COLORADO FOREST RESTORATION INSTITUTE
COLORADO STATE UNIVERSITY

Monument Fire Center Prescribed Fire:

1-Year Post-Burn Addendum

Introduction

In 2023, the Pikes Peak Ranger District implemented a thinning and mastication treatment, followed by roughly 650 acres of broadcast burning in 2024 in the North and Nursery Units at the Monument Fire Center (MFC). The Colorado Forest Restoration Institute (CFRI) monitored and reported on initial post-mechanical results in 2024 and immediate post prescribed fire results in 2025. Results from post-mechanical treatment monitoring showed substantial changes to forest structure and composition. Tree density was reduced by 98% following initial treatment, to 98 trees per acre, and proportion of ponderosa pine in the overstory (> DBH) increased from 67% to 98%, largely due to a reduction in small diameter (0–5 inch DBH) Gambel oak. However, despite a large reduction in Gambel oak tree density and shrub cover, we reported a substantial increase in oak regeneration following the initial mastication treatment – with increases in resprouts and seedlings from 7,741 to 21,110 stems/acre. In June 2024, prescribed fire was implemented to manage the Gambel oak sprouting response and reduce activity fuels associated with the mechanical treatment. Results from immediate post-burn monitoring showed that the burn met objectives related to fine fuel loadings – reducing fine fuel loads more than 50% while introducing fire to over 70% of the fire area.

Figure 1. Photos of (A) immediate post-burn and (B) 1-year post-burn highlighting oak recovery as well as understory forb and grass response to the prescribed fire, 1-year after treatment.

Gambel oak was not measured as part of CFRI's immediate post-burn monitoring, but was measured 1-year post-burn, and results related to Gambel oak response and fine fuel accumulation are presented in this addendum. Additional objectives of the prescribed fire, that were not monitored previously included: increasing crown base heights (CBH) of conifers, reducing conifer regeneration, and limiting ponderosa pine mortality to less than 35%. These metrics are also included in this addendum.

Results

One-year post-burn CBH was 116% higher relative to pre-treatment conditions (6.2 feet, $p < 0.01$). However, relative to post-mastication the burn resulted in a 13% increase in average tree CBH (Table 1), from 11.9 to 13.4 feet, and this result was not statistically significant ($p = 0.57$). Additionally, the burn resulted in variable mortality rates, from 0-50% with a mean of 6.2% across monitored plots, with a loss of only 3 ponderosa pine stems per acre and 23 total stems per acre, on average (Table 1).

Seedlings increased significantly following mastication, from an average of 7,741 to 21,100 stems per acre, ($p < 0.01$) (Table 1), yet the prescribed fire resulted in only a 7% (non-significant, $p = 0.87$) reduction in seedlings per acre, leaving on average 19,660 stems per acre post-burn. Figure 2 shows the dramatic increase in seedlings per acre resulting from mastication, particularly in the 4.1 – 18 inch size class, and minimal reduction in stems per acre post-burn. Additionally, post-mastication and post-burn monitoring revealed no ponderosa pine or Douglas-fir regeneration, indicating that stem counts were entirely comprised of oak stems. Despite an initial reduction in oak shrub cover following mastication, post-burn oak cover was approaching similar levels to pre-treatment conditions following the burn (Figure 3, 12% pre-treatment vs 10% post-burn). Finally, oak shrub height (Figure 4) remained low after the prescribed fire (20 inches), which was largely unchanged from post-mastication conditions (17 inches, $p < 0.01$).

Table 1. Ponderosa pine density (> DBH) and CBH (mean ± standard deviation). Superscripts indicate statistically distinct groupings at the α=0.05.

Phase	Trees per Acre	Ponderosa Pine Trees per Acre	Crown Base Height (ft)*	Seedlings per Acre
Pre-treatment	2552 ± 2235^{a}	236 ± 342^{a}	6.2 ± 3.7^{a}	7741 ± 5821^{a}
Post-mastication	98 ± 155^{b}	53 ± 61^{b}	11.9 ± 5.0^{b}	21110 ± 22450^{b}
1-year Post-burn	75 ± 83^{b}	50 ± 53^{b}	13.4 ± 6.6^{b}	19660 ± 19879^{b}

* Small discrepancies in crown base height relative to the previous report are attributable to the inclusion of additional trees that were measured by field crews during the most recent survey, which were not captured in the earlier dataset.

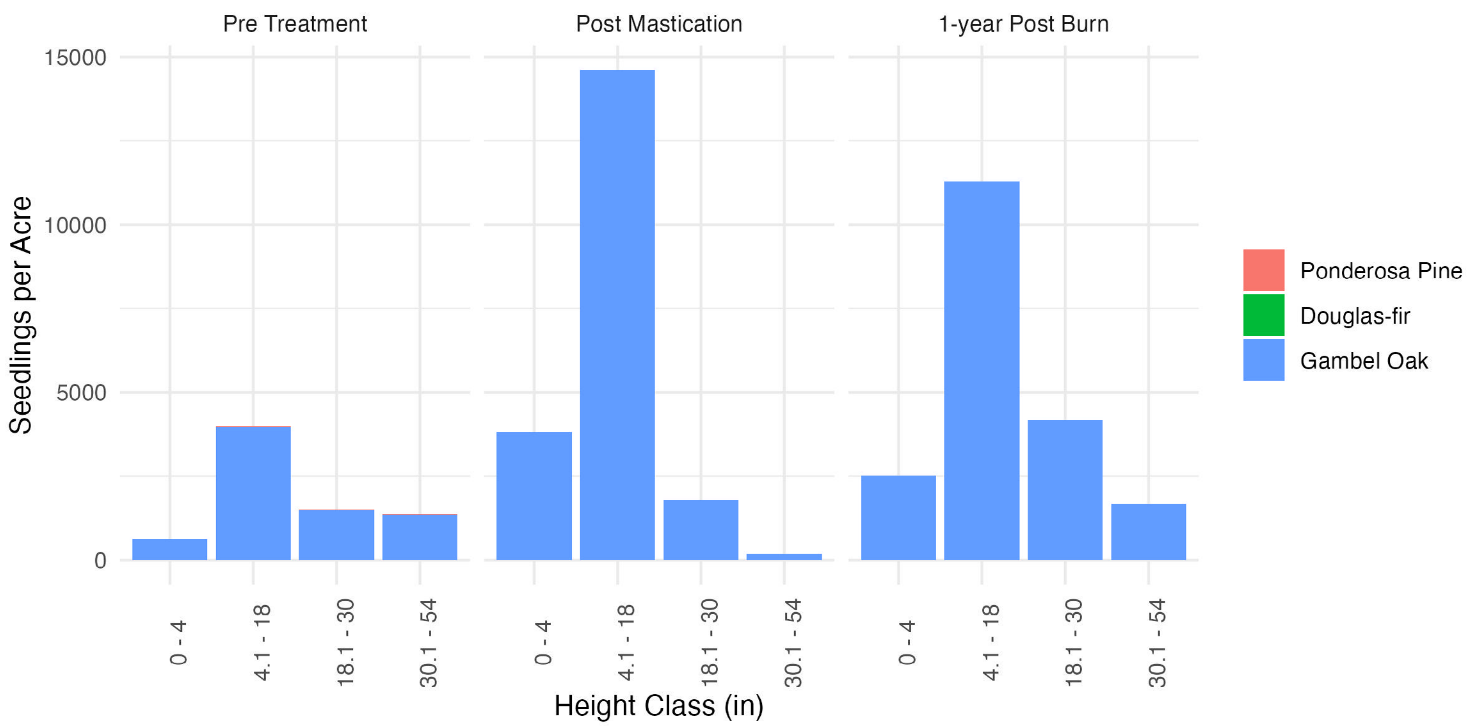

Figure 2. Seedling density by size class.

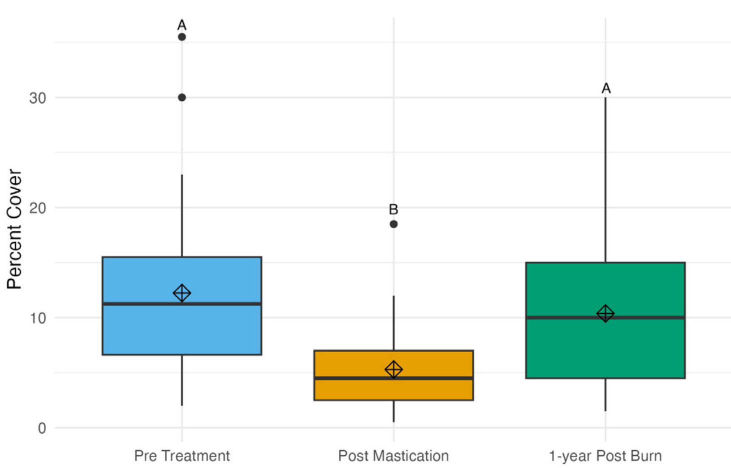

Figure 3. Oak shrub cover. Letters above the boxplots indicate statistically significant differences at the α=0.05.

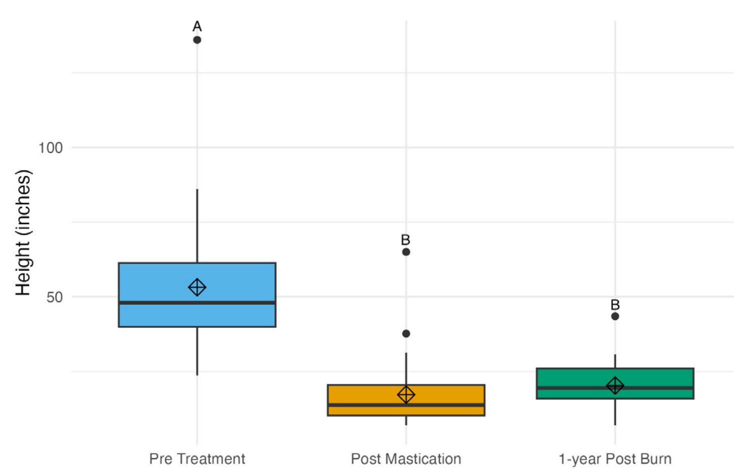

Figure 4. Shrub height. Letters above the boxplots indicate statistically significant differences at the α=0.05.

Fuels remained low relative to pre-treatment conditions (Figure 5A and 5B). Duff loadings were reduced after the prescribed fire and remained unchanged 1-year following the burn. Similarly, litter loadings were also reduced immediately after the prescribed fire and showed no significant change 1-year post-burn. Fine fuel loadings also followed a similar trajectory. Loadings for 1-, 10-, and 100-hour fuels reached their highest levels after mastication, were reduced to pre-treatment levels after the prescribed fire, and showed no significant change 1-year post-burn.

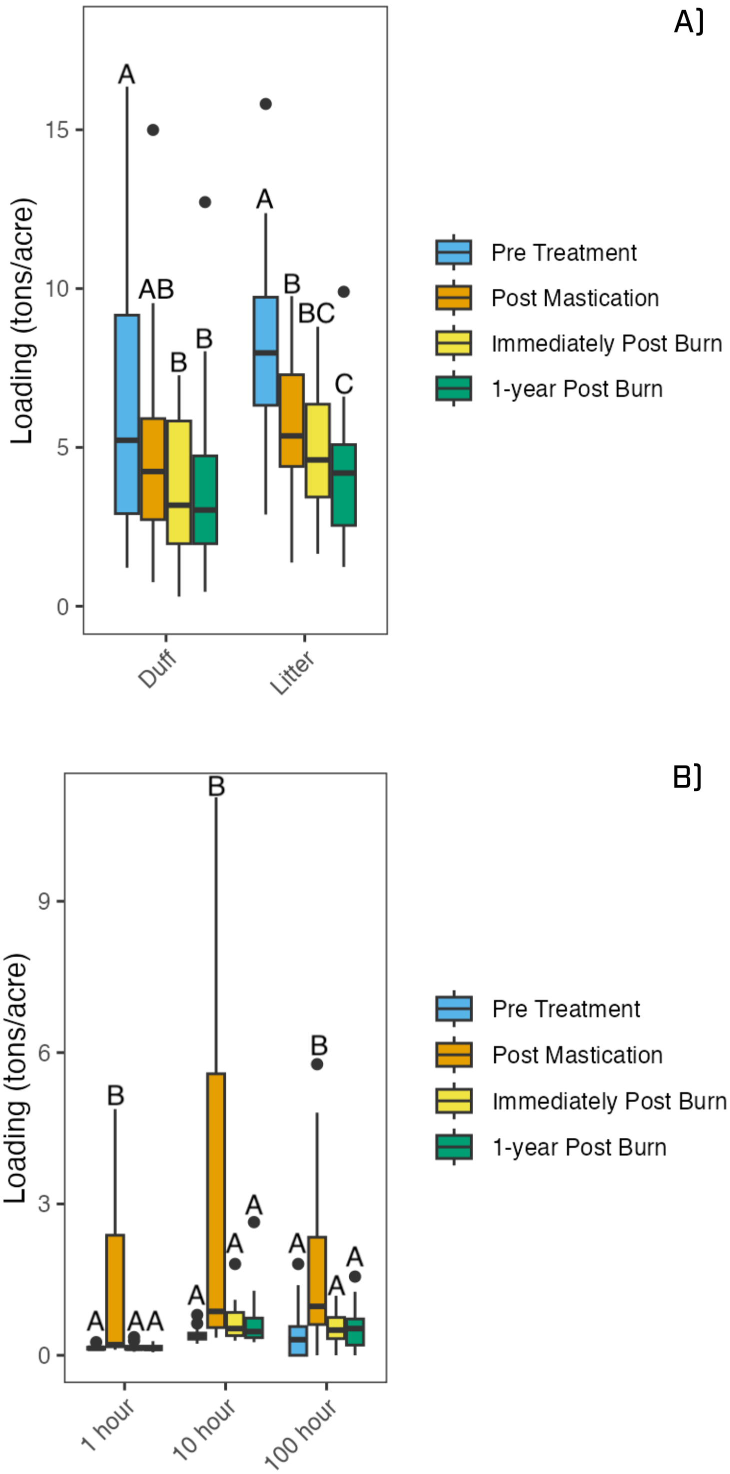

Figure 5. Litter and duff (A) and fine woody fuel loading (B). Letters above the boxplots indicate statistically significant differences in fuel loadings at the α = 0.05 level.

Conclusions

1-year post-burn monitoring shows that the prescribed fire met many of the project objectives; however, managing Gambel oak response to forest management remains challenging. Although CBH was not significantly altered resulting from the burn, we did observe about a 1.5 ft mean increase in CBH following the burn, and CBH remained significantly higher than pre-treatment conditions. The prescribed fire also reduced fine fuels to pre-treatment conditions, and fuels remained well below post-mechanical conditions. We also only observed a mean 6.2% mortality rate of ponderosa pine resulting from the burn, well below the maximum acceptable mortality of 35%.

Although conifer regeneration remained very low throughout the project area, Gambel oak regeneration was challenging to manage via prescribed fire. Thinning and mastication initially resulted in a substantial increase in Gambel oak seedling stems per acre, and subsequent prescribed fire was relatively ineffective at reducing stems per acre. Additionally, while mastication resulted in an initial reduction in shrub cover, we observed shrub cover approaching pre-treatment levels 1-year following the prescribed fire. Shrub height 1-year post-burn remained significantly lower than pre-treatment conditions, though trends in shrub cover and seedling density suggest a trajectory toward taller shrub cover without additional management. Overall, the prescribed fire was successful at meeting many objectives but continued burn entries are warranted if Gambel oak continues to be of management concern. Additionally, the MFC continues to be an extremely valuable case study for evaluating the response of Gambel oak to multiple treatment entries and intensive management into the future.

Author: Kevin J. Barrett Contact: Kevin.J.Barrett@colostate.edu

cfri.colostate.edu February 2026 • CFRI-2604

COLORADO FOREST RESTORATION INSTITUTE
COLORADO STATE UNIVERSITY

Thank you to the many field technicians and crew leaders who collected data for this project. Thank you to Andrew Slack, Caden Chamberlain, and Camille Stevens-Rumann for document review, and Karissa Courtney for document layout. This report was generously funded by the Arapaho Roosevelt and Pike San Isabel National Forests, as well as Colorado Springs Utilities and the USFS Rocky Mountain Region.