AN ABSTRACT OF THE THESIS OF

Jennifer Sarah Powers for the degree of <u>Master of Science</u> in <u>Forest Science</u> presented on <u>January 18</u>. Title: <u>Spatial and Temporal Dynamics of the Douglas-fir Bark Beetle</u> (*Dendroctonus pseudotsugae*, Hopk.) in the Detroit Ranger District, Oregon: a Landscape Ecology Perspective.

Abstract approved:

Phillip Sollins

I developed a conceptual model of Douglas-fir bark beetle dynamics and associated host mortality across spatial and temporal scales. I proposed that a hierarchy of factors influence host resistance to attack at different spatial scales. I then tested this model by measuring the association between the occurrence of beetle-kill and different factors that might render trees more susceptible to attack at different spatial and temporal scales. At a stand level, there was not a strong relationship between death by the beetle and resistance to attack measured by tree growth rate prior to attack. Furthermore, tree growth rates were influenced by stand basal area but not by other site level factors such as aspect, elevation, total annual solar radiation, or potential evapotranspiration. At the landscape scale there were strong associations between the occurrence of beetle-kill and i) portions of the landscape that were potentially drier and received more solar radiation, and ii) portions of the landscape that had more mature and old-growth conifer vegetation. The distribution of patches of beetle-killed trees with respect to other patches was aggregated at the scales of approximately 1 and 4 kilometers. There was no significant relationship between the occurrence of beetlekill and linear landscape features such as road and stream networks and vegetation boundaries. Statistical analysis of the long term records of beetle-kill showed that beetle epidemics were related to the occurrence of windstorms and drought at certain spatial scales. The original conceptual model assumed that the strength of the relationships between the presence of beetle-kill and explanatory variables across all

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spatial and temporal scales was similar. These results showed that landscape scale phenomena and temporal patterns were more strongly correlated with beetle-kill events than physiological interactions at the scale of individual trees.

Spatial and Temporal Dynamics of the Douglas-fir Bark Beetle (Dendroctonus pseudotsugae, Hopk.) in the Detroit Ranger District, Oregon: a Landscape Ecology Perspective

by

Jennifer Sarah Powers

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APPROVED:

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Jennifer Sarah Powers

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