

Abstract

Microbial response to high severity wildfire in the
southwest United StatesSteven T. Overby^a, Stephen C. Hart^b, Gregory S. Newman^b, Dana Erickson^a^a Rocky Mountain Research Station, 2500 S. Pine Knoll Dr., Flagstaff, AZ 86001, United States^b School of Forestry, POB 15018, Northern Arizona University, Flagstaff, AZ 86011-5018, United States

Keywords: Microbial community structure; PLFA (phospholipid fatty acid); CLPP (community-level physiologic profile)

Southwest United States ponderosa pine (*Pinus ponderosa* Dougl. ex Laws) ecosystems have received great attention due to fuel conditions that increase the likelihood of large-scale wildfires with severe fire behavior. The fire season of 2002 demonstrated these extreme fuel load conditions with the largest fires in southwest history. The Jemez District of the Santa Fe National Forest, New Mexico experienced a wildfire (Lake Fire Complex 08/26/02 to 09/01/02) that consumed one complete replicate block that was part of the nationwide Fire/Fire Surrogate (FFS) project. This event provided a unique opportunity to investigate wildfire effects on soil, and associated microbial populations. Pre-treatment sampling completed prior to the wildfire allowed resampling of the exact sites to investigate immediate post-fire effects. Soil microbial functional diversity and biomass were determined from the top 5 cm of mineral soil. Virgin Mesa and Tusa Tank FFS control and burn only blocks were used as controls since

they had not been treated. We predicted that due to the direct impact of heating, that the high severity wildfire would reduce the size of the microbial biomass and possibly favor bacteria over fungi because of the apparent greater sensitivity of fungi to heat. We also expected that wildfire would not only alter the quantity of available C, but it would also change the quality of C remaining in the soil, and these two factors would alter the physiological capacity of the microbial community. Community level physiological profiles (Biolog), and laboratory estimates of C and N transformations suggest that there was a large change in the function of the soil microflora following a high-severity burn. Phospholipid fatty acid (PLFA) analysis of the microbial population shows significant decrease in the fungal and bacterial populations in the 0–5 cm layer of soil immediately following the fire. Wildfire resulted in a reduction in the size of the microbial biomass and a change in its functional and structural composition.