The Effect of Mechanical Fuel Reduction Treatments in the Wildland-urban Interface on the Amount and Distribution of Bark Beetle-Caused Tree Mortality[1]

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Abstract

Selective logging, fire suppression, forest succession, and climatic changes have resulted in high fire hazards over large areas of the western USA. Federal and state hazardous fuel reduction programs have increased accordingly to reduce the risk, extent and severity of these events, particularly in the wildland urban interface. In this study, we examined the effect of mechanical fuel reduction treatments on the activity of bark beetles in ponderosa pine, *Pinus ponderosa* Dougl ex. Laws., stands located in Arizona and California, USA. Treatments were applied in both late spring (April-May) and late summer (August-September) and included: (1) thinned biomass chipped and randomly dispersed within each plot, (2) thinned biomass chipped, randomly dispersed within each plot, and raked 2 m from the base of residual trees, (3) thinned biomass lop-and-scattered (thinned trees cut into 1-2 m lengths) within each plot, and (4) an untreated control. The mean percentage of trees attacked by bark beetles ranged from 2.0 percent (untreated control) to 30.2 percent (plots thinned in spring with all biomass chipped). A three-fold increase in the proportion of trees attacked by bark beetles was observed in chipped versus lop-and-scattered plots. Higher levels of bark beetle colonization were associated with spring treatments. Raking chips away from the base of residual trees did not significantly affect attack rates. Several bark beetle species were present including the roundheaded pine beetle, *Dendroctonus adjunctus* Blandford, western pine beetle, *D. brevicomis* LeConte, mountain pine beetle, *D. ponderosae* Hopkins, red turpentine beetle, *D. valens* LeConte, Arizona fivespined ips, *Ips lecontei* Swaine, California fivespined ips, *I. paraconfusus* Lanier, and pine engraver, *I. pini* (Say). *Dendroctonus valens* was the most common bark beetle infesting residual trees.

Based on these results, managers should consider chipping during periods of bark beetle inactivity (e.g., late summer through winter) when possible. Reasonable effort should be made to limit large quantities of chips from directly contacting residual trees. Treatments that promote the desiccation of slash and slow release of monoterpenes prior to chipping should be considered. The implications of these results to sustainable forest management were discussed in detail.

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