FIRE SEVERITY AND INTENSITY IN NATURAL AND MANIPULATED FUELS DURING SPRING BURNING IN MIXED SHRUB WOODLANDS

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Whiskeytown National Recreation Area has applied a variety of alternative fire risk reduction methods, which expand the options for fire managers but have unknown ecological impacts and long-term effects. This research project examined fire severity and behavior in masticated and unmanipulated fuels during a spring burn. Pre and post fire measurements of surface fuels (litter, duff, 1, 10, 100, 1000 hr TLFM) and on-site estimates of fire behavior (flame length, flame zone depth, and rate of spread) were used to characterize the differences in burning conditions in the various fuel types. In addition, maximum temperature was measured using pyrometers placed in three strata: 0.5 meters above the ground, on top of the litter, and at the interface between duff and soil layer. Fire severity was characterized by measuring the scorch height and mortality of overstory trees and shrubs. The mastication treatment significantly altered the fuel profile, converting live and dead standing materials into downed woody debris and resulting in an approximate 200% average cover increase in woody fuel loading for 1 and 1000 hr TLFM size classes, and greater than 300% average cover increase in 10 and 100 hr TLFM size classes. The mean flame length (28.28 inches) and flame zone depth (19.15 inches) were significantly greater ($P<0.001$) in masticated plots than the mean flame length (10.12 inches) and flame zone depth (6.27 inches) in the unmanipulated plots. Similarly, the mean temperatures for litter (657.24°F) and aerial (277.33°F) tags in the masticated plots were significantly greater ($P<0.001$) than temperatures recorded for litter (218.55°F) and aerial (58.87°F) tags in unmanipulated plots. These indices lead to an increase in mortality of overstory (>8 inches dbh) and pole-sized (<8 inches dbh) oaks and conifers. These results highlight the complexity of burning in masticated fuels when the objective is to retain overstory trees and some vegetation.