CALIFORNIA FIRE SCIENCE CONSORTIUM

Research Brief for Resource Managers

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Natural experiment shows SPLAT fuel treatment efficacy

Tubbesing, C. L., Fry, D. L., Roller, G. B., Collins, B. M., Fedorova, V. A., Stephens, S. L., Battles, J. J., 2019. Strategically placed landscape fuel treatments decrease fire severity and promote recovery in the northern Sierra Nevada. Forest Ecology and Management. 436, 45–55. https://cloudfront.escholarship.org/dist/prd/content/qt2c13v0j9/qt2c13v0j9.pdf?t=png4cz

Management Implications

- Strategically placed landscape area fuel treatments (SPLATs) in the Sierra Nevada **reduced wildfire severity** in a natural experiment.
- Treatments **promoted post-fire seedling regeneration**, particularly for firs.
- Fir seedling densities were higher in areas with **lower neighborhood fire severity**.
- Since this study included only one fire event, additional natural experiments testing SPLATs would help bolster these findings.

Fuel treatments, including thinning and prescribed fire, are used to help prevent fires from reaching catastrophic severities. However, fuel treatments are expensive and difficult to implement, so they cannot be used everywhere. A recommended approach is to place networks of fuel treatments in patterns that maximize their benefits even if only a fraction of the landscape is treated. These strategically placed landscape area treatments, or SPLATs, have not been tested in a real-world wildfire until recently, when the 2013 American Fire burned through the Sierra Nevada Adaptive Management Project's fuel treatment network. This study tested how well SPLATs, which were completed shortly before the American Fire, worked to improve fire resistance and recovery. Both fire effects and initial post-fire conifer regeneration were investigated.

Fire Severity Patterns

Overall, the fire burned at lower severity in the treated landscape than in the landscape that was not treated (i.e. control). For example, the control landscape burned with 25.6% stand-replacing fire while the treated landscape burned with only 11.3% (**Table 1**, **Figure 1**). Furthermore, the control landscape had more large contiguous patches of stand-replacing fire, indicated by the dark red areas in Figure 1. These internal patch areas are less likely to return to forest long-term.

The researchers also used a fire model to predict how the American Fire would have burned if treatments had not occurred. Inputs for the model were based on pre-treatment field measurements. The model used was called FARSITE. Results

Table 1. Fire severity patterns in the American Fire footprint, including pre-treatment model predictions and actual fire severities.

	Control Landscape		Treatment Landscape	
	Pre-treatment model	American Fire	Pre-treatment model	American Fire
Percent area stand-replacing	28.0%	25.6%	37.7%	11.3%
Stand-replacing area >120 m (~400 ft) from patch edge	2.60%	2.39%	6.50%	1.02%

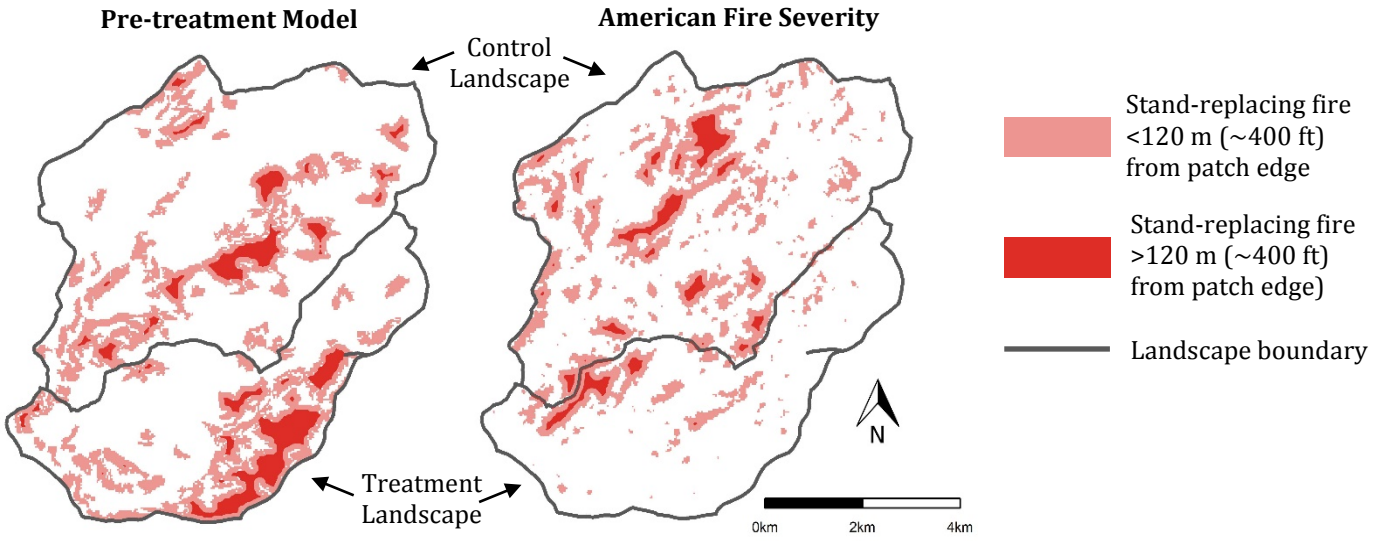

Figure 1. Left: stand-replacing fire patches based on FARSITE model output using pre-treatment vegetation data. Right: stand-replacing patches based on American Fire severity from remote sensing data (RdNBR). The southern landscape was treated with SPLATs while the northern landscape was not. The differences between modeled pre-treatment fire patterns and actual post-treatment fire patterns show that SPLATs moderated fire behavior.

showed that the American Fire would have burned more severely in the treatment landscape had treatments not occurred (**Figure 1**, **Table 1**).

Post-Fire Regeneration

This study evaluated the impact of SPLATs on post-fire conifer regeneration. Two years after the American Fire, there were almost ten times more seedlings in the treated plots than in untreated plots (**Figure 2**). Treatments increased fir densities more strongly than they increased pine densities.

There are several possible explanations for how treatments may have promoted post-fire seedling growth, such as increasing bare mineral soil, changing shrub abundance, affecting overstory basal area, and more. Of the six possible explanations investigated in this study, the one with strongest evidence was neighborhood fire severity. Neighborhood fire severity was defined as the percentage of area within 120 meters (~ 400 ft) of a plot that experienced stand-replacing fire. Plots that burned at moderate plot-level severity and had low neighborhood fire severity had the highest conifer regeneration, perhaps as a result of good growing space after the fire coupled with an abundance of nearby seed sources.

Overall, SPLATs moderated fire behavior in the American Fire, which in turn helped to increase post-fire recovery of conifers.

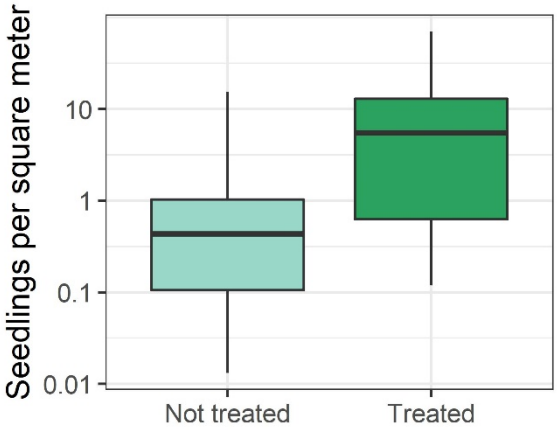

Figure 2. Top: Treated plots in the American Fire footprint had higher seedling densities than untreated plots. Note that the y-axis increases by multiples of ten. Bottom: Abundant regeneration in an area treated before the American Fire. Photo credit: Susie Kocher