



Silver Trident Prescribed Fire: Post-Burn Monitoring Summary

Project Overview

In September 2023, the Pikes Peak Ranger District conducted over 2,000 acres of broadcast burning as part of the Ensign Gulch and Trident Prescribed Fire Project. Approximately 1500 acres were previously thinned, and 660 acres were monitored and reported on by the Colorado Forest Restoration Institute (CFRI), including Silver Trident near Woodland Park, CO (Figure 1). Silver Trident is part of the larger Upper Monument Creek Landscape, where CFRI partners with Colorado Springs Utilities and the Pike San Isabel National Forests to collect long-term monitoring data to inform adaptive management. Management goals broadly aim to create a forest structure that supports desired fire on the landscape. [Monitoring after mechanical thinning](#) reported changes to forest structure and composition that promoted the future application of prescribed fire. However, the mechanical treatment did result in large increases in fine fuel loading along with high residual seedling regeneration. CFRI recommended the future use of prescribed fire to continue to promote desired conditions at Silver Trident.

Goals and Objectives

In addition to the broader goals and objectives outlined by the Front Range Collaborative Forest Restoration Program (FR-CFLRP), specific goals for Silver Trident Prescribed Fire Project included: (1) a 50-75% reduction in 1-, 10-, and 100-hour fuels, (2) the introduction of fire into at least 50% of burn unit acres, (3) limiting prescribed fire mortality to 15% or less in conifers greater than 12 inches DBH, and (4) reducing conifer regeneration and increasing average crown base height of mature conifers by at least 10%.

Data was collected pre- and post-mechanical treatment, and immediate post-prescribed fire data is reported here. Additional monitoring of 1-, 5-, and 10-year post-burn will further inform adaptive management and future forest management related to longer term outcomes.

Methods

16 plots were established for pre- and post-treatment monitoring at Silver Trident, 10 of which burned and are reported on here (Figure 1). Plots were originally stratified into dry vs wet slopes. However, since only one wet plot experienced fire, all burned plots are lumped to the project level for analysis. Fire effects on the forest floor were classified at each burned plot from 12 subplots within a 1/10th acre area.

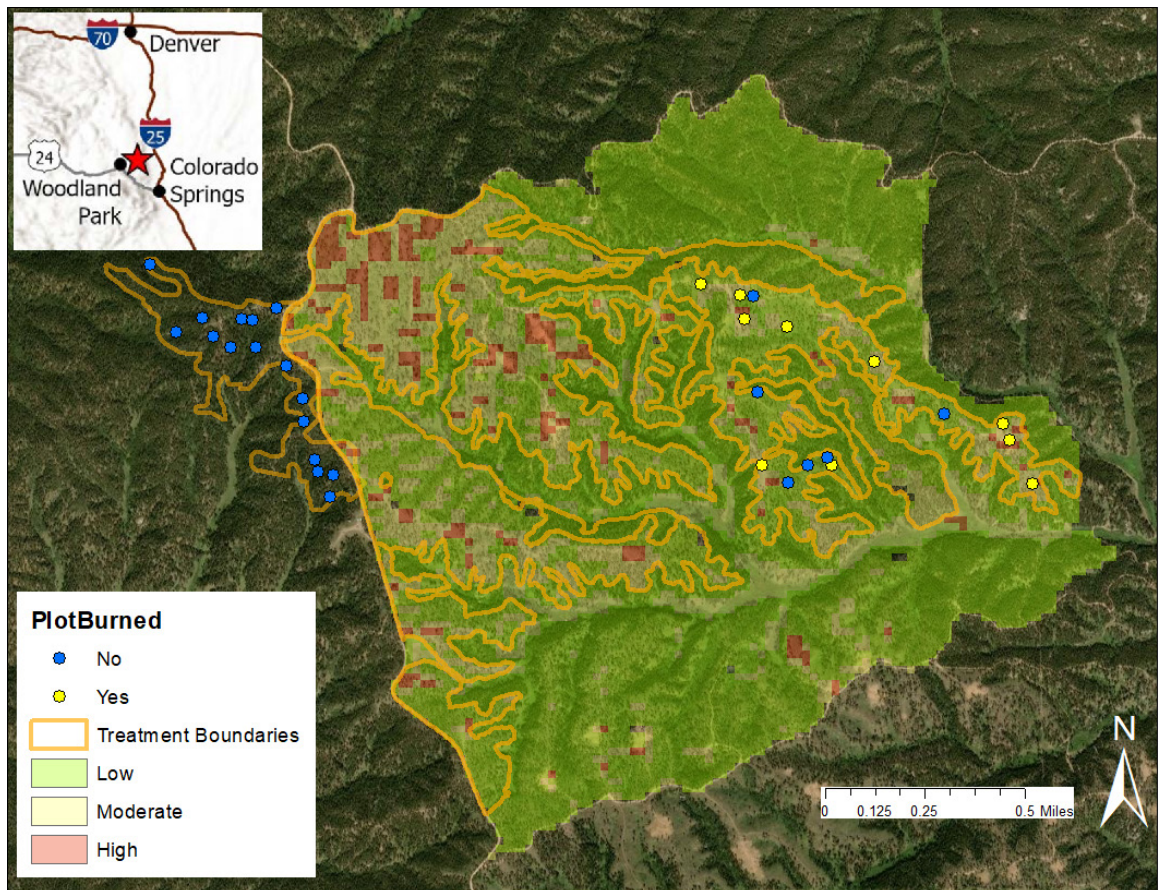


Figure 1. Burn Severity map of Silver Trident's location, unit boundaries, and monitoring plots. Plots that burned were located in largely low-moderate severity burn areas on the east side of the project, while the western side of the project area experienced more high severity fire. Control plots are on the far western edge of the project, and are not reported on here.

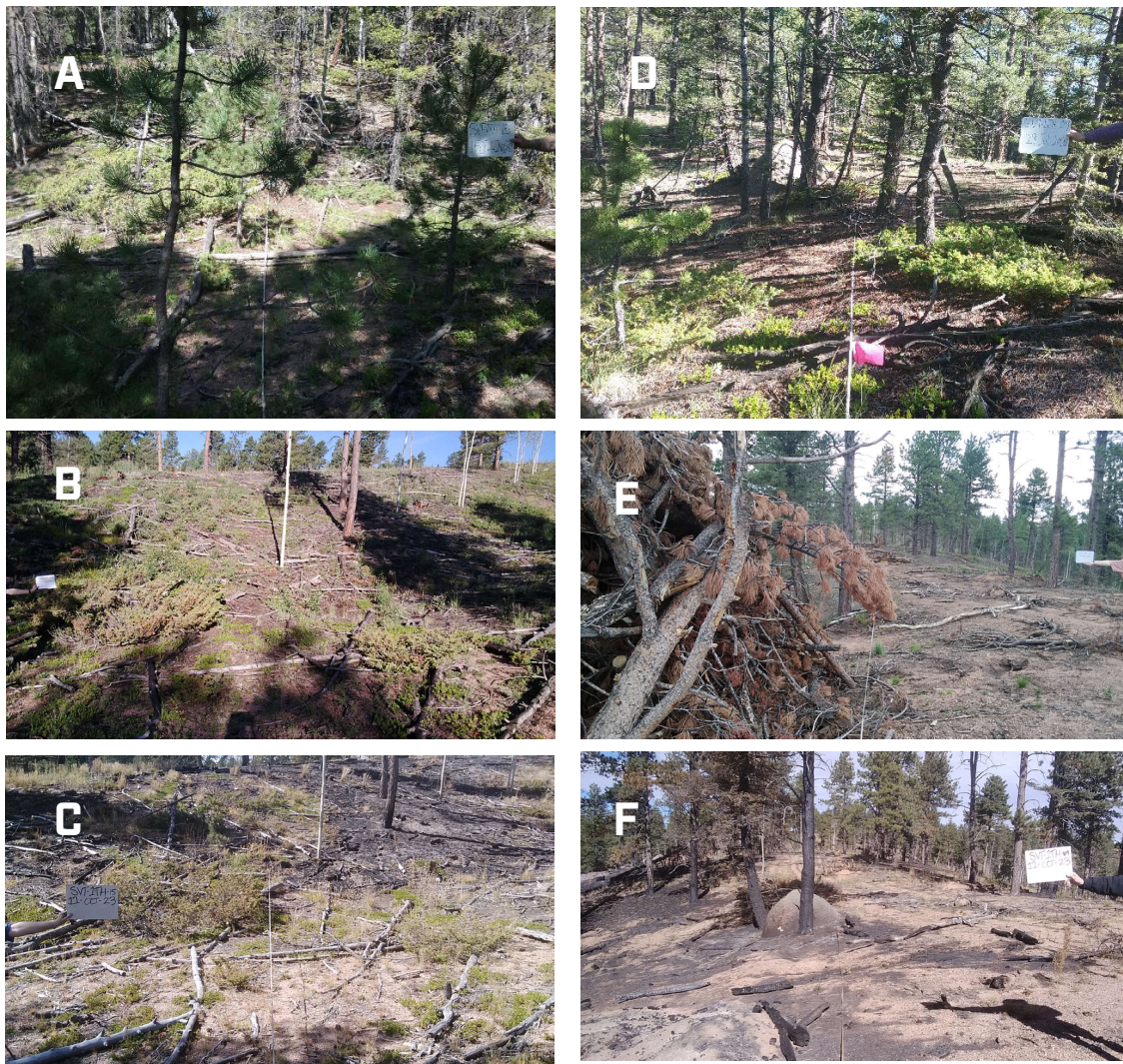


Figure 2. Pre- and post-treatment photos showing the variability in fuel consumption. A-C show low fuel consumption for pre-mechanical (A), post-mechanical (B), and post prescribed fire (C). D-F show high fuel consumption for pre-mechanical (D), post-mechanical (E), and post prescribed fire (F).

Highlights and Conclusions

Prescribed fire in Silver Trident met most treatment goals and objectives; however, the fire was patchy, leaving many areas unburned. 63% of plots experienced some effect of prescribed fire; however, only 3 plots (19%) were more than 50% burned (Figure 3). This indicates high variability in burn coverage across the project. Additionally, 36% of the burn severity subplots were unvegetated during the burn, and 17% of the vegetation burned, with a relatively even distribution of scorched to high severity (Figure 4A). In the 10 plots that burned, only 42% of the substrate (litter and duff) burned, most of which burned at light to moderate severity Figure 4B).

Litter and duff loadings remained relatively unchanged post-burn, and there was no statistically significant difference between pre- and post-mechanical, and post-burn conditions (Figure 5A). Fine woody fuel loading was reduced and returned to pre-mechanical treatment levels for 1-, 10, and 100-hr fuels after prescribed fire. 1-hr fuels declined by 59%, resembling pre-treatment conditions, although this reduction was not statistically significant. 10-hr fuels were reduced 56%, which was a statistically significant reduction back to pre-treatment

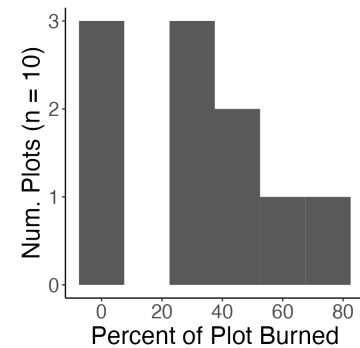


Figure 3. Burned area distribution of the 10 plots that experienced fire. Area burned for each plot ranged from 1 – 82%, with 3 plots having greater than 50% area burned, and an average of 34% of the plot burned.

conditions. Similarly, 100-hr fuels were reduced 55%, which was also a statistically significant reduction back to pre-treatment conditions (Figure 5B).

Crown volume scorch, max scorch height and stem char height for trees was highly variable within burned plots, with crown volume scorch ranging from 0-55%, max scorch height from 0-40 feet, and stem char height from 0-29 feet. Despite this variability, average crown volume scorch was low (Table

1), and we anticipate tree mortality to be very low to none. Very few saplings (n=10) were recorded within plots, and we did not detect evidence of fire on saplings within burned plots.

Overall, prescribed fire met most treatment goals and objectives. Although we did not measure regeneration or changes in crown base height as part of our immediate post prescribed fire effects protocol, subsequent measurements will address these treatment outcomes in future reports. Immediate post prescribed fire results show fine woody fuels were reduced within target reduction levels, and we anticipate very low to no tree mortality resulting from prescribed fire. Even though the majority of plots experienced some fire effects, the average area burned within those plots was 34%, below the target burn objective of 50% of burn unit acres. Despite missing the target burn area in the units that CFRI monitored, burn severity mapping (Figure 1) indicates that monitored units generally burned at lower severity than

units further west in the Silver Trident project area, and monitoring those units may have resulted in a greater area burned within the project. Regardless, the Ensign Gulch and Trident prescribed fire contributed to a heterogenous burn pattern with significant reductions of activity fuels resulting from the previous mechanical treatment, addressing previous recommendations from CFRI's post-mechanical monitoring efforts.

Table 1. Average percent of crown volume scorched and the average max scorch and stem char height (feet). Standard deviation is in parentheses.

	Crown Volume Scorched (%)	Max Scorch Height (ft)	Stem Char Height (ft)
Trees	9 (19)	8 (14)	5 (7)

* Trees are defined as >5in DBH

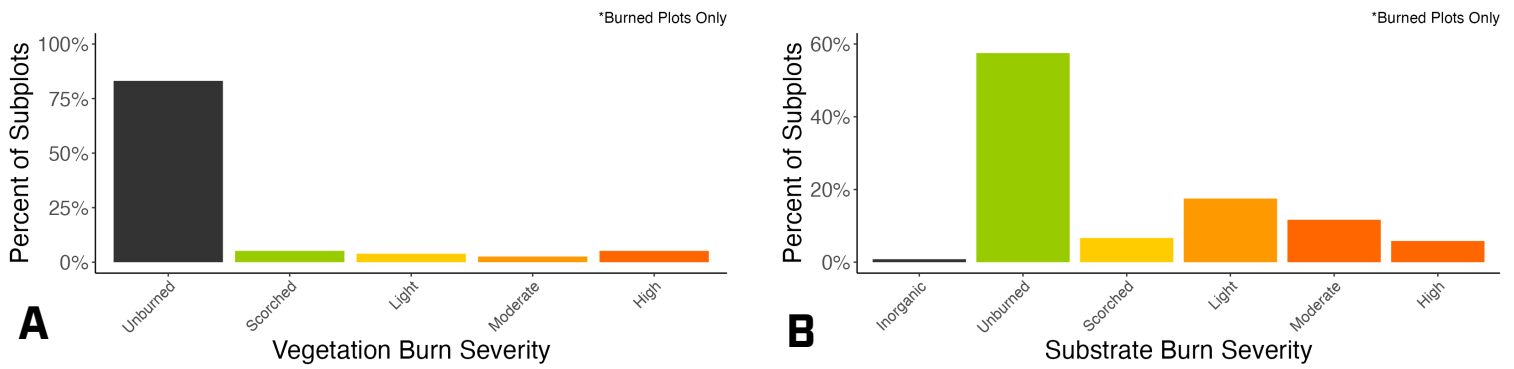


Figure 4. Vegetation burn severity (A) and nonvegetative substrates (B). See the USDI National Park Service Fire Monitoring Handbook for detailed descriptions of each burn severity class.

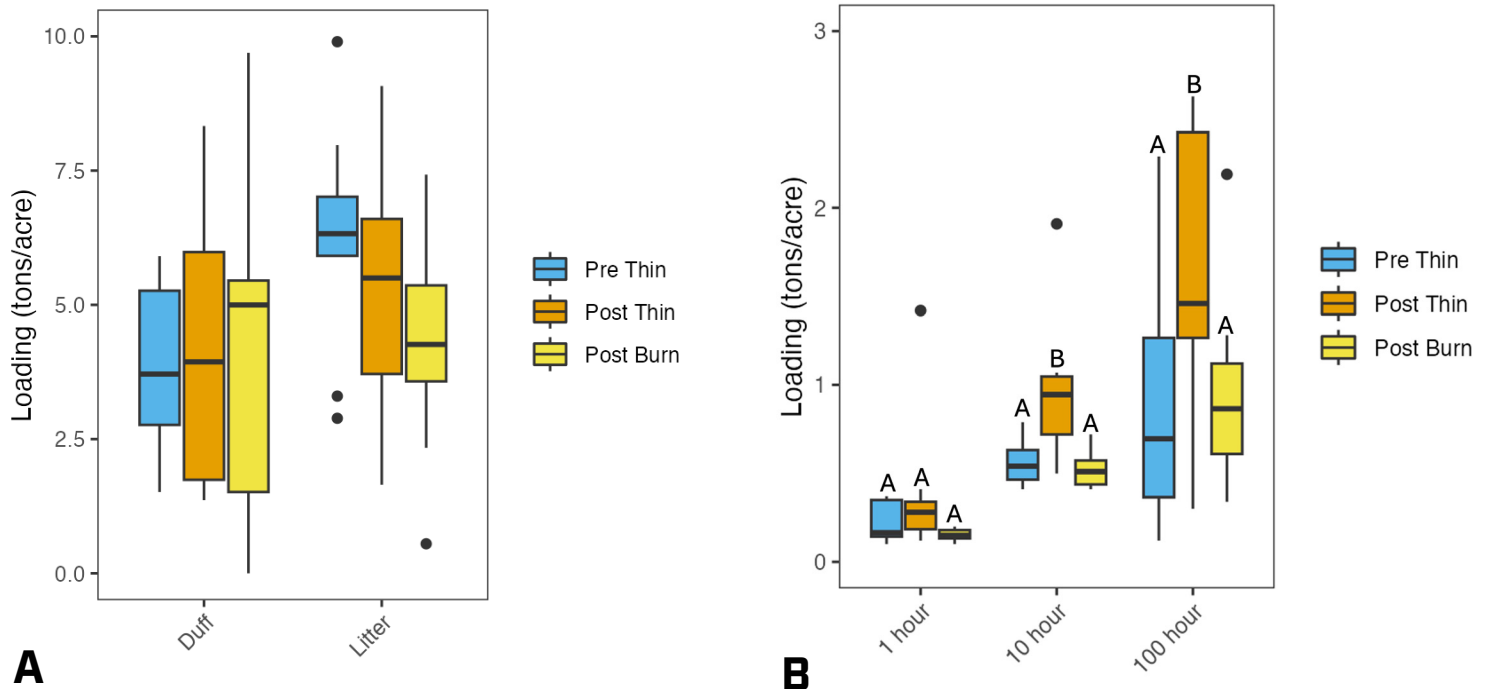


Figure 5. Litter and duff surface fuel loadings (A) and fine woody fuel loading (B). Letters above boxplots show statistically significant differences in fine woody fuel loadings at an $\alpha = 0.05$ level.