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Effect of brush mastication and prescribed fire on mycorrhizas and hypogeous fungi in mixed hardwood chaparral

Jessica Donohue, Jonathan Frank, Darlene Southworth, Department of Biology, Southern Oregon University, Ashland, OR; Jennifer Gibson, National Park Service, Whiskeytown National Recreation Area, CA

The need to reduce fire risk at the wildland-urban interface while minimizing impacts to ecosystems is a challenge for land managers, especially in fire-prone areas of the western United States. Brush mastication is attractive as a fire surrogate because it is cost effective and quick and avoids problems with limited burn windows. However, the dense layer of chipped debris that results from mastication alters soil moisture conditions and increases fire severity when burned. The goal of this project was to evaluate the effect of brush mastication and burning on the belowground ectomycorrhizal community and on hypogeous fungi associated with conifers and hardwoods in a mixed oak shrubland. We hypothesized that (i) brush mastication would lead to greater abundance and species richness of ectomycorrhizas and hypogeous fungal fruit bodies, (ii) burning without mastication would not reduce the mycorrhizal community, but would decrease the hypogeous sporocarps, and (iii) brush mastication followed by burning would decrease abundance and species richness of both ectomycorrhizas and hypogeous fungal fruit bodies. Experimental treatments included masticated debris and standing chaparral both with and without burning. Roots were sampled at the drip line of pines and oaks. Mycorrhizas were described by morphology and DNA sequencing of the ITS region. Mycorrhizal density was greater in the upper 0-10 cm than in the lower 10-20 cm of soil. Abundance of mycorrhizas per soil volume decreased following brush mastication and burning. Species richness of mycorrhizas decreased following mastication, and increased slightly following burning. Species richness of hypogeous fungi, sampled by scuffling the soil surface, increased following mastication, but decreased with burning of masticated debris. This study provides valuable information on the relationships between belowground mycorrhizal fungi and fire surrogate treatments.