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AN ABSTRACT OF THE THESIS OF

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Title: Factors Determining Species Composition of Post-Disturbance Vegetation Following Logging and Burning of an Old Growth Douglas-fir Forest

Abstract approved: _____
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I investigated how the factors that affect the contribution of propagules from the seed bank, bud bank and seed rain influenced the initial vegetation following logging and slash-burning of an old growth Douglas-fir forest at 800 m elevation located in the western Cascades of Oregon.

Permanent field plot data showed species composition and density of establishing vegetation differed greatly between the first and second year after disturbance. This difference was caused by a shift in the relative contribution of propagule sources, which generally differed in species composition. Vegetative propagules of old growth species dominated the first year (67%) and dispersed seed of early successional species dominated the second year (98%).

Seedling emergence from field soil samples placed in a greenhouse showed early successional species dominated the old growth seed bank, which included 88 seeds/m^2 and 11 species; the disturbed

seed bank density was significantly reduced to 18 seed/m^2 with 6 species.

To further investigate the effect of heat on seed bank density, a laboratory study assessed the effect of experimental heat treatments on the germination of six old growth seed bank species. With one exception all species had the same response to heat treatment: at 50C germination was not reduced; at 100C germination was significantly reduced; and, at 75C, germination was significantly reduced in the wet soil, but not in the dry soil.

Of the pre-disturbance species on the permanent field plots, 89% have the ability to sprout after disturbance. These species constitute the potential bud bank.

Seedling emergence from soil seed traps placed at the field site showed the seed rain of the second year was dominated by early successional species.

To investigate why so few old growth species regenerated from dispersed seed, seed reproduction, seed viability, dispersal rates and emergence rates were examined for three old growth understory species, Berberis nervosa, Linnaea borealis and Gaultheria shallon. Although B. nervosa had the highest cover, it produced no seeds in the year of study. The seed production (227 seeds/m^2) of G. shallon was much greater than that of L. borealis (4 seeds/m^2). The density of dispersed seed of G. shallon, the only species to disperse seed into the old growth (18 seeds/m^2) and into the disturbed site (6 seeds/m^2), was much less than the density of seeds produced. None of the three species emerged from seed experimentally sown in the disturbed site. Thus, if similar patterns of low seed production,

low seed viability, low dispersal and establishment rates hold for other old growth understory species, regeneration from dispersed seed will be necessarily slow immediately after disturbance.

Both the low potential of the seed bank and the greater potential of the bud bank contributed to the dominance of old growth species from vegetative propagules in the first year's establishment. The reduction of the bud bank propagules after the first year's establishment, the low regeneration of old growth understory species from dispersed seed and the on-site dispersal of early successional species that colonized the first year contributed to both the greater density of vegetation establishing the second year and the dominance of early successional species.

Factors Determining Species Composition of Post-disturbance Vegetation Following Logging and Burning of an Old Growth Douglas-fir Forest

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