Influence of host tree species on ecosystem response to bark beetle outbreaks in subalpine forests of the Greater Yellowstone Ecosystem

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Western subalpine forest landscapes are currently experiencing simultaneous outbreaks of multiple bark beetle species, each specialized to attack a particular host tree species. Some effects of bark beetle outbreak on forests (e.g. host mortality, forest structure, and biomass fluxes such as litterfall) are similar across multiple host-insect pairings. However, undisturbed forests of each host-tree species have unique biogeochemical profiles which may influence ecosystem response to outbreak. A conceptual model comparing potential biogeochemical consequences of outbreaks of mountain pine beetle (*Dendroctonus ponderosae* Hopkins) and Douglas-fir beetle (*Dendroctonus pseudotsuga* Hopkins) in lodgepole pine (*Pinus contorta* Dougl.) and Douglas-fir (*Pseudotsuga menziesii*) forests was developed. Hypotheses generated from this model suggest that differences in litter quality and pre-disturbance soil characteristics will result in host-specific changes to soil nitrogen availability and cycling rates following disturbance. Field measurements of insect activity and host mortality were conducted in the Greater Yellowstone Ecosystem (GYE) from 2006-2007 to confirm the similarity of both outbreaks. In 2007, a chronosequence approach was adopted to measure soil nitrogen dynamics in post-beetle lodgepole pine forests, and a similar effort will begin in post-beetle Douglas-fir stands in 2008. Initial data are presented on the effects of bark beetles on stand structure for both host tree species, and on soil nitrogen availability across the chronosequence of post-outbreak lodgepole pine. Results from this study will increase the ability to identify potential feedback mechanisms on post-outbreak soil fertility, regeneration, and herbaceous diversity, as well as provide comparisons to the biogeochemical changes induced by other disturbance types in these forests. Elucidating these patterns is key to understanding the functional consequences of insect disturbance in western coniferous landscapes.

Key Words: lodgepole pine; Douglas-fir; soil nitrogen; chronosequence

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