CALIFORNIA FIRE SCIENCE CONSORTIUM

Research Brief for Resource Managers

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Post-fire Mastication Effects on Shrub Regrowth

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Management Implications

- Post-fire mastication treatments that leave a layer of woody material on the ground may reduce shrub dominance, giving planted seedlings an advantage by reducing competition.
- The benefits of heavy masticated fuel in promoting rapid reforestation must be weighed against the wildfire risk from increased fuels on site.

Introduction - In California's dry mixed conifer forests, increasingly large high severity wildfires threaten to convert significant areas of forested land into shrub dominated landscapes in the absence of active reforestation, including control of competing vegetation. Previous studies have found that salvage logging and other methods used to prepare a site for reforestation may reduce shrub cover after wildfire. This study investigated the effect of masticated fuel depth on shrub growth where salvage logging and mastication followed high severity wildfire.

Study Site and Methods - The 2007 Angora Fire burned 1,255 ha of high-elevation (1,930 m) mixed conifer/eastside pine type forest in South Lake Tahoe, California. We established permanent monitoring plots on severely burned lands on both a treated and an untreated parcel. The treated parcel was salvage logged in 2007 and unmerchantable trees and slash were masticated and spread across the site (Figure 1a). Jeffrey pine, sugar pine, and incense cedar seedlings were

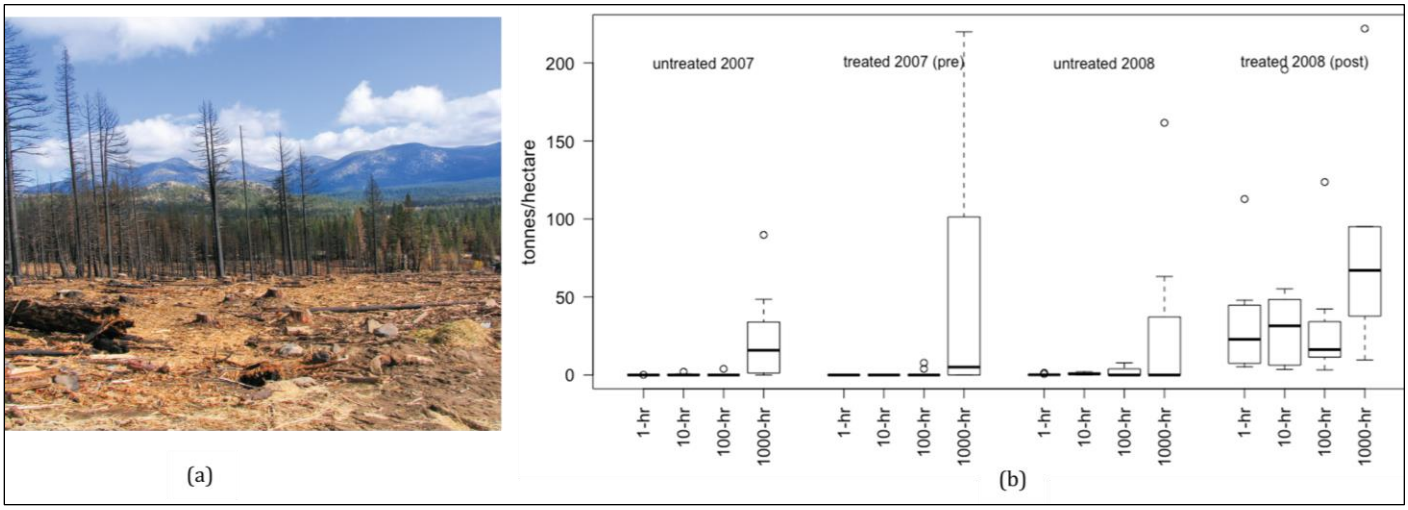

Figure 1. (a) The treated site in November 2007, following salvage logging and mastication. (b) Fuel loads on the untreated and treated sites in 2007 (pre-treatment) and 2008.

planted in 2008, 2009, and 2010. We installed circular 1/10th acre monitoring plots to track project outcomes immediately after the fire. Fuels were measured before and after treatment. Vegetative cover, vegetative height, and fuel depths were measured along transects within these plots in 2009 and 2014.

Results

Fuel: Fuel loads increased fourfold on the treated site following mastication in 2007. On the untreated site, fuels did not significantly increase from 2007 to 2008 (Figure 1b). Fuel covered 82% of the treated site in 2009, to an average depth of 3.7 cm. This increased to 97% cover in 2014, with an average depth of 5.5 cm. As there were no living trees left on site, this increase came from litter from shrubs.

Shrub growth: We found no vegetation in any plot after the fire or after treatment. By 2009, shrubs were growing vigorously on both parcels, but less so on the treated plots, with cover averaging 4% compared to 28% on the untreated site. By 2014, shrub cover increased to an average of 50% on treated plots (Figure 2) and 92% on untreated plots (Figure 3). Shrubs were significantly taller on the untreated site by 2009, with the average tallest shrub per quadrat reaching 21cm compared to 7cm on the treated site. The average tallest shrub was 114cm on the untreated site in 2014 compared to 69cm on the treated site (Figure 4). The most common shrub species encountered was resprouting native mountain whitethorn (*Ceanothus cordulatas* Kellog).

Figure 2. Mountain whitethorn shrubs on the treated site in 2014. Masticated fuel is visible on the right.

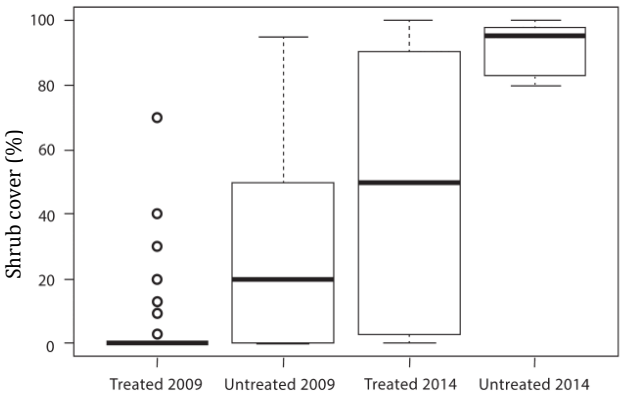

Figure 3. Shrub cover per quadrat on the treated and untreated sites in 2009 and 2014.

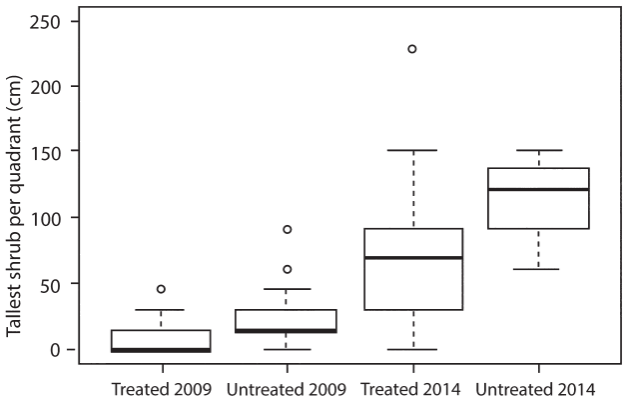

Figure 4. Tallest shrub per quadrat on the treated and untreated sites in 2009 and 2014.

Effect of Fuel Depth on Shrub Growth - Where masticated fuels were deeper, shrub height and cover were less. The physical barrier created by widespread fuels was responsible for some of the reduction in post-fire shrub growth. Crushing of underground surviving shrub tissue by salvage logging may also have been a factor.

Conclusion - Our results suggest that post-fire treatments that spread a thick layer of woody material across a site may give an advantage to planted conifers in upper elevation Sierra Nevada forests by suppressing shrub growth. However, managers must weigh the potential benefit of heavy masticated fuels against possible increased fire risk, especially to young trees. Further research into the effects of heavy masticated fuels on planted seedlings across diverse forest types would assist managers.