BEETLE-KILLED STANDS IN THE SOUTH CAROLINA PIEDMONT: FROM FUEL HAZARDS TO REGENERATING OAK FORESTS

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Impacts of spring prescribed fire, mechanical mastication, and no-treatment (control) on fuels and natural hardwood tree regeneration were examined in beetle-killed stands in the South Carolina Piedmont. Mechanical mastication ground the down and standing dead trees and live vegetation into mulch and deposited it onto the forest floor. The masticated debris layer had an average depth of 15 cm and loading of 503 Mg ha^{-1} in the first year (Yr 1) post-treatment.

Prescribed burning reduced fuelbed continuity by significantly ($P < 0.05$) reducing litter (Oi) and duff (Oe + Oa) layer thicknesses by 88 and 84 percent, respectively. There were significant reductions in fine (1- and 10-hr timelag size class) fuels (71 and 73 percent, respectively) and 100-hr fuels (13 percent) with prescribed burning, but not 1000-hr fuels. Total dead and down fuel loading in Yr 1 post-burn (16.3 Mg ha^{-1}) was significantly less than the loading of masticated debris, but not significantly different than total fuel loading in control stands (24.3 Mg ha^{-1}). Both prescribed burning and mastication significantly reduced (by 27 and 52 percent, respectively) dead and down fuelbed depth.

Hardwood tree regeneration re-sprouted after the treatments were implemented. However, there were differences in sprouting between burned and masticated stands. By the second year (Yr 2) post-burn, oak sapling (≥ 1.4 m tall) density was 680 stems ha^{-1} and the ratio of oak saplings to those of other hardwood competitors was 1:3. There were 8417 sprouts (0.5-1.4 m tall) ha^{-1} in Yr 2 post-burn.

There were 47 oak saplings ha^{-1} in Yr 2 post-masticated stands and the ratio of oak to other hardwood saplings was 1:15. There were 66 percent fewer oak sprouts post-mastication (2833 stems ha^{-1}) when compared to post-burn stands. It is likely that because the cutting teeth on the masticating head penetrated the soil surface up to 5 cm in depth, the treatment damaged basal buds and inhibited sprouting. The masticated debris layer may have also been a physical impediment to new sprout growth.

Results of this study suggest that prescribed burning reduces the fuel hazard in beetle-killed stands by reducing the continuity of the fuelbed. Mastication on the other hand increased both the loading of dead and down woody debris and continuity of the fuelbed. However, it is largely unclear how the thick, compacted layer of masticated debris affects fire risk. Finally, advance oak regeneration was abundant in post-burn stands while the sprouting of oak and other hardwoods was inhibited in masticated stands, suggesting that prescribed burning is a superior option when silvicultural objectives include naturally-regenerating hardwoods in beetle-killed pine stands.

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