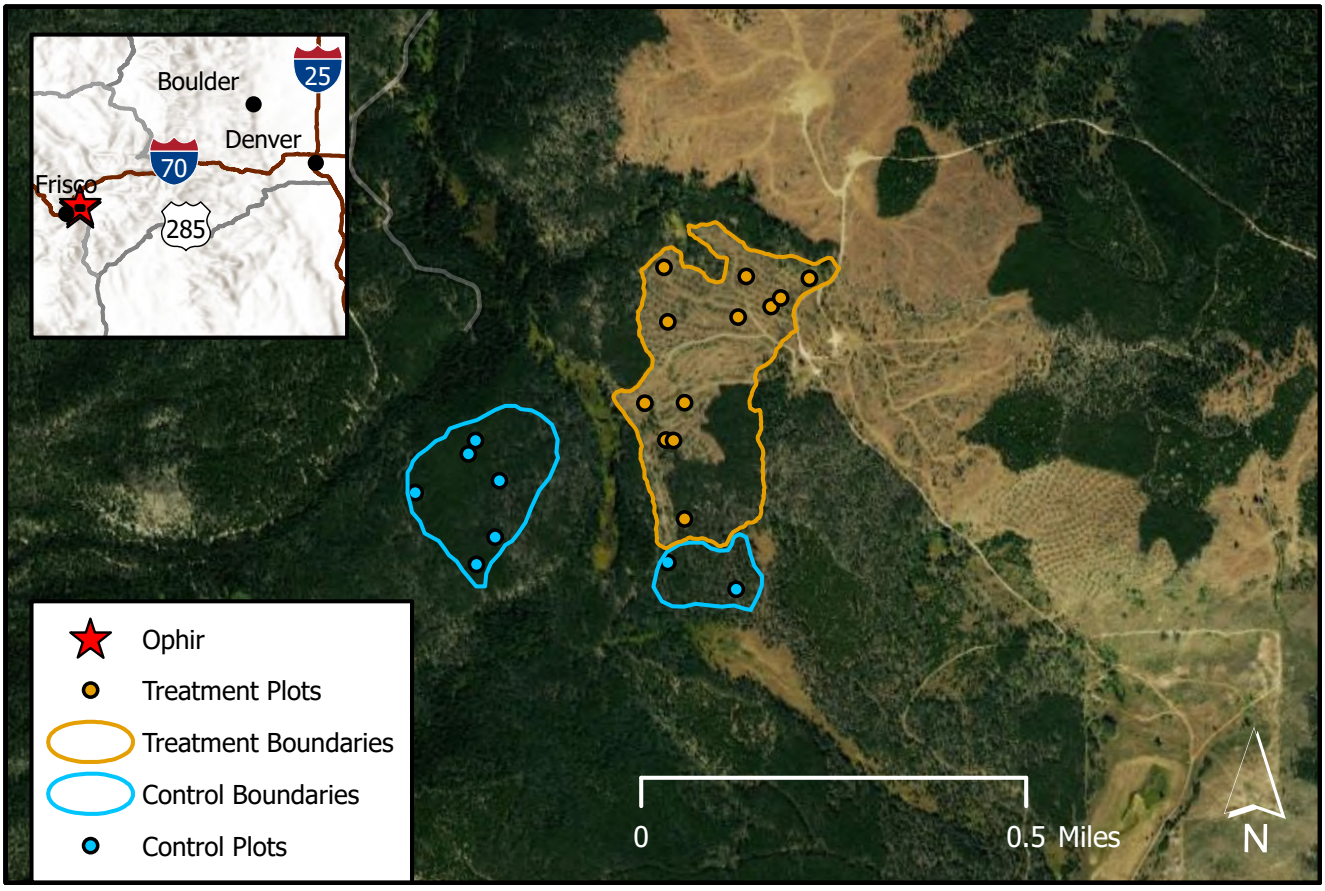


Figure 1. Map of project location, unit boundaries, and monitoring plots.

Pre-treatment

Post-treatment

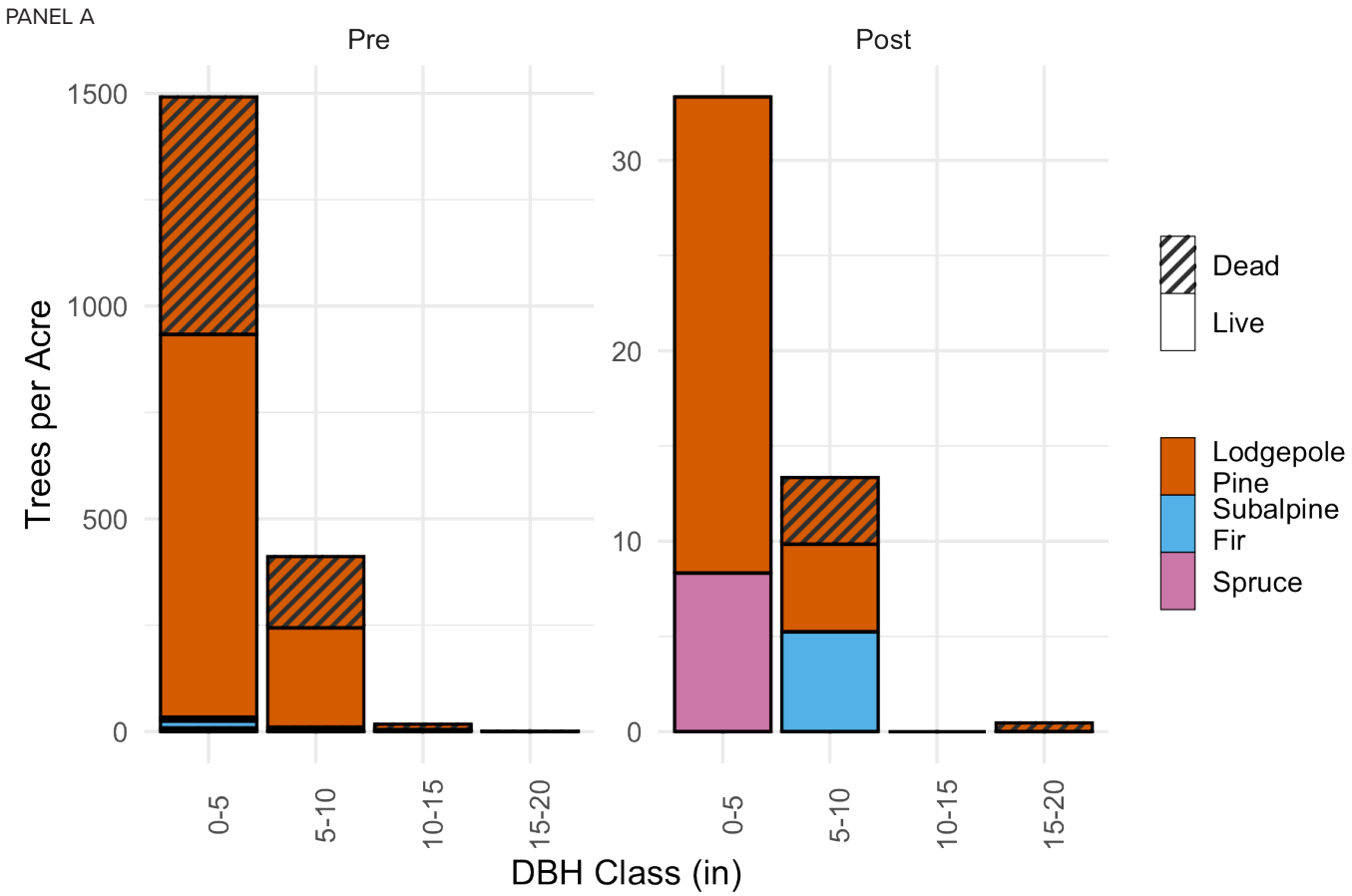
Figure 2. Examples of forest conditions before and after treatment. Note the near-complete overstory removal and slight increase in woody fuel on the forest floor following treatment.

Stand structure and composition

A majority of the overstory was removed. There was an increase in germinant seedlings which raised the number of seedlings per acre following treatment, though that change was not statistically significant due to high variability. Germinant seedlings are susceptible to mortality from drought and mechanical damage.

Table 2. Stand characteristics (mean ± standard deviation) before and after treatment. Asterisks (*) denote a statistically significant difference at an α=0.05 level.

Phase	Live Trees per Acre	Dead Trees per Acre	Live Basal Area	Dead Basal Area (ft^2/ac)	Canopy Cover	Seedlings per Acre
Pre	* 1172 (876)	*750 (455)	* 104 (50)	* 72 (38)	* 68 (23)	2,042 (4,286)
Post	* 43 (57)	*4 (12)	* 3 (7)	* 4 (2)	* 1 (2)	3,042 (3,948)



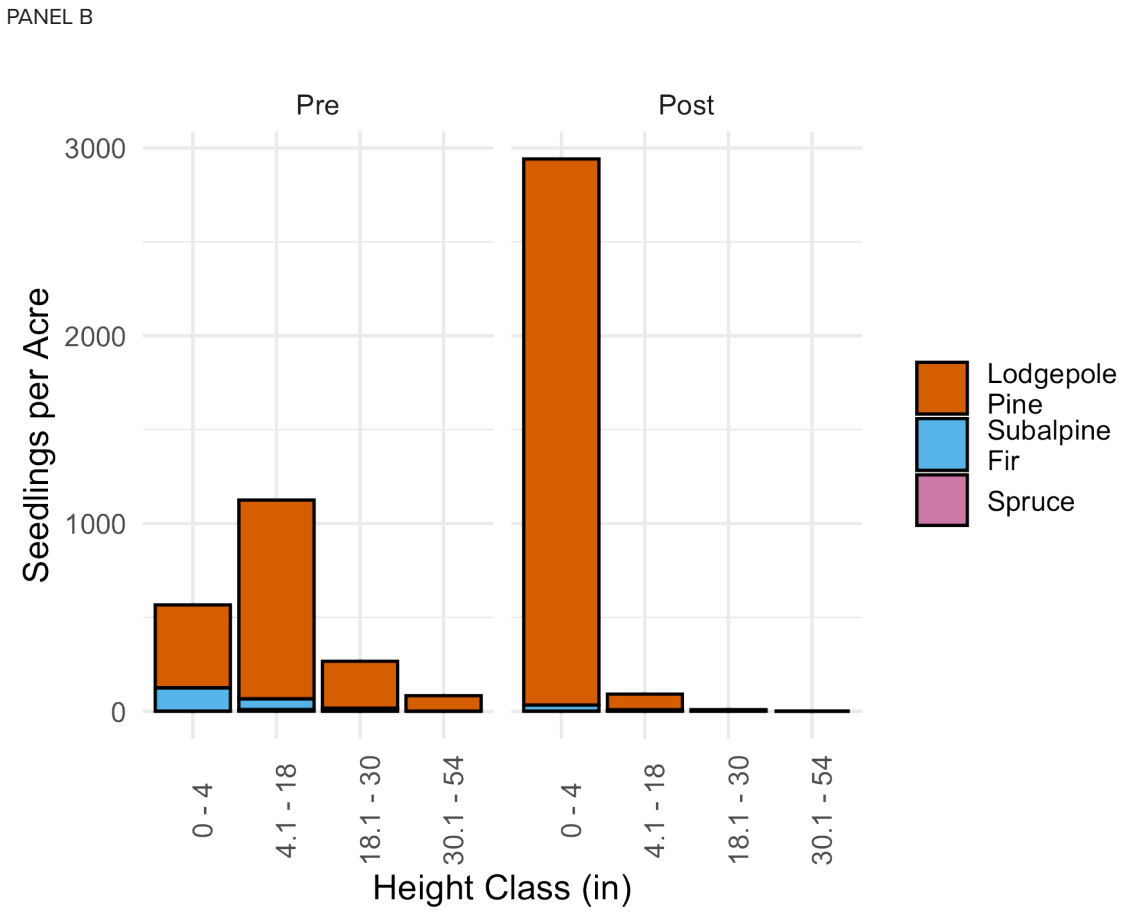


Figure 3. Panel A. Overstory trees and saplings per acre pre- and post-treatment by diameter class, species, and status. Note that the y-axis scale is different between pre- and post-treatment. Before treatment, across size classes 97% of the trees were lodgepole pine, 2% were spruce, and 1% were subalpine fir. After treatment, 69% of the trees were lodgepole pine, 19% were spruce, and 12% were subalpine fir.

Panel B. Number of seedlings per acre by species and height class. Note the increase in lodgepole germinants.

Fuels and Fire Behavior

Fine woody fuel loading significantly increased following treatment. Coarse woody fuel loading remained below the goal of 5-15 tons/acre. Predicted flame lengths under severe fire weather conditions decreased by 35 feet, but surviving tree basal area under moderate fire weather conditions also decreased following treatment. This is because with the taller overstory removed, the stand will not carry fire as effectively through tree crowns, but smaller trees and species with lower crowns remained on the site; these will be killed by less intense fires.

Table 3. Surface fuel conditions (mean ± standard deviation) before and after forest treatment. Asterisks (*) denote a statistically significant difference at an α=0.05 level.

Phase	Fine Woody Fuel Loading (tons/acre)	Coarse Woody Fuel Loading (tons/acre)	Litter Depth (in)	Duff Depth (in)	Shrub Cover (%)
Pre	* 1.9 (0.9)	3.0 (2.8)	* 0.4 (0.2)	* 1.1 (0.5)	* 5.8 (4.6)
Post	* 3.2 (1.4)	4.3 (2.7)	* 0.8 (0.4)	* 0.5 (0.2)	* 0.6 (1.0)

Table 4. To model the potential fire behavior before and after treatment, CFRI used field data with the Forest and Vegetation Simulator Fire and Fuels Extension (FFE-FVS). Surviving tree basal area under moderate fire weather conditions decreased following treatment because smaller trees and species with lower crowns remained on the site.

Phase	Pre		Post	
Fire Weather Conditions	Moderate	Severe	Moderate	Severe
Total Flame Length (feet)	1	49	2	14
Surviving Tree Basal Area (%)	25	1	10	2

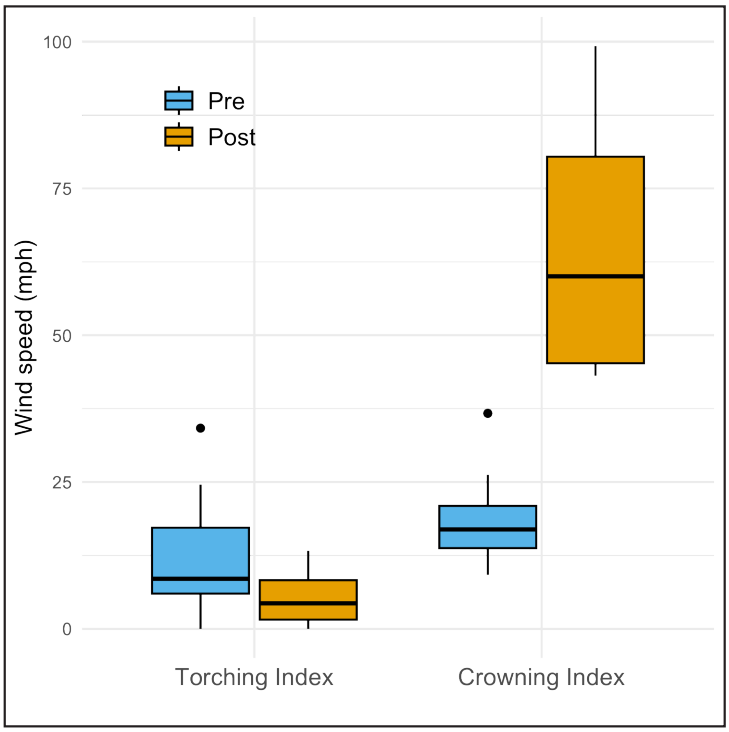


Figure 4. The figure shows the range of predicted windspeeds needed to initiate crown fire activity or torching (Torching Index), and to carry an active crown fire (Crowning Index). The decrease in Torching Index is due to smaller trees and species with lower crowns remaining on the site—a fire with lower flame lengths will still consume smaller trees. The large increase in Crowning Index is caused by the large spaces between remaining trees—fire cannot carry between tree crowns without higher windspeeds.

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