2008 IAWF Abstract for POSTER SESSION

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A comparison of severe fire and bark beetle disturbance effects on soil nitrogen dynamics of the Greater Yellowstone Ecosystem.

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The dominant components of the disturbance regime within western subalpine forest landscapes are fires and bark beetle (*Dendroctonus* spp.) outbreaks. Together, these disturbance types have affected approximately 80% of Yellowstone National Park over the past four decades, as well as large areas of the Greater Yellowstone Ecosystem (GYE). In addition to large changes in seral stage, stand structure, and spatial heterogeneity induced by these disturbance types, there are also significant alterations to soil nutrient dynamics. Fire and beetle disturbances differentially affect ecosystem pools such as foliar litter, organic soil, and aboveground biomass, which in turn create the potential for unique responses in soil nitrogen cycling following disturbance. To characterize these differences, we first describe the unique effects of each disturbance type on a suite of ecosystem pools important to the nitrogen cycle within lodgepole pine (*Pinus contorta var. latifolia* Dougl.) forests. Then, we examine soil nitrogen data from a post-fire time series and a post-mountain pine beetle (*Dendroctonus ponderosae* Hopkins) chronosequence to compare the responses of the lodgepole pine ecosystem to these different disturbance types. We find that despite differing and even sometimes opposite effects on tree mortality, litter depth, and organic soil mass, there are qualitatively similar responses of soil N availability following each disturbance type, namely a sharp increase in available ammonium following disturbance. However, the magnitude and duration of this response differs by disturbance type, being much larger and shorter-lived following fire, and smaller but longer-lived following bark beetle outbreak. Understanding how post-disturbance soil N dynamics are altered in this system has important consequences for regeneration, nutrient retention, and other ecosystem services.

Key Words: lodgepole pine; soil nutrients; time series; chronosequence

Word count: 297; 2138 characters with spaces