



Payne Gulch Prescribed Fire: Post-Burn Monitoring Summary

Overview

In October of 2023, the South Platte Ranger District of the Pike National Forest completed roughly 450 acres of broadcast burning within the Payne Gulch Project Area (Figure 1, Figure 3, Table 1). The project area is dominated by ponderosa pine and was initially thinned in 2017 to restore an open and heterogeneous forest structure that promotes wildlife habitat, forest resiliency to subsequent disturbances, and the future use of prescribed fire ([Slack et al. 2021](#)). Furthermore, the project is strategically located to mitigate the impacts of wildfire to the town of Bailey, the Highway 285 corridor, and the North Fork of the South Platte River. The combination of forest thinning followed by broadcast burning has been shown to be the most effective management action to reduce the intensity and severity of future wildfires ([Davis et al. 2024](#)). This can improve firefighter safety and successful wildfire response, and mitigate wildfire impacts to homes, infrastructure, and water resources. Additionally, restoring a lower severity fire regime to maintain open ponderosa pine stands can help establish fire refugia and promote forest resiliency to climate change by limiting overstory mortality and supporting post-fire tree recruitment ([Rodman et al. 2023](#)). This post-burn monitoring summary presents data on changes in surface fuel conditions and immediate post-fire effects for units burned in 2023. The implementation of broadcast burning in Payne Gulch is ongoing and this summary only covers a portion of the larger project area.



Figure 1. Photo of the Payne Gulch prescribed fire actively burning in October of 2023. Photo taken by James Pilsmaker.

Goals & Objectives

- 1) Create sustainable forest conditions that are resilient to disturbance, while providing diverse wildlife habitat and recreation opportunities.
- 2) Reduce wildfire hazard near the town of Bailey.
- 3) Reintroduce fire and restore historical fire regimes.
- 4) Maintain firefighter and public safety.
- 5) Introduce fire to 75% of surface fuels (e.g. flammable grasses, 1-100-hr woody fuels).
- 6) Achieve 6-foot scorch heights.

Table 1. Project Information

Implementation Agency	Pike San Isabel National Forest, South Platte Ranger District
Ownership	U.S. Forest Service
Funding	Forests to Faucets
Forest Type	Ponderosa Pine
Year Completed	2023
Implementation Method	Mechanical thinning (2017); Prescribed fire (2023)
Acres Treated	545 (2017); 450 (2023)
Acres Monitored	75 (2016-2021); 33 (2023)
Years Monitored	2016 (pre-thin), 2018 (post-thin), 2021 (pre-burn), 2023 (post-burn)

Methods

The Colorado Forest Restoration Institute (CFRI) partners with the Pike National Forest and Denver Water to collect monitoring data at permanently established plots to evaluate the long-term outcomes of forest management in the Payne Gulch Project Area. Field data was collected pre- and post-thinning (2016, 2018), and pre- and post-prescribed fire (2021, 2023; Figure 2) to monitor changes in forest overstory, tree regeneration, surface fuels, and understory plant communities.



Figure 2. Photo time series of a CFRI monitoring plot showing conditions prior to forest thinning (A, 2016), reduced tree density after thinning (B, 2018), surface vegetation growth before prescribed fire (C, 2021), and patchy surface fuel consumption after prescribed fire (D, 2023).

Field data was collected at 10 plots established within one of the Payne Gulch burn units southwest of Bailey, Colorado (Figure 3). Fire effects on the forest floor were classified in 12 subplots within a 1/10th acre area at each plot (120 total). A detailed description of our field data collection methods can be found in the Post-Wildfire Mothership Plot Protocol and Immediate Post-Burn Simple Plot Protocol (CFRI 2022, CFRI 2020). In the future, monitoring crews will visit plots 1- and 5-years post-burn to collect additional data.

Highlights

The Payne Gulch prescribed fire successfully reintroduced fire to the project area and contributed to further reductions in fire hazard. However, the area burned was highly variable, and within monitoring plots burn severity was low. Fire was observed in 10 out of 12 monitoring plots, but plots were located in an area that experienced relatively low burn severity and higher severity areas of the burn were not represented in the data (Figure 3). In the future, to effectively capture the variability in broadcast burning additional monitoring plots may be required.

Within the 10 plots that experienced fire, 16.5% of burnable substrate (i.e. dead surface fuels) and 13.6% of live vegetation burned. When surface fuels did burn only scorching and lightly burned severity classes were recorded indicating an overall low burn severity on the forest floor (Figure 4). Broadcast burning did not significantly impact surface fuel loading, and fine woody fuels, litter, and duff remain near or slightly lower than the loading recorded prior to thinning and burning (Figure 5). Crown scorch was recorded in 2 out of 37 overstory trees, and 1 out of 13 saplings within monitoring plots that experienced some amount of fire (all Douglas-fir). Crown scorch did reach a minimum height of 10 feet on sampled trees and saplings, and little tree mortality is expected following broadcast burning.

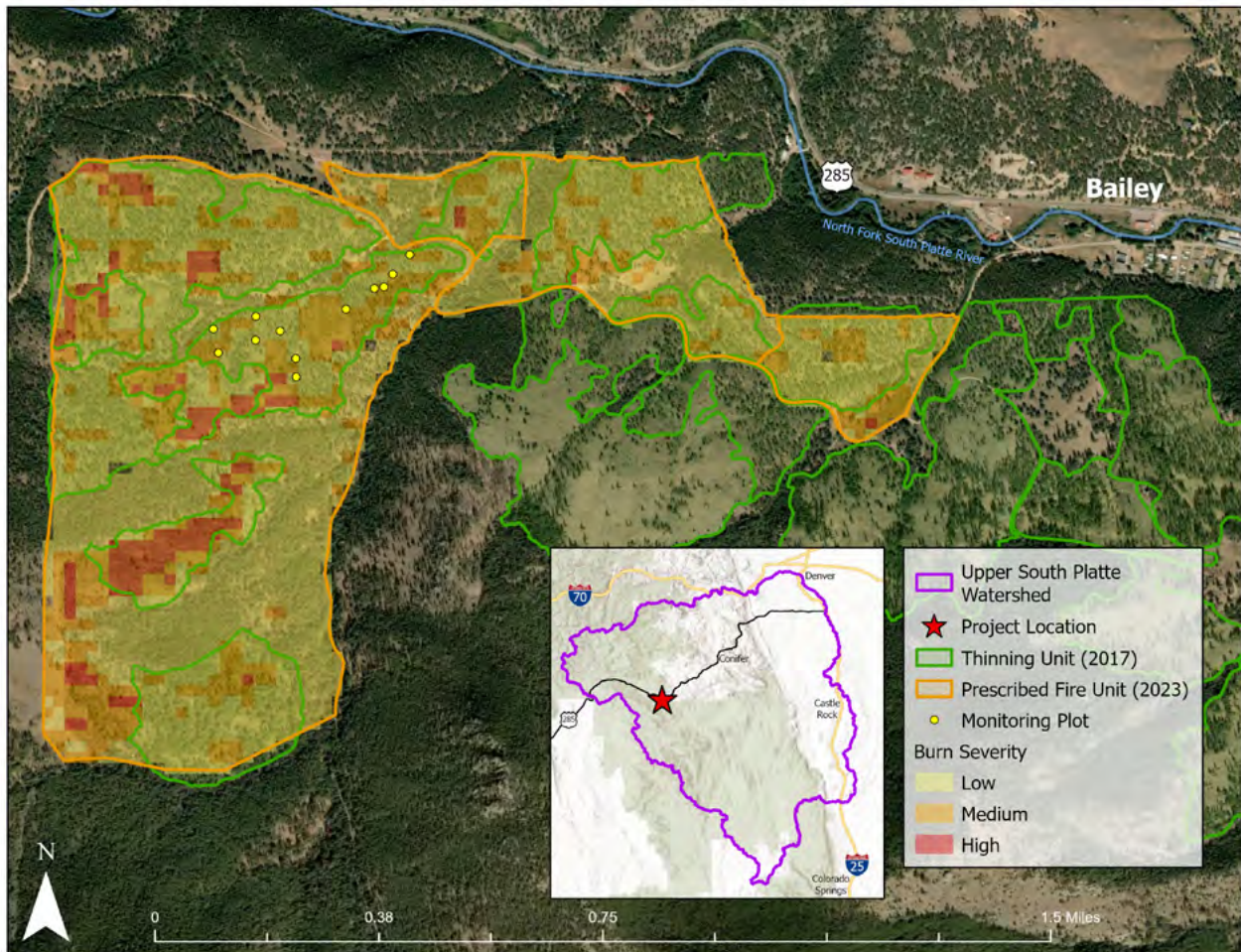


Figure 3. Map of Payne Gulch prescribed fire project area, located near the town of Bailey in the Upper South Platte watershed. The burn severity map was calculated using aerial imagery to determine the difference in Normalized Burn Ratio (dNBR; [Key and Benson 2006](#)).

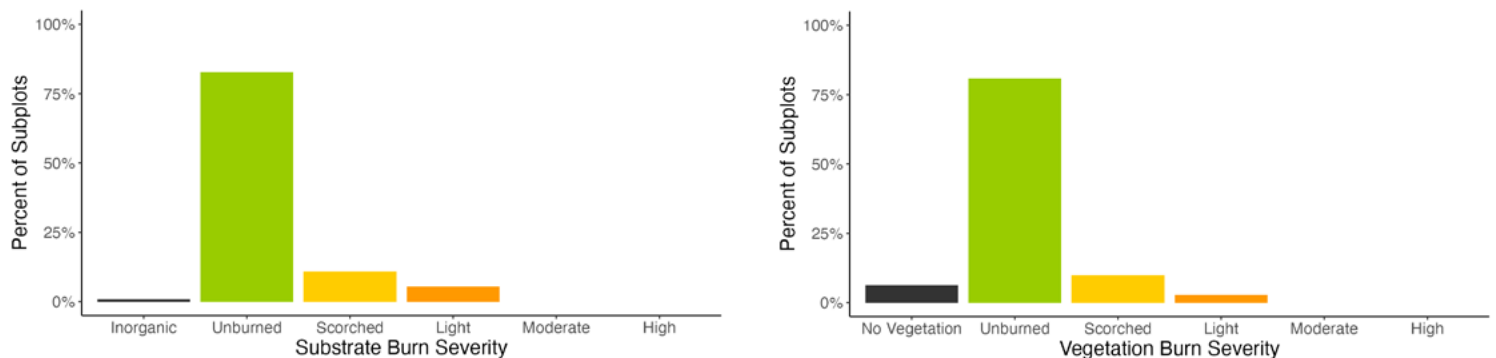


Figure 4. Forest floor burn severity for substrate (i.e. dead and inorganic material, A) and vegetation (B). Burn severity was low within monitoring plots, and over 80% of surface fuels were unburned following broadcast burning.

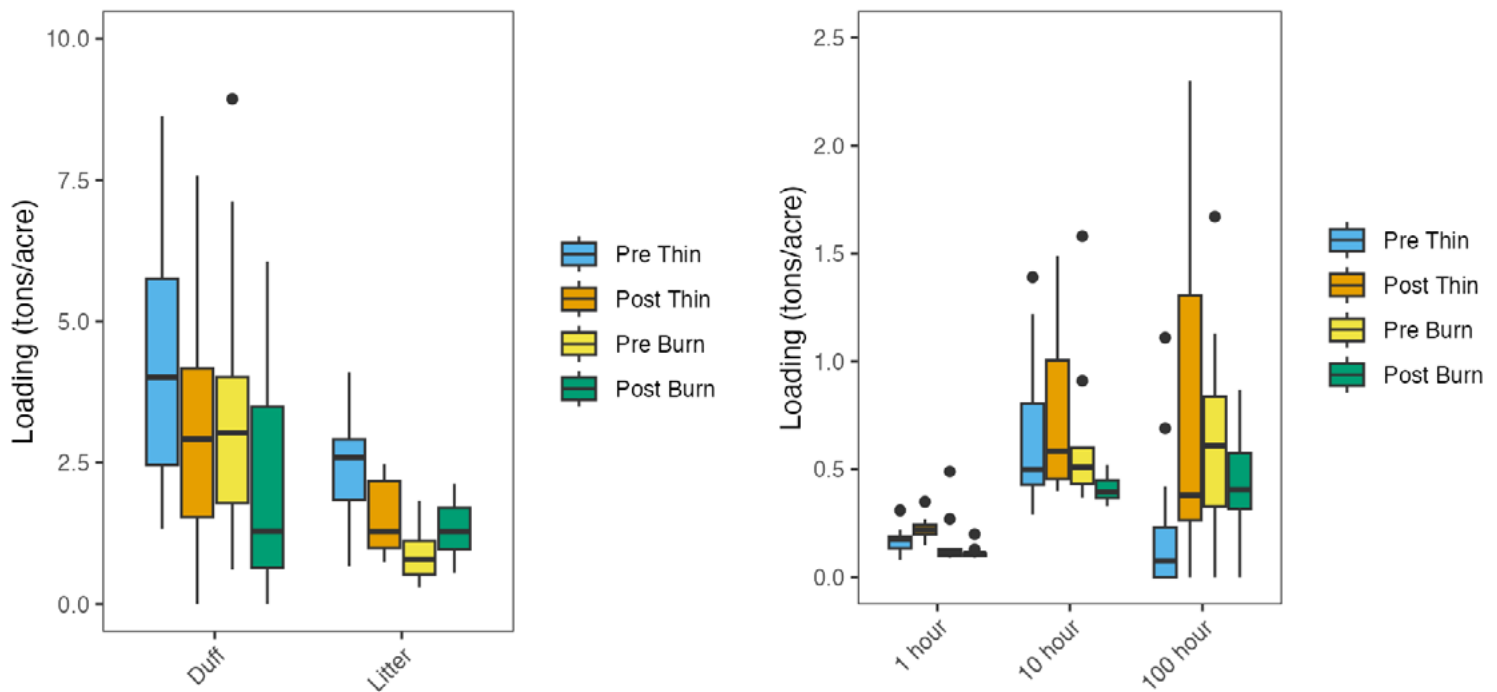


Figure 5. Changes in surface fuel loading for fine woody fuels (i.e. 1-, 10-, and 100-hour fuels, A) and litter and duff (B).

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