Mastication and prescribed fire impacts on fuels, fire behavior and tree mortality in a 25-year old ponderosa pine plantation, southern Sierra Nevada

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Due to increases in tree density and hazardous fuel loading in Sierra Nevadan forests, land management is focusing on fuel reduction treatments to moderate the risk of catastrophic fires. Fuel treatments involving mechanical and prescribed fire methods can reduce surface as well as canopy fuel loads. Despite a paucity of data on masticated fuels, land managers desire fuel loading, potential fire behavior and fire effects such as tree mortality information for masticated areas. In this study we measured fuel characteristics before and after mastication and mastication plus prescribed burn treatments in a 25-year old ponderosa pine (*Pinus ponderosa* C. Lawson) plantation. Potential fire behavior estimates using 90th and 97th percentile weather, similar to wildfire conditions, were derived using FMAPlus along with post-treatment fuel data. In addition to surface fuel characteristics and tree data collection, bulk density samples were gathered for masticated material. Mastication treatment alone showed increases in most surface fuel loadings and decreases in canopy fuel loads. Masticated treatment in conjunction with prescribed burning reduced both surface and canopy fuel loads. Rates of spread and flame lengths as predicted with FMAPlus using 90th and 97th percentile weather and post-treatment fuel conditions for masticated plots were higher in masticated than masticated/burned plots. Torching and crowning indices from FMAPlus indicated that higher winds would be necessary to promote torching in plots treated with mastication and prescribed fire and the probability of active crown fire was reduced slightly for all treated plots. Post-treatment tree mortality, as measured in the field at the end of the first growing season, was 38 % for mastication/burn and 28 % for mastication/pull-back/burn treatments. Understanding potential fire behavior and fire effects associated with masticated fuels will allow managers to make decisions on the possibility of mastication to create fuel breaks or enhance forest health.

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