Reducing Fuel Hazards using Mechanical Mastication in the Wildland-Urban Interface

Machine mastication holds promise as a fuel treatment option in situations where prescribed fire is not possible due to wildland-urban interface (WUI) concerns but also as a prescribed fire fuelbed preparation treatment.

One of the most expensive elements of fuel hazard reduction in the wildland-urban interface (WUI) is the treatment of small diameter trees. Mechanical mastication treats these fuels in place making it a cheaper treatment compared to other options such as manual slashing and pile burning, slashing and chipping or mechanical thinning and removal.

Photos: Richy Harrod

Before (left) and after (middle) images of a masticated stand on the Okanogan-Wenatchee National Forest in central Washington State. Note the thinned aerial fuel component of the stand as well as the pulverized large fuels in the foreground. A typical masticated fuel bed (right) showing the high variability of particle size.

Mastication is the on-site pulverizing or chopping of standing trees and logs into small particles. Unlike chipping, masticated particles are not uniform in size (Figure 1) and trees do not need to be dragged to a chipping machine. Equipment used for mastication treatments over the past several years include the hydro-axe, slashbuster, a rotary brush cutter and ProMac with prime movers including various rubber-tired and tracked machines (Figure 2).

From a fuel management perspective, the goal behind machine mastication is to reduce the aerial fuelbed by removing aerial fuels and adding them to the surface fuel layer. In most situations, the target stand is thinned resulting in an increase in the canopy base height and a decrease in the canopy bulk density–both are critical factors in the initiation and propagation of crown fires (Figure 3). These fuelbed changes are critical in the WUI where a fast travelling crown fire can destroy a lot of property in a very short period of time.

The masticated fuelbed, if left to decompose without prescribed fire, does constitute a burn severity threat before the material decomposes. While there are no studies detailing decomposition rates of masticated fuelbeds, a useful proxy are either moderate loading natural forest fuels or slash fuels. A recent study published by the USDA Forest Service in Montana found that decomposition rates are highly correlated with soil moisture. (A higher moisture content equals a higher decomposition rate.) The author found the lowest rates associated with low elevation, south facing forests with high canopy cover (Keane 2008).

The primary wildfire concern with a masticated fuelbed, similar to a deep duff fuelbed, is the chance of prolonged, smoldering combustion at moderate to high temperatures which negatively affects soil biota, structure, and chemical composition. Burn severity studies in masticated fuels show that burn severity decreases with reduced fuelbed depth and increased soil moisture (Busse et al. 2005). Keeping fuelbed depth in mind when masticating can greatly reduce wildfire concerns.

Mastication equipment can also be used to alter surface fuel layers by reducing the average size of fuel particles, thereby increasing decomposition rates and/or simplifying subsequent prescribed fire operations. Some mastication equipment is useful in grinding/pulverizing surface fuels into much smaller particles.

Mechanical mastication is not new. It has been used extensively in shrub fuel complexes such as chaparral in southern California and mixed hardwood/shrub in Florida, Georgia, and Alabama. In the Pacific Northwest, it has been used extensively for powerline and highway right-of-way clean-up. In the mid-80s the equipment was also used in the East



Viewpoints

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Photo: John Przeczek

This hydro-axe is one of the machines used to masticate standing trees and logs into small particles.

Kootenay area of British Columbia to extend the density of treatable post-fire lodgepole pine stands for juvenile spacing.

Machine mastication serves two purposes. As a stand alone treatment, it is particularly good in ecosystems with inherently high decomposition rates such as the warm, moist ecosystems of southern Vancouver Island, the Gulf Islands, the Coast-Interior Transition Zone and the west Kootenays. In dryer ecosystems, it is best used as an initial treatment to prepare a fuelbed for subsequent prescribed burning operations. In this configuration, it can significantly simplify prescribed burn operations.

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