MOISTURE DYNAMICS AND FIRE BEHAVIOR IN MECHANICALLY MASTICATED FUEL BEDS

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ABSTRACT

With the increasing wildland–urban interface and potential limitations on prescribed burning in the southeastern United States, the use of mechanical fuels reduction treatments are likely to increase. As these treatments are implemented, there are still few data regarding subsequent fire behavior in mechanically reduced fuels. Moisture desorption and fire behavior were both studied here in dense masticated fuel beds to understand the role of particle fracturing and high fuel bed bulk density. While common western U.S. shrub species were used in this study, these methods could be applied to explore similar fuel beds in southeastern forests. Drying rates (response time) did not differ between intact and fractured particles or pine dowels (control) when desorbing at the fuel bed surface, but these particles did respond much faster than did the entire fuel beds in which they were drying. Average response times of 10-hour particles (0.635 to 2.54 cm) at the surface of fuel beds ranged from 17 to 21 hours, while response time of entire fuel beds was 240 to 440% slower. Also, response time of fuel beds composed exclusively of fractured particles did not differ from fuel beds composed exclusively of intact particles. Fuel bed properties may be more important than particle-level properties in moisture dynamics in these dense fuel beds. Laboratory burning of masticated *Arctostaphylos manzanita* fuel beds under four fuel moisture content (FMC) treatments (2.5, 7, 9, and 11%) resulted in lower fire intensity and longer duration of flaming combustion under higher FMC, but duration of lethal heating at fixed positions above fuel beds did not differ across FMC. In addressing the effect of particle fracturing, fuel beds composed exclusively of fractured particles did not burn with greater intensity than fuel beds composed exclusively of intact particles across two shrub species (*A. manzanita* and *Ceanothus velutinus*) and two FMC treatments (5 and 13%). While particle-level fracturing did not increase fire behavior, masticated fuel beds did burn with sufficient fire behavior to induce long-duration heating that could ultimately lead to undesired fire effects. Fully understanding subsequent fire behavior and effects in mechanically altered fuels in southeastern forests will enhance managers' abilities to make decisions regarding the use of such treatments to mitigate potential fire hazard.

Keywords: fire behavior, fire effects, fuel moisture, fuels treatments, mastication.

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