Boulder Complex Fire Behavior, Suppression Action, and Severity

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- ## Scope of this Brief:

This brief provides a preliminary assessment of overall fire severity within fuel treatments and in un-treated areas on the Boulder Complex. Secondly, this brief provides preliminary documentation of how fuel treatments were used for suppression actions. The discussion in this brief focuses primarily on the "Boulder" and "Hungry" fires. The other fires within the Boulder Complex were relatively small and were not directly affected by fuel treatments. Information in this brief is taken from the Boulder Complex Incident Narrative (Norcal Team 1, 2006), the Boulder Complex Burned Area Emergency Response Report (BAER Report 2500-8), as well as interviews with on scene fire management personnel. It is important to note that extreme local wind conditions experienced on the Boulder Fire exceeded 20 miles per hour for at least two days. These wind speeds exceeded the design 90th percentile windspeeds of ~10 miles per hour. The Boulder Complex will be further analyzed using updated fire severity maps as part of a separate study.

- ## Antelope Project Purpose and Need (USDA 2000)

1. Reduce the Probability of future crown fires by using thinning and prescribed burning to remove at least 90% of fuel ladders
2. Reduce the potential spread of crown fires by reducing canopy cover to 40%
3. Reduce potential for high severity surface fire
4. Contribute to economic stability of rural communities by generating economic activity, income, and employment
5. Implement the Record of Decision for the HFQLG-FRA EIS

In addition, the HFQLG EIS, Appendix J, (USDA 1999) states that within fuel treatments:

"Suppression efficiency would be improved under this strategy by creating an environment where wildfires would burn at lower intensities and where fire fighting production rates would be increased because less ground fuels and small diameter trees would need to be cleared for fireline construction or backfiring (removing the fuels under

controlled burning conditions prior to the wildfire reaching the DFPZ). Aerial retardant application would also be more efficient under this strategy because the open canopy would allow the retardant to penetrate and be more effective at slowing fire spread in the light surface fuels."

- **Overall Fire Behavior and Severity**

The Boulder Fire origin was near a ridgeline above the headwaters of the north branch of Lost Creek. On June 25th, thunder cells moving though the Antelope Lake Area causing erratic, strong winds. These winds pushed the fire down slope for 1.8 miles towards Antelope Lake in 40 minutes (>200 chains per hour). Over the next few days (6/26, 6/27) gusting winds were reported over 20 miles per hour on the Boulder Fire and at the Pierce R.A.W.S. Station. During these wind events, flame lengths exceeding 5 feet along with torching and long distance spotting were reported. Crews could not attempt direct suppression actions during these high wind events. Areas burned under these windy conditions had high mortality (>75% mortality) of conifers.

Based on observations during and after the fire, flame lengths and fire intensity were lower within the Antelope Fuel Break on the Boulder Fire. High resolution burn severity maps show greater than 90% mortality within fuel treatments between the northern edge of the fuel treatments to the intersection with road 27N19Y. Initial post burn reconnaissance confirmed high mortality in this portion of the area, though dead needles are still attached to the limbs. In the adjacent untreated area, immediately east of the treatment boundary, needles are "blown off" limbs, indicating a much higher intensity fire in this area. Within the Antelope fuel treatment south of road 27N20Y, severity is relatively lower (10-50%) than adjacent untreated areas that burned with high severity (>75%).

The Border Fuel Treatments along the Wemple Cabin road (27N60) were used for a burn out operation. During this burnout (see discussion on effects of treatments on suppression actions, 900 acres were burned using a backing fire over a 3 day period (07/01/2006-07/04/2006). Within the burnout area, fire severity was approximately 70% low and 30% moderate or high. The burnout area was used to contain the south and southeastern flanks of the Boulder fire. The northern edge of the fire impacted the Hallet Project (overstory removal and underburned- completed in 1999). The main fire impacted the Hallet Project as a crown fire, but due to previous treatments, specifically underburning, the fire behavior transitioned to a low intensity ground fire. Within this area, flame lengths were generally less than 3 feet with a relatively low rate of spread and easily contained by fire fighters.

On the Hungry Fire, similar weather conditions occurred as described for the Boulder Fire as these fires burned simultaneously. Most notably, on the Hungry Fire, the Hungry Underburn, which was completed 06/04/2006 (last patrol date 06/22/2006) was used to hold the southern edge of the Hungry Fire.

It is important to note that extreme local wind conditions experienced on the Boulder Fire were outside the typical 90th percentile windspeeds of ~10 miles per hour. Even with extreme winds, and based on initial assessments, the fuel treatments in the Boulder and Hungry fires did the following:

1) Reduced fire severity, particularly along the Antelope Lake Road south of Road 27N19Y
2) Increased needle retention in treated areas burned under high severity when compared with untreated areas. These needles have already begun to fall and provide ground cover.
3) Enhanced opportunity for conducting a safe, low severity burnout along Wimple Cabin Road with decreased chances of torching and spotting.
4) The Hallet Project was ignited by the Boulder Fire, though containment in this area was relatively easy due transition from a crown fire and low (<3 feet) flame lengths.
5) The Hungry Underburn was used to safely contain the southern edge of the Hungry Fire
6) Created conditions where flame lengths remained below 4 feet in some areas, allowing direct suppression action by hand crews.

- ## Influence of Fuel Treatments on Fire Suppression Activities

Antelope Border DFPZ: Used for burnout along Wemple Cabin Road

Once fire was established in the Antelope Creek drainage, steep and rocky terrain made it difficult to build direct fireline. The fact that the DFPZ along the 27N60 Road was in place and completed (to the extent permitted by existing guidelines) allowed for flexibility in planning suppression actions. The fire team elected to use indirect suppression methods, along the road and fire out the line. This provided firefighters with a safer environment in which to work. Using the road allowed for enhanced safety for firefighters and made it easier to identify, locate and suppress any spot fires, which resulted from the burnout operation. Having the DFPZ located on both sides of the road allowed fire fighters to more easily “hold” the top of the underburn. A few spot fires were ignited in the treated area above the underburn but were easily contained by fire fighters in the area. During the burnout, untreated riparian areas resulted in a slowing of burnout operations and had a greater amount of spotting and torching when compared with treated areas.

The team had the decision space to work in, because of the DFPZ, to conduct the burnout operation under more benign environmental conditions. This reduced the spotfire probability, and increased the probability of the largest trees surviving. Since there was insufficient heat to get fire into the crowns of the larger trees, fewer embers crossed the 27N60 road, which was being used as the fireline. The lower surface fuel loading in the treated areas kept flame lengths low and manageable, and enabled suppression forces to conduct the burnout during a longer “window of opportunity”.

Antelope Border DFPZ Eastern Boundary: Used for control lines/contingency

The Border DFPZ allowed for flexibility in choosing at which point the counter fire operation would turn down the hill towards the lake. Once this operation was completed, there was a complete firebreak around the fire. After one burning period, mop up was initiated, and the threat of fire spread was greatly reduced.

A one-blade wide dozer fireline was constructed from the 60 Road down to the lake along a small spur ridge that was located in the area, treated in 2001 or 2002. Since this area had been thinned and underburned, it was safe and easy to construct the dozer line along the spur ridge. In addition, since the dozer line was located within the treated unit, if the fire had spotted across this relatively narrow line, there were a couple of areas, from which contingency lines could have been placed that also provided a safe environment.

Hallet Project: 8-9 year old overstory removal and burn treatment (burned 1997): Used for handline construction

The western portion of the Boulder Fire migrated into the old Hallet Project area. This project was an overstory removal followed by underburning and completed in the mid-90s. Although there was some regrowth of brush as well as places where mortality from the previous underburn had fallen to the forest floor, the fire behavior transitioned to a crown fire to a low intensity ground fire (flame length <3 feet with low rate of spread) to the extent that suppression crews were able to safely construct about a mile of direct handline from the top of the western flank of the fire down to the lower lake road. Had this area not been treated, the probability of the wildfire spotting across the Boulder Creek drainage and establishing itself on the south side of Wildcat Ridge would have greatly increased.

Hungry Underburn Anchorpoint

With regard to the Hungry Fire, a 237-acre underburn was completed just 3 weeks prior to the lightning fire. The treated unit was located southwest of the point of origin of the lightning fire. The Incident Commander was able to utilize the treated area as a safety zone and as a safe anchor point for suppression operations on the 650-acre wildfire. In addition, since such a large unit was previously treated, fewer firefighters and other resources were needed on a significant portion of the perimeter of the fire.

Summary

Overall, fuel treatments in the Boulder Complex met stated Purpose and Need of reducing probability of future crown fire and high severity surface fire. Fuel treatments which were exposed to extreme winds (>20 MPH) during on June 26th did incur high mortality (>75 % of basal area killed). This result is not unusual considering that gusting

windspeeds greatly exceeded design windspeeds on June 26th and 27th. In addition, an extreme amount of radiant heat was blown towards the fuel treatment from adjacent un-treated areas as they burned, resulting in increased severity within fuel treatments. Driving along road on the east side of Antelope Lake, one can clearly see areas of high severity (>75% basal area killed) in untreated stands immediately adjacent to areas of low to moderate severity in treated stands.

With respect to suppression actions, fuel treatments along the Wemple Cabin Road allowed for a safe implementation of a low severity burnout operation. The Hungry Underburn allowed for relatively easy containment of the south edge of the Hungry Fire using fewer resources. The portions of the Boulder Fire burning within the Hallet underburn were relatively easy to contain with limited resources due to low (<3 foot) flame lengths. In these areas, the fuel treatments improved suppression efficiency as stated in the HFQLG-EIS, Appendix J (USDA 1999).

The Type II Team assigned to the Boulder Complex had local knowledge of existing fuel treatments. This knowledge facilitated the use of these treatments for suppression tactics. This underscores the need for districts to be able to quickly provide GIS based, updated spatial information about fuel treatment locations to incoming fire teams so that the treatments may be used more efficiently to contain fires, potentially reducing overall fire severity and suppression costs.

References

BAER (Burned Area Emergency Response) Report 2500-8. 2006. Boulder Complex Fire Initial 2500-8 Burned Area Response Report. Signed by Bernard Weingardt, Regional Forester, on July 14, 2006.

Northern California ICT 1. 2006. Boulder Complex Incident Management Report. June 27-July 6, 2006. Incident Number CA-PNF-000371.

USDA.1999. Herger-Feinstein Quincy Library Group Forest Recover Act: Final Environmental Impact Statement. Appendix J. Lassen, Plumas, & Tahoe National Forests.

USDA. 2000. Antelope-Border Defensible Fuel Profile Zone. Environmental Assessment. Plumas National Forest, Mt Hough Ranger District.