Mechanical Mastication as a Fuels Treatment Method in Pine Flatwoods

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ABSTRACT

As the wildland-urban interface area in the southeast grows, the threat to communities from wildfire becomes more widespread. The use of prescribed fire to reduce this threat becomes more challenging. Mechanical treatments may be employed to alter fuel complexes prior to or as an alternative to prescribed burning. We are currently studying the effectiveness as well as the potential consequences of mechanically masticating understory shrubs and small trees in pine flatwoods of the Okefenokee National Forest, Florida, USA.

METHODS

Mechanical mastication of understory shrubs and small trees (<20 cm diameter) is being conducted using a crown cutting operation at the Fire Research and Education Center in northern peninsular Florida, USA. The sites being masticated are primarily in pine flatwoods ecosystems dominated by slash (Pinus elliotii) and longleaf pines (P. palustris) and pines. These plots are 100 m × 100 m and 20 m × 20 m in size. Geophysical monitoring is being conducted to determine the effectiveness of this treatment method.

BACKGROUND

Fire is an important ecological process in many forest ecosystems of the southeastern United States and the maintenance of these ecosystems is often conducted with the use of prescribed burn. But as the spatial area occurring within the wildland-urban interface (WUI) increases, it will become more difficult to use prescribed fire not only to maintain fire-dependent ecosystems but also to mitigate threats associated with wildfire through the manipulation of fuel complexes. As prescribed burning becomes more difficult to employ, the mechanical treatment of fuels is likely to increase as an alternative to prescribed burning or as a pre-treatment option in conjunction with prescribed burning. While mechanical treatments increase fuel loads, they may also reduce the effectiveness of some of the objectives of prescribed burning. This is why we are investigating the efficacy of mechanical mastication in pine flatwoods ecosystems to better understand how surface fuels are affected by this method.

OBJECTIVES

Our primary objectives are to:
1. Characterize the resulting fuel complex created from the mastication of southern pine flatwoods.
2. Assess vegetation dynamics following mastication treatments.
3. Quantify fire behavior and potential fire effects in these unique fuelbeds.

PRELIMINARY RESULTS AND DISCUSSION

Preliminary results indicate an increase in loading biomass of small diameter (<7.6 cm) woody surface fuel, but a reduction in both surface woody fuel height and surface litter depths. While surface litter depths appear reduced we do not have results of the change in biomass of surface litter as we are currently developing equations to quantify biomass from litter depth in post-treatment fuelbeds. While litter depth may be decreasing in masticated fuelbeds, it is visually apparent that litter biomass has increased since heavy accumulations of litter, especially from saw palmetto, are visible. An increase in surface fuel loading in conjunction with a decrease in fuel bed height results in high fuel bed bulk density. Vertically oriented live fuels (shrub) are being converted into a compact, horizontally oriented fuelbed composed of dead litter and small diameter wood.

Our preliminary data from the burning of constructed fuelbeds are giving us some indication of how these fuelbeds may burn under various post-treatment fuel loadings that may result from the mastication of sites with a range of live biomass prior to mastication. Maximum flame heights, for example (Fig. 3), have been shown to be affected by different fuel loading treatments (p<0.01) and different fuel moisture treatments (p=0.006) and ranged from 25 to 140 cm. Temperature profiles appear to all take the general shape of that indicated in the example from a low FMC burn with 30 MWh (Fig. 3). Temperatures peak above the fuelbed (Fig. 6) for a relatively shorter duration. A small heating front moves across the fuel bed and the magnitude of the heat pulse decreases with height above the fuelbed. In contrast, soil heating (Fig. 6-8) shows a delayed heating response compared with that above the fuelbed and that the retention of this heat lasts longer as soil salles remain cool both at the soil surface and cooler. With these temperature data we intend to analyze the duration of occurrences of various temperatures to help us understand how energy released from the burning of these fuelbeds might induce heating to grow plant tissue (tree cambium, tree roots, shrub underground storage organs, etc.). A better understanding of the effectiveness, longevity, and potential consequences of these treatments will help land managers to better assess the usefulness of mastication as a fuels management tool in these ecosystems.