

Explaining broad-scale infestation patterns of three bark beetle species in the Greater Yellowstone Ecosystem

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ABSTRACT

The Mountain Pine Beetle (*Dendroctonus ponderosae*) has reached epidemic conditions in many parts of the intermountain West, affecting more than 400,000 ha of lodgepole (*Pinus contorta*) and whitebark pine (*P. albicaulis*) stands. Other species of bark beetles, namely spruce beetle [*Dendroctonus rufipennis*], Douglas-fir beetle [*Dendroctonus pseudotsugae*] are also showing increased populations in many parts of the Greater Yellowstone Ecosystem (GYE). Although infestations primarily occur in mature stands, the complete suite of factors that explain the presence and severity of bark beetle damage are unknown. The objective of this study was to determine the factors that explained the broad-scale patterns of damage and mortality caused by the three species of bark beetles in the GYE. We used broad-scale field surveys to determine 1) forest attributes (composition, % mortality, serotiny for lodgepole pine); 2) stand structure (density, diameter, and age); 3) presence and damage by bark beetles; 4) soil characteristics; and 5) site conditions (elevation, slope, aspect, site index, surficial deposits, etc.) in lodgepole pine, whitebark pine, Douglas-fir (*Pseudotsuga menziesii*), and Engelmann spruce (*Picea engelmannii*) stands that were either severely damaged or undamaged by the beetles. Logistic regression analysis was used to relate bark beetle damage to the biotic and abiotic explanatory variables. Analyses were performed for all species of beetle together as well as for each species individually. These results will help understand and hopefully predict at a landscape scale the factors that make host stands susceptible to bark beetle infestations.