COLORADO FOREST RESTORATION INSTITUTE
COLORADO STATE UNIVERSITY

Ophir Monitoring Summary: 3 years post-treatment

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 understory plants. Data was collected from 12 treatment plots and 8 control plots before treatment and at 1- and 3-years 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, 2023
Forest Type	Lodgepole pine
Implementation Method	Non-sawtimber cutting and removal
Slash Treatment	Removal, lop and scatter residual

Highlights

Most of the forest canopy was removed by the treatment. The resulting openings triggered a large increase in lodgepole pine seedlings. Coarse woody fuels slightly increased between 1- and 3-years following treatment, meeting the goal of 5-15 tons/acre. Fine woody fuels and litter initially increased after treatment but were on a downward trend after 3 years. Understory vegetation cover and total number of species present decreased immediately following the treatment but exceeded the pre-treatment measurements after three years. The increase in understory percent cover was largely driven by an expansion of graminoid cover 3 years following treatment. Percent cover by non-native species remained low: 0.2% in the treated area and 0.1% in the control. Overall, the fuels reduction treatment at Ophir met objectives as measured 3 years after the treatment.

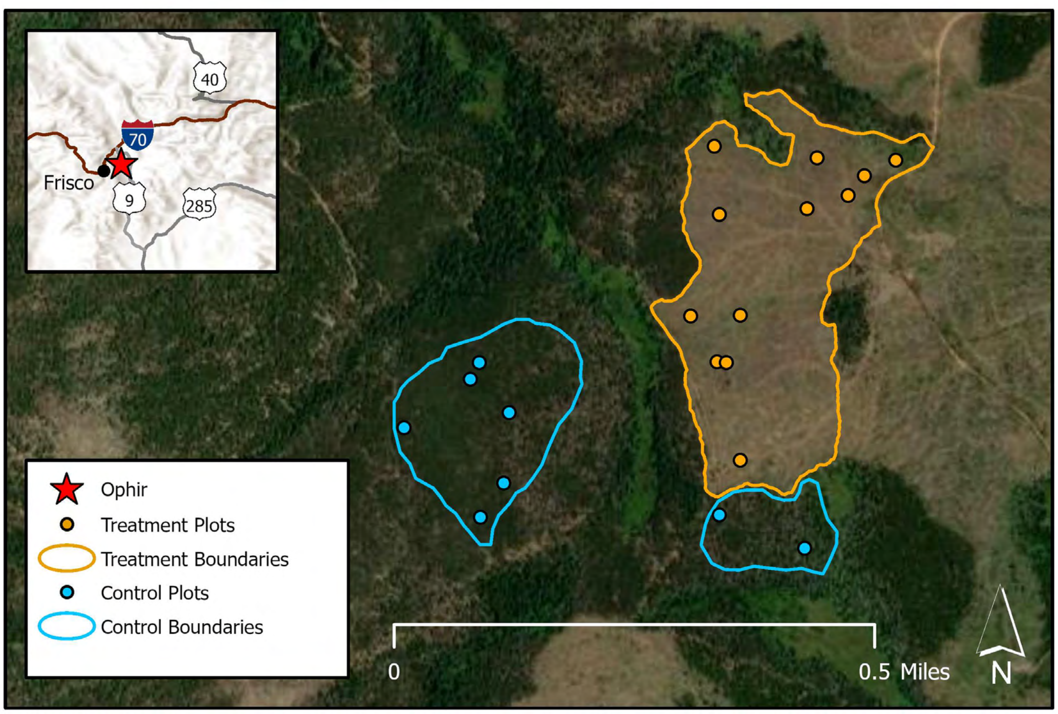

Figure 1. Map of the treatment and control units. 12 monitoring plots were randomly located within the treatment unit, and 8 monitoring plots were randomly located within the control units

Pre

1 year Post

3 year Post

Figure 2: Photo time series of two CFRI monitoring plots showing forest conditions pre-treatment (2018), large openings created 1 year post-treatment (2020), and seedlings mixed with understory vegetation 3 years post-treatment (2023)

Stand structure and composition

Methods: Trees were measured in 12 plots across the treatment area. Variable radius plots were used to capture trees with DBH equal to or greater than 5 inches, while seedlings and saplings were measured in a 1/100th acre subplot.

Results: Live trees were greatly reduced following the treatment and continued to decrease slightly over the next several years through a combination of blowdown and mortality (Table 2). Seedlings increased fourfold from pre- to 3 years post-treatment (Figure 3).

Table 2. Stand characteristics (mean ± standard deviation) before, 1 year post-treatment, and 3 years post-treatment. Asterisks (*) denote a statistically significant difference from pre-treatment at α=0.05 level.

Phase	Live Trees per Acre	Dead Trees per Acre	Live Basal Area (ft^2/ac)	Dead Basal Area (ft^2/ac)	Seedlings per Acre
Pre	1172 (876)	104 (50)	72 (38)	750 (445)	2,042 (4,286)
1 year Post	43* (57)	3* (7)	2* (4)	4* (12)	3,042 (3,948)
3 year Post	12* (31)	1* (3)	2* (7)	13* (45)	8,825* (8,825)

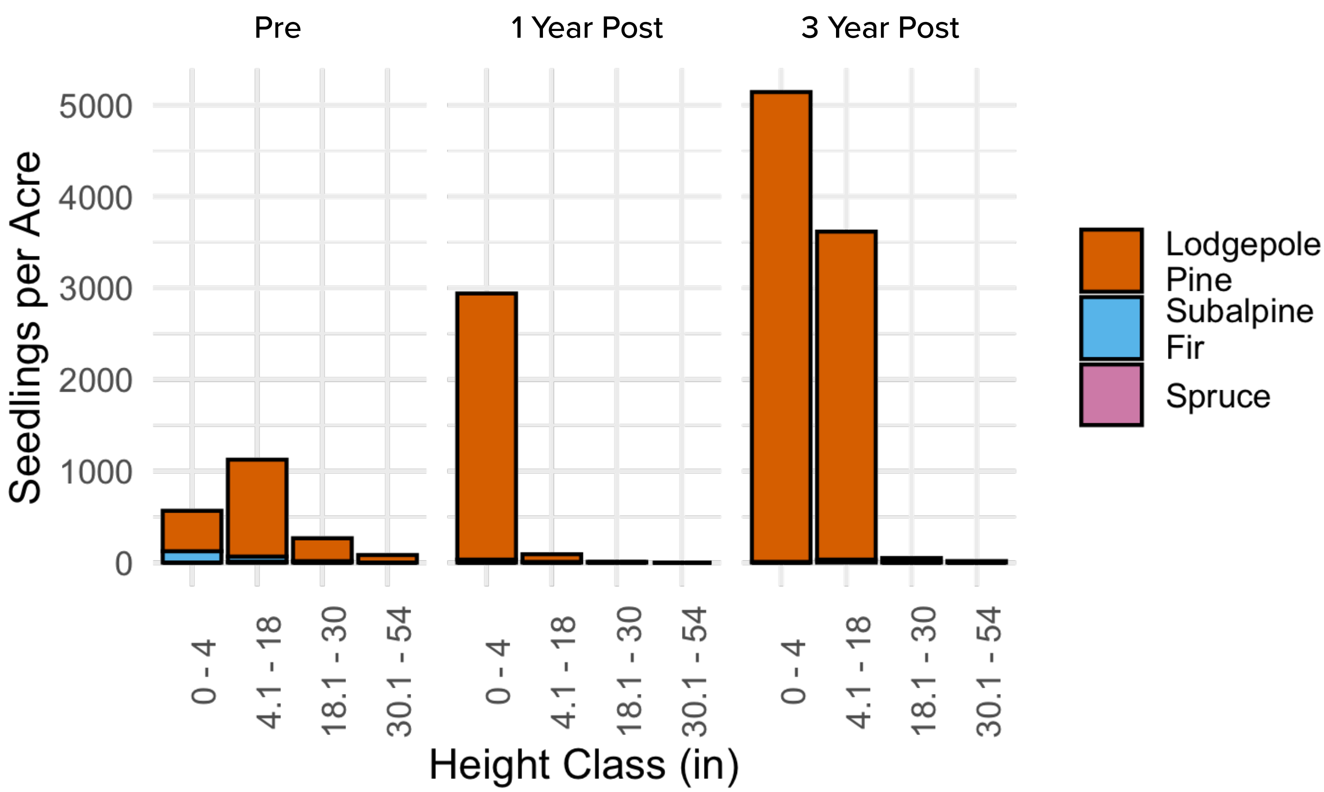

Figure 3: Seedling species and height class in treatment plots before, 1 year post-treatment, and 3 years post-treatment.

Fuels

Methods: Fine woody fuel loading was estimated using the photoload method in 3 quadrats per plot. Coarse woody fuel diameters and lengths were measured within a 1/100th acre subplot. Litter and duff depths were recorded at 12 locations within each plot. Shrub cover was calculated from 200 points along 8 transects at each plot.

Results: Fine woody fuel loading increased initially following the treatment but is trending downwards several years later (Table 3). Coarse woody fuel loading continued to increase over several years following the treatment due to blowdown (Table 3).

Table 3. Surface fuel conditions (mean ± standard deviation) before, 1 year post-treatment, and 3 years post-treatment. Asterisks (*) denote statistically significant difference from pre-treatment at 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)
1 Year Post	3.2* (1.4)	4.3 (2.7)	0.8* (0.4)	0.5* (0.2)	0.6* (1.0)
3 Year Post	2.4* (1.0)	5.4* (3.3)	0.5* (0.2)	0.7* (0.4)	1.4* (1.5)

Understory

Methods: Data was collected at 12 treatment plots and 8 control plots to assess the changes in understory species cover, richness, diversity, and native vs introduced status. At each plot, the line point intercept method was used along 8 transects for a total of 200 points. In addition, all species within a 1/10th acre plot were recorded to calculate species richness.

Results: In the treated area, understory vegetation percent cover decreased immediately following treatment but greatly increased after 3 years (Figure 4). This increase is largely driven by expanded cover of graminoids. Percent cover in the control did not change during the same time period. Species richness, or average number of species within a 1/10th acre plot, also remained stable in the control (Figure 5). In the treatment, a slight decrease in species richness immediately post-treatment was followed by a large increase after 3 years, a trend which was driven primarily by native species. Diversity in the control remained stable, while in the treated area there was an upward trend in the years following treatment (Figure 6).

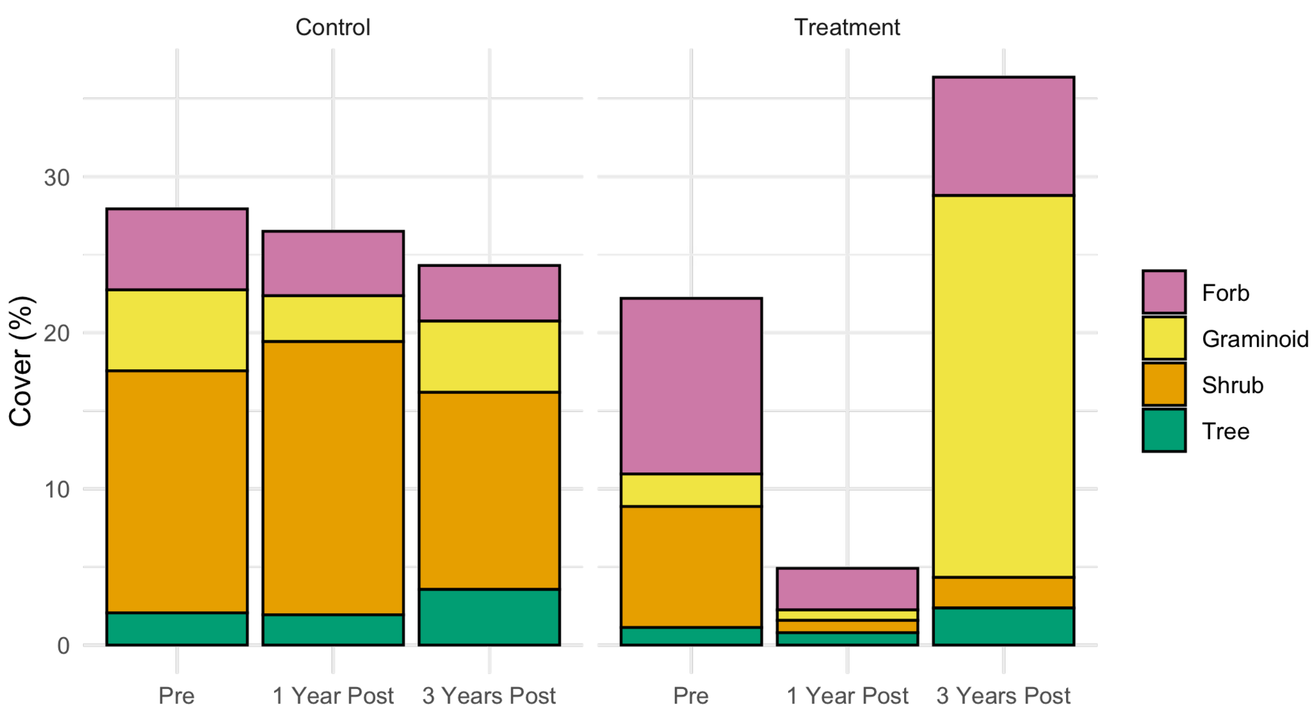

Figure 4. Percent total cover by growth form within the control and treatment units over time.

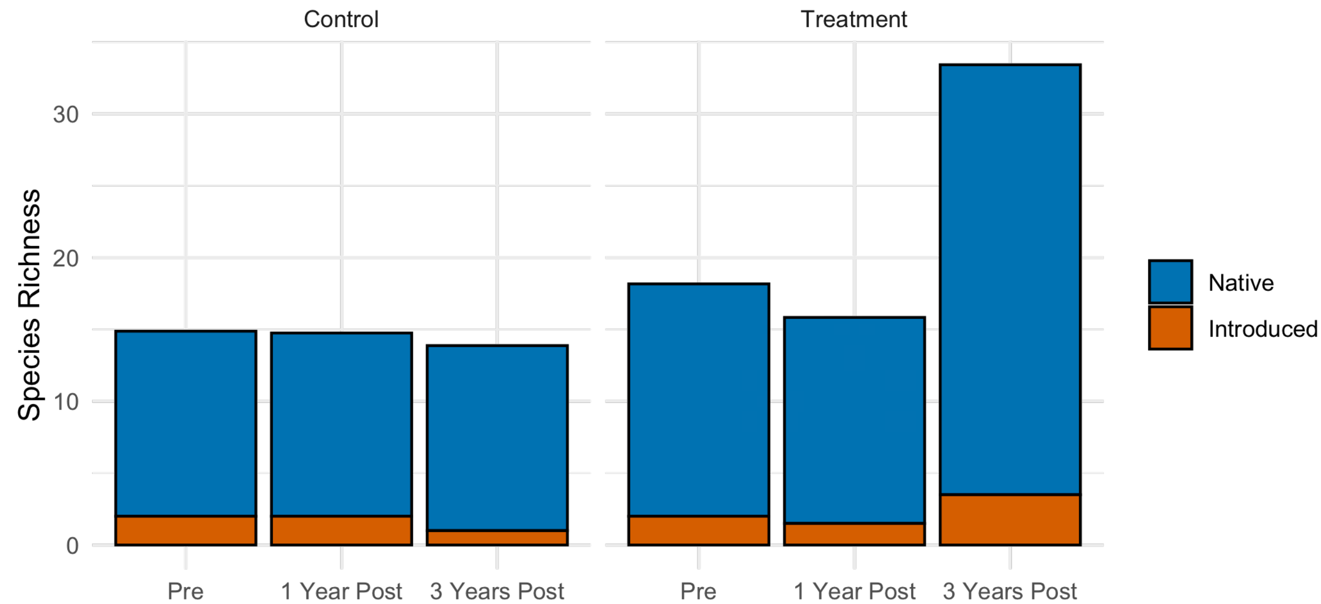

Figure 5. Plot average species richness by native status within the control and treatment units over time.

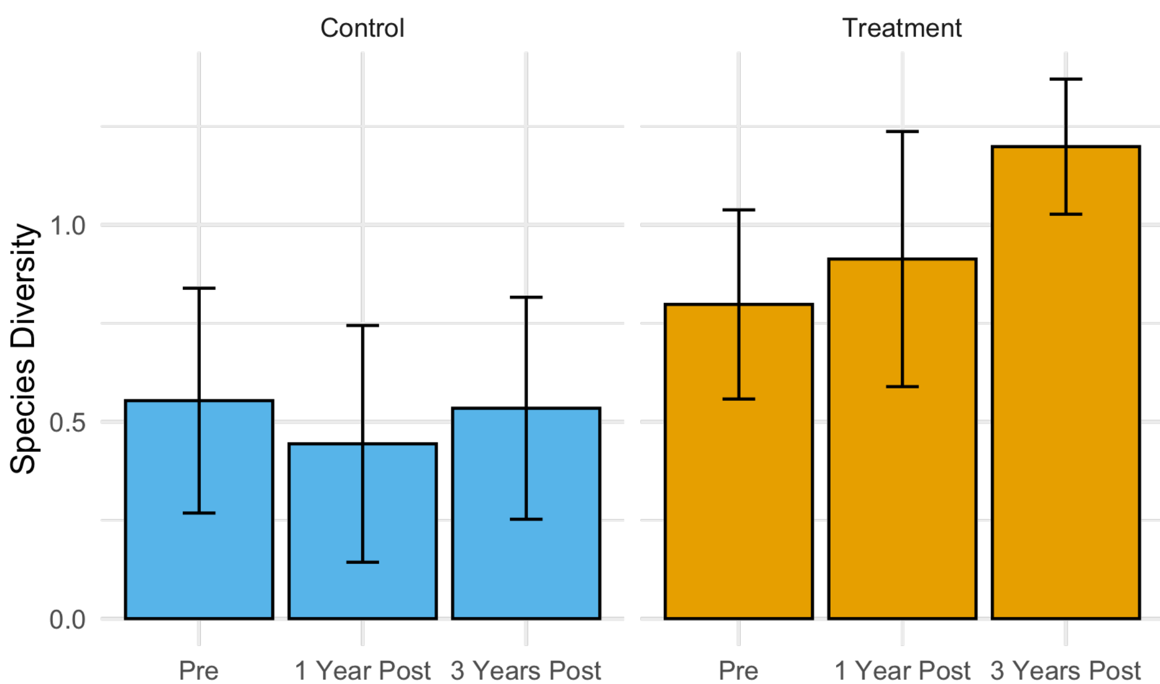

Figure 6. Plot average Shannon's diversity index in the control and treatment units over time.

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