Performance of Fire Adapted 50 Fuel Treatment Units During the Caldor Fire

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Background

On August 14, 2021 the Caldor Fire ignited about two miles east of Omo Ranch and four miles south of Grizzly Flats in El Dorado County. As of September 26, the fire had affected over 221 thousand acres and was 76 percent contained. In addition to the destruction of over 800 residences and other structures, the fire affected many acres of productive timberland on public (Forest Service), industrial private (Sierra Pacific Industries), special district (El Dorado Irrigation District) and non-industrial private land. Surveys in the burn indicated that there were areas of high severity fire where all vegetation had been destroyed. The following pictures show two examples of high severity fire effects located along Mormon Emigrant Trail and Fleming Ridge.

Extensive tree mortality and presence of white ash are indicative of how intense the fire was in areas that experienced high severity fire. In dense thickets of small and pole sized trees there were generally no surviving trees. In stands with larger trees, some may have survived the immediate effects of the fire but because of their post-fire susceptibility to bark beetle attack, they may ultimately die. Although no estimates of tree mortality currently exist, maps of soil burn severity prepared by the Burned Area Emergency Response Team indicate that approximately 13 percent of the burn experienced high severity fire. The team defines high severity fire as complete elimination of all surface fuels and presence of bare ground or several inches of ash susceptible to erosion and water quality impacts during upcoming precipitation events. Our observations in the burned area suggest that severity as indicated by tree mortality encompasses a much greater area. For example, on one surveyed road, North South Road, over 15 miles of road traversed an area of total tree mortality.

Fire Adapted 50 is an all-lands approach to wildfire hazard reduction focused in the area between Camino and Echo Summit along Highway 50. It is a primary focus area of the South Fork American River Cohesive Strategy, a collaboration of state and federal agencies, non-profits, utility districts, Resource Conservation Districts and private landowners. There are several phases to Fire Adapted 50. Phase I was completed in 2018 and involved the treatment of 644 acres in the general area of the Sly Park Recreation Area and Jenkinson Lake. Phase IA, which is currently underway, includes the treatment of 832 acres located between Highway 50 and the Sly Park Recreation Area. Phase II is the treatment of 968 acres of private land in a shaded fuel break located between Camino and Pollock Pines. Phase B, also underway, includes U.S. Forest Service land located within that fuel break as well as private land in the Copperton Road and Sierra Springs neighborhoods for a total of 1500 acres. These phases are funded by grants from CAL FIRE. An additional project, Phase I – SNC consists of 257 acres of fuel treatments funded by the Sierra Nevada Conservancy located on El Dorado Irrigation District land in the Sly Park Recreation Area. That project was completed in 2021. All phases of Fire Adapted 50 implement a

prescription that includes the removal of understory ladder fuels (trees 12 inches diameter breast height or less and shrubs), spacing stands of smaller trees where they are the only trees present to 20 feet apart and pruning residual trees to a height of 10 feet. Virtually all work is accomplished by mechanical mastication. The objectives of treatments are to reduce likelihood of a crown fire if a wildfire occurs, improve the resiliency of the residual stands, allow implementation of prescribed fire to maintain desired conditions and improve access and safety for fire fighters by providing areas where they can stage to fight a fire or conduct back burning.

During the early days of the Caldor Fire, it grew westward from Grizzly Flats towards Jenkinson Lake. Between August 22nd and August 25th it threatened to cross over into the communities along Sly Park Road and Sierra Springs. During that period, it approached units that were treated in Phase I – SNC (see Figure 1). In order to slow the progression of the fire and protect human and natural assets, CAL FIRE and the USFS chose to conduct backfiring through the FA50 Phase I and Phase I – SNC units. This report describes how the units performed and the resulting stand conditions after backfiring. For context, information on pre-treatment and post-treatment conditions in the units is also presented.

Wildfire modeling and greenhouse gas analysis conducted to assess the effectiveness of Fire Adapted 50 treatments in reducing fire severity and greenhouse gas emissions predicted that all phases combined would have cumulative benefits including reduced risk of high severity wildfire and reduced probability of ignition within adjacent downwind stands (Bucholtz et al. 2021a). Predicted reductions in greenhouse gas emissions were minor, primarily due to negligible effects on average fire size and low probability that treatments would be encountered by a wildfire during the analysis period. Considering just Phase I – SNC, analysis indicated that there would be reduced risk of high severity wildfire within the treated area but no off-site effects due to the small scale of the project relative to the overall fire shed used for the analysis (Bucholtz et al. 2021b). An objective of the present evaluation was to determine if the predicted benefits of the Phase 1 – SNC project occurred. Those benefits would include lack of tree mortality due to crown fires, reduced severity of surface fires and reduced scorching of tree stems and crowns.

Pre-Treatment and Post-Treatment Conditions within the Units

The majority of the unmanaged forest in the general area of Sly Park Recreation Area is overstocked with dense understories of small shade tolerant trees and shrubs (see following photograph). The condition reflects a recent history during which timber harvesting has been limited due to a variety of economic, social and regulatory constraints.

Conditions also reflect a lack of recent wildfires in the area. The following figure shows the fire history of the area.

As previously stated, the prescription applied to the Phase 1 – SNC project included the elimination of ladder fuels, reduction of shrub cover and pruning of residual trees

to a height of 10 feet. Pre-treatment conditions in one unit are shown below (Photograph #115, see Figure 2 for photograph locations).

Conditions immediately after treatment in a similar unit are shown in the following photograph (not geo-referenced).

Subsequent to the Phase 1 – SNC treatment, the units were logged to further enhance stand resiliency. The logging prescription was to reduce basal area to 85-125 square feet/acre and to separate crowns. Post-logging conditions in the unit shown in the first photograph above are illustrated in the following photograph (Photograph #115).

Bucholtz et al. (2021c) analyzed the effects of logging to reduce basal area after initial fuel treatment on wildfire behavior. Reducing basal area to levels of 80 to 120 square feet/acre had the benefits of further increasing canopy base height, further reducing average flame height and consequent reduced risk of crown fire. All the units evaluated during the current study that were subjected to backfiring had been logged after initial fuel treatments. It was therefore, not possible to determine if additional benefits occurred during backfiring due to the logging.

Performance of Units During the Caldor Fire

Figure 1 shows the location of the units that were backfired by CAL FIRE during the Caldor Fire on or about August 22 to August 25 where we conducted post-fire evaluation. Backfiring is generally conducted during favorable weather conditions with controlled ignition and precautions against escape e.g., perimeter fire lines. We focused on observing the effects predicted by Bucholtz et al. (2021a; 2021b; 2021c): reduced flame length and reduced scorch height on trees and reduced or no tree mortality as compared to a wildfire in an untreated area. It should be noted that strictly speaking, we could not make observations in Phase 1 – SNC treated stands that were subjected to the full force of the wildfire since none experienced the wildfire. However, observations in other stands treated by Sierra Pacific Industries and the U.S. Forest Service that did experience the wildfire demonstrated similar responses to what we saw in the Phase 1 – SNC stands.

The following sequence of photographs shows pre-treatment, post-treatment/logging and post-fire conditions in three representative areas (see Figure 1 for photograph locations; zoom for better resolution).

Photographs #115 and #111

Photographs #112

Additional photographs representative of the treatment units after backfiring are included in Appendix 1.

In general, all surface fuels were consumed within the units. There were exceptions, however, as illustrated in the following photograph showing shrubs that withstood the backfiring (not geo-referenced).

Also, it is notable that backfiring did not ignite standing dead trees that had been killed by bark beetles (see following photograph, not geo-referenced).

Scorch height on trees was between two and four feet, uncommonly more and depth of scorch appeared superficial, suggesting low likelihood of damage to the cambium. Scorch height indicated that flame length was generally less than four feet. A few trees experienced severe scorching, shown in the following photograph and these could be susceptible to future attack by red turpentine beetle. Observations at the Angora Fire on Tahoe Conservancy land indicated invasions in severely scorched trees by that beetle within weeks of the fire. Red turpentine beetle is not normally a cause of mortality in itself but its attack can make trees vulnerable to attack by other insects such as western pine beetle.

We did not observe fire-caused mortality in the units we visited. Because there was no crown fire, the potential for downwind spot fires was eliminated.

Conclusions

The Fire Adapted 50 units performed well when subjected to backfiring by the USFS and CAL FIRE. In general, the predictions of treatment effectiveness presented in Bucholtz et al. (2021a) and specifically for the Phase 1 – SNC units (Bucholtz et al. 2021b) were validated by our observations in the backfired units. The caveat is that backfiring does not represent the intensity of a full-scale wildfire. Backfiring is controlled in terms of ignition and weather conditions and in this instance was comparable to the application of a post-treatment prescribed fire. None of the units in any Fire Adapted 50 phases experienced the full force of the Caldor Fire.

There is evidence that forested areas treated with fuel reduction and prescribed fire will perform well when wildfire occurs. At the Cone Fire at Blacks Mountain Experimental Forest when areas treated with thinning and prescribed fire were subjected to uncontrolled wildfire the fire did drop to the ground and only consume surface fuels. However, untreated areas adjacent to the treated area still experienced high severity fire. The treated units did not modify fire intensity in the adjacent units (Skinner at al. 2004). This is in line with the predictions of Bucholtz et al. (2021) that fuel reduction treatments at the scale of Phase 1 – SNC may not have significant off-site benefits.

Literature Cited

Bucholtz, T., D. Schmidt and J. Moghaddas. 2021a. Effects of wild land fuel treatments located in the Highway 50 corridor in El Dorado County on future wildfire size and severity, greenhouse gas emissions and carbon storage. Report prepared for El Dorado and Georgetown Divide Resource Conservation Districts, Placerville, CA. 55 p.

Bucholtz, T., D. Schmidt and J. Moghaddas. 2021b. Effects of wild land fuel treatments on 269 acres (Sierra Nevada Conservancy Phase 1) located in the Highway 50 corridor in El Dorado County on future wildfire size and severity, greenhouse gas emissions and carbon storage. Report prepared for El Dorado and Georgetown Divide Resource Conservation Districts, Placerville, CA. 15 p.

Bucholtz, T., D. Schmidt and J. Moghaddas. 2021c. Analyzing fuel treatment alternatives for their effectiveness to impact wildfire behavior. Report prepared for El Dorado and Georgetown Divide Resource Conservation Districts, Placerville, CA. 22 p.

Skinner, C.N., M.W. Ritchie, T. Hamilton and J. Symons. 2004. Effects of prescribed fire and thinning on wildfire severity: the Cone Fire, Blacks Mountain Experimental Forest. Paper presented at the 25th Vegetation Management Conference, January 2004, Redding, CA.

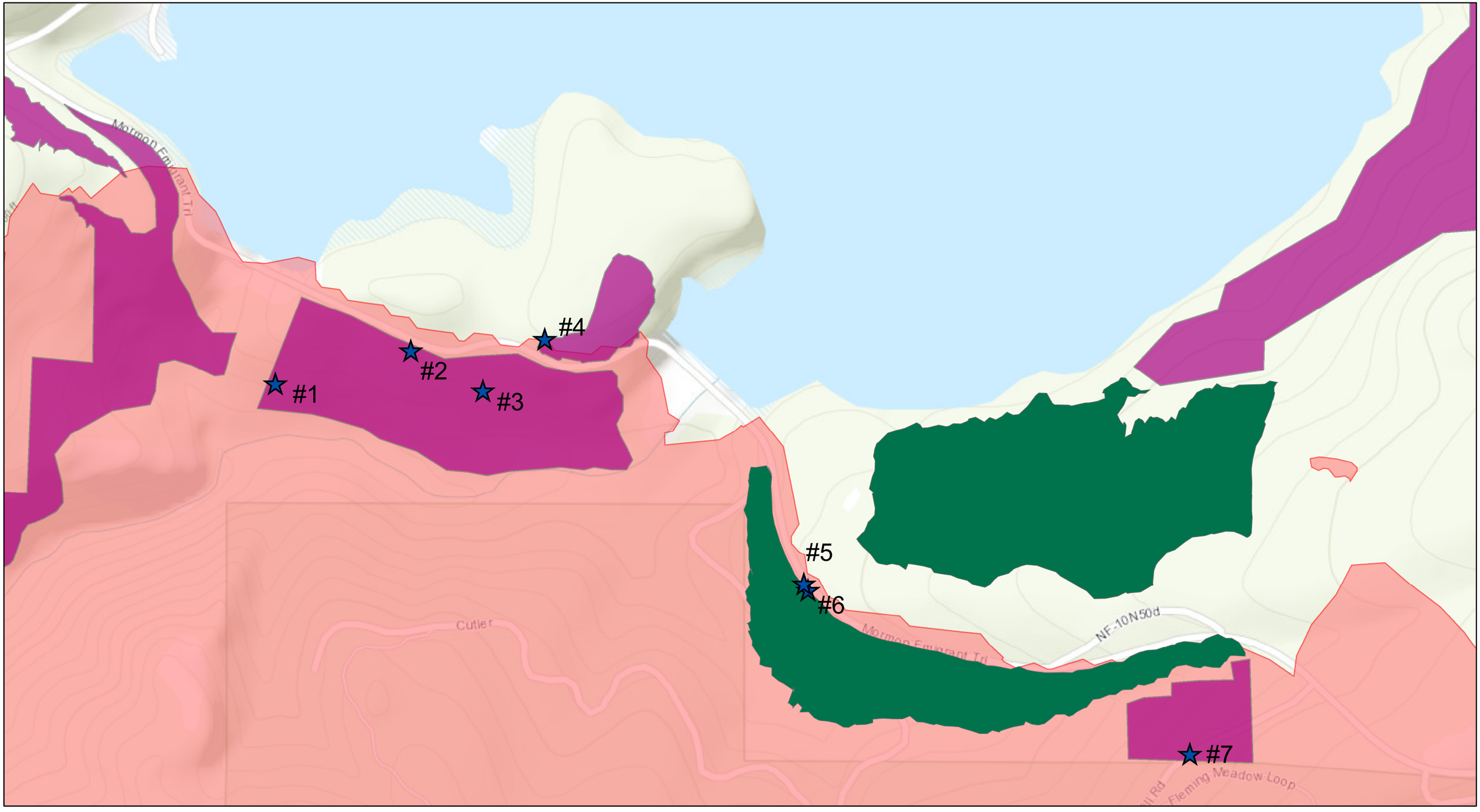
Attachment 1: Representative Photographs of Phase 1 and Phase 1 – SNC Units Subjected to Backfiring During the Caldor Fire (see map for photo-point locations)

Photograph #1

Photograph #4

Photograph #5

Photograph #6



FA50 Fuel Reduction Treatments Performance Report Photo Map

- Photo_Points
- FA50_PHI_Treatment_Area
- FA50_SNC_Treatment_Area
- Caldor_Fire_Perimeter

150 75 0 150 Meters

N W E S

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Created by: Brittney Burke

Date: September 29, 2021

Caldor Report Photo Coordinates

#1. 38°43.012' N, 120°34.290' W
Post treatments, post logging, post burn -SNC

#2. 38°42.895' N, 120°34.428' W
Outside of unit after burn (Moderate/low severity?) – **NOT IN PROJECT- ADJACENT TO SNC**

#3. 38°42.892' N, 120°34.360' W
Post treatments, post logging, post burn - SNC

#4. 38°42.922' N, 120°34.223' W
Post treatments, post logging, post burn - SNC

#5. 38°42.915' N, 120°34.165' W
Post treatments, post logging, post burn - SNC

#6. 38°42.915' N, 120°34.165' W
Post treatments, post logging, post burn - SNC

#7. 38°42.952' N, 120°33.873' W
Post Treated, Not Logged, not burned – SNC -**Good example of current post treatment conditions.**

#8. 38°42.952' N, 120°33.882' W
Not Masticated, not Logged, not burned. **NOT IN PROJECT- ADJACENT TO SNC – Good example of what vegetation looks like in this area if not treated.**

#9. 38°42.782' N, 120°33.652' W
Low/moderate Burn Beyond Treatment Area - – **NOT IN PROJECT- ADJACENT TO PHI**

#10. 38°42.778' N, 120°33.645' W
Treated area with untreated area in the background. - PHI

#11. 38°42.778' N, 120°33.645' W
Treated area with untreated area in the background - PHI

#12. 38°42.750' N, 120°33.667' W
Untreated USFS Adjacent To Treatment – **NOT IN PROJECT- ADJACENT TO PHI**

#13. 38°42.745' N, 120°33.592' W
Post treatments, post logging, post burn - PHI

#14. 38°42.740' N, 120°33.588' W
Post treatments, post logging, post burn - PHI

#15. 38°42.655' N, 120°33.583' W
No treatment done beyond the draw - PHI

#16. 38°42.677' N, 120°33.407' W
Post treatments, post logging, post burn - PHI

#111. 38°42.942' N, 120°34.020' W
3 photos – Pre-treatment, post treatment, post logging and fire- SNC

#112. 38°42.908' N, 120°33.942' W
3 photos – Pre-treatment, post treatment, post logging and fire - SNC

#115. 38°42.935' N, 120°33.865' W
3 photos – Pre-treatment, post treatment, post logging and fire - SNC