

Antelope Complex: Wheeler Fire

Rapid Fire Behavior Assessment Report



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Fire Behavior Assessment Team***

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Fire Behavior, Suppression, and Fuel Treatments

On July 5th, 2007 the Wheeler fire in the Antelope Complex started near Wheeler peak. It rapidly progressed down the slope into the Indian Creek drainage. As it moved down into the drainage, it burned primarily through dense mixed conifer forest with intermixed shrubs that had not burned since fire records have been retained by the forest (1910). The fire burned actively all night but firefighters were able to directly attack the heel of the fire. The next morning when temperatures increased, humidities decreased and up canyon and upslope winds commenced, the fire progressed more rapidly up the Indian Creek Canyon and toward the northeast with the prevailing wind direction. Again, the fire burned primarily through areas with dense forests with intermixed shrubs that had not burned since 1910 or 1920 (a portion of the area burned in 1920). It also made runs back up the slope toward the west during the heat of the day and when upslope and up canyon winds occurred. It burned primarily as a crown fire or high intensity surface fire. By the late afternoon on July 6th, the fire had become established in a large area to the west of dry flat and a large, pyrocumulus column developed, verified by incident meteorologists, reaching an elevation of over 35,000 feet. At approximately 6 to 6:30 pm, the column collapsed, resulting in very active crown fire spreading in all directions, including to the north toward Antelope lake along the 28N03 road and to the south and east toward dry flat. Areas burned at this time show evidence of very intense fire with little to no needles remaining in the crowns, complete or nearly complete surface fuel consumption and soil discoloration in many places.

After July 6th, extensive suppression resources arrived and the weather moderated. Fire behavior changed to mostly surface fire with torching of groups of trees or patches of forest with heavy ladder and surface fuels.

Throughout the fire, firefighters utilized roads and fuel treatment areas when nearby to conduct burn operations---where they burned from road edges back toward the main fire to slow or stop its progression. Early during the Antelope complex, some stands treated with prescribed fire and others with mastication apparently resulted in reduced fire behavior (based on observations of firefighters and post-fire assessment) and were also used in the burn operations. These treated areas were on the western flank of the fire along the 27N09 road. Here the fire changed from crown fire or high intensity surface fire to moderate intensity surface fire, allowing firefighters to directly suppress the fire or safely apply burn operations. In the masticated units, flamelengths dropped to 2 feet (at night) and direct attack with handline, bulldozers and hoselays was possible. Where the masticated material was deeper, some embers were generated from trees that torched and embers that spotted to other areas but overall, the masticated unit aided suppression substantially. In this area, prescribed burn treatments had been conducted on steeper slopes, where mastication was not possible. The Hungry wildfire burned into and petered out in the prescribed burn unit last year. During the Wheeler fire, both the Hungry fire and prescribed fire units slowed the fire progression and aided suppression. Both the mastication and prescribed burn units were particularly significant in aiding suppression early on, because there were few fire fighting resources available and at the scene of the fire.

Other treated areas along the northern flank of the fire, along the 27N59 and 27N36 roads were also utilized during burn operations to stop the progression of the fire. In each of these two areas on the west and north flanks of the fire, observations and post-fire assessments showed that spots (areas of fire that start from embers that cross over fire control lines) were contained or went out on their own in the treated units. We have direct evidence of this from the detailed fire behavior assessment in several locations. For that we had set up fire behavior sensors in treated units where the cameras were tripped by bulldozers or bulldozers successfully stopped spot fires from reaching the fire behavior sensors.

Similarly, treated areas on the south and east flanks of the fire, along the 28N03, 25N07 and 26N46 roads were used as “anchors” for burn operations. Normally to conduct a burn operation in the most effective manner and minimize the likelihood of the fire causing spot fires across the control lines, firefighters “prep” the line. The “prep” work includes removing ladder fuels, shrubs and small trees, and removing the lower limbs of trees near the margin of the road. When a burn operation is conducted where a fuel treatment has already occurred, the “prep” work is already completed or reduced greatly. In addition, the intensity of the burn operation fire as it moves away from the road toward the main fire is lessened. With a “prep” conducted rapidly in an untreated unit, only the first 10 to 20 feet from the road is cleared of ladder fuels. Then when the road is lit off, the fire may increase in intensity as it moves away from the road toward the main fire. Often times, when the fire is moving fast, especially during initial attack, there is no time to prep and the importance of fuel treatments along roads are even more important. Burn operations are one of the most effective tools used during suppression to stop a fire and are used extensively. While stands (or units) treated for fuel hazard reduction don't always stop a fire on their own, when used during burn operations, they can speed up the application—and often time is critical—and result in reduced fire intensity and consequent fire severity.

During the periods of time when the fire was burning most actively, when the column developed, it burned through several treated areas. The fire was so intense that although there is evidence that it dropped to the ground in the treatment areas (crowns were scorched in most of the treated areas but totally consumed in surrounding areas) but the fire overall was little affected. It is possible that a larger expanse of treated area would have resulted in a more moderating effect on fire behavior.

Evidence from Post-Fire Survey

Sixty-one rapid plots were placed in the area burned by the Antelope Fire to gather quantitative evidence on the ground of the differences in fire behavior and effects.

Plots were placed in treatment units and in untreated areas representative of the variety of fire behavior and immediate post-fire effects observed.

In each plot, information was collected on tree crown scorch or consumption, understory vegetation consumption and litter/duff consumption. The condition of scorched crown and evidence of fire behavior such as needle freeze was also noted.

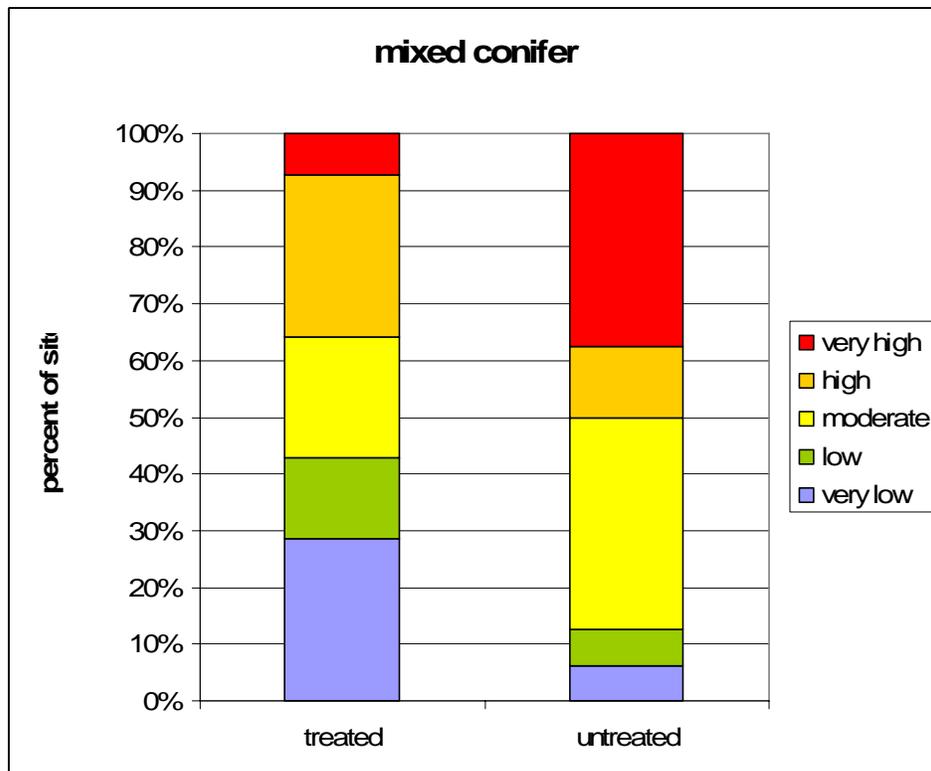
Each plot was given a broad severity rating based primarily on overstory tree effects (Table 1). Ratings ranged from low severity, with little to no evidence of crown scorch, to very high severity with complete or nearly complete needle consumption in the crowns. These overstory crown effects were generally related to understory vegetation consumption.

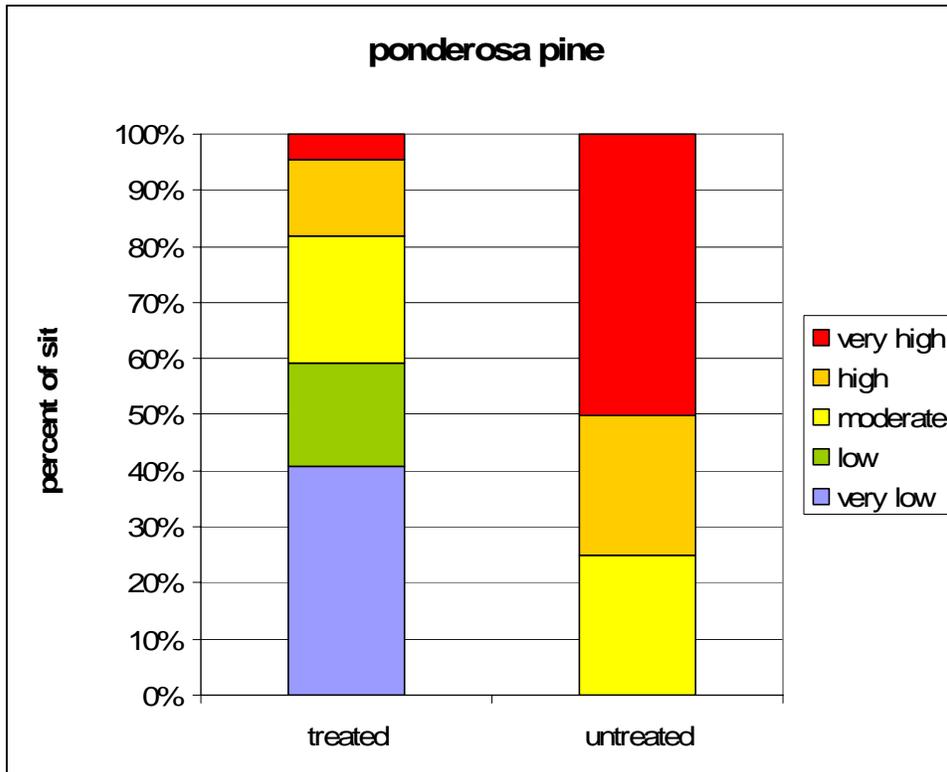
Table 1. Severity rating levels applied to each plot.

Severity code	definition
1	little, no crown effects
2	low scorch (brown needles)
3	heavy needle scorch (red needles, no freeze)
4	Very heavy needle scorch (red needles) & freeze
5	heavy needle consumption

Preliminary Findings of Field Survey

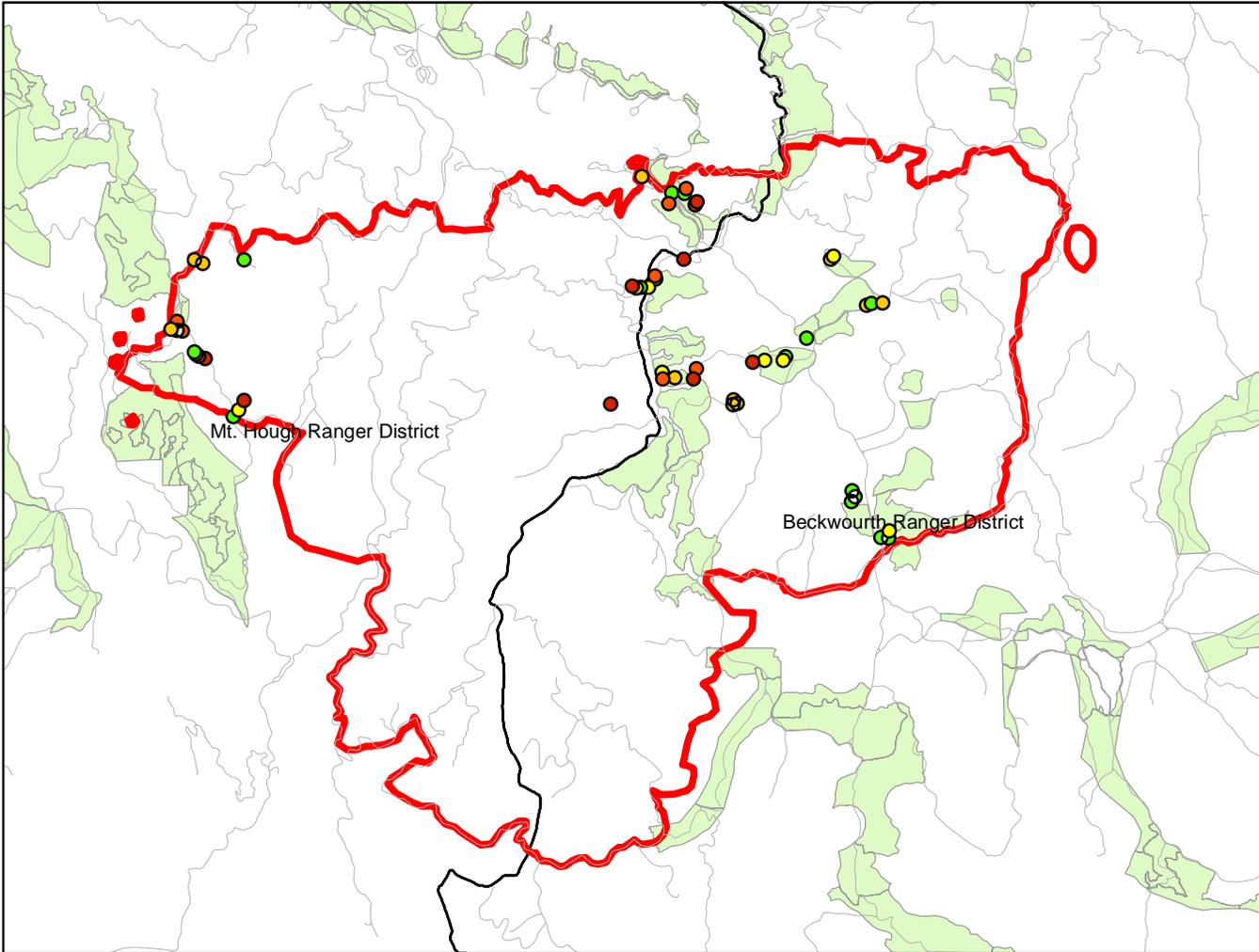
Separating out the effect of treatments, the time of day the fire burned through a site and suppression tactics is not straightforward but some overall trends are readily apparent (Figure 1). Areas that had been treated burned had evidence of less intense fire and those that were untreated more intense fire. These results are preliminary and more thorough sampling, particularly of untreated areas would ensure that these results are representative.







Antelope Complex Rapid Fire Severity Plots



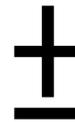
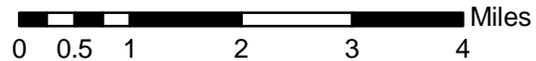
Legend

- Roads
- Fire Perimeter
- Ranger Districts
- Fuel Treatments

Severity Plots

Severity Level

- 1
- 2
- 3
- 4
- 5



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