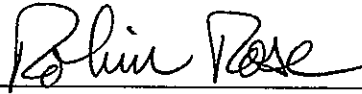


## AN ABSTRACT OF THE DISSERTATION OF

Fen-Hui Chen for the degree of Doctor of Philosophy in Forest Science presented on November 19, 2004.

Title: Effects of Weed Control on Vegetation Dynamics in Pacific Northwest Conifer Plantations

Abstract Approved: \_\_\_\_\_



Robin Rose

Weed control in Pacific Northwest forests has been criticized for its potential impact on biodiversity. Changes were evaluated in conifer growth, diversity of vegetation in situ and of recruiting plants through different regeneration mechanisms after applying temporally-varied weed control by herbicide treatments based on the critical period concept. Conifer size and vegetative surveys were conducted for up to four years post-treatment in four sites planted with four conifer species.

Increasing volume, diameter, and height and decreasing height/diameter ratio for all conifer species with increasing years of weed control indicated that conifer seedling growth would benefit from longer weed control. Survival did not differ by herbicide treatment.

Weed control caused up to a 90% decrease in total vegetation cover and significant decrease in plant diversity (species richness and Shannon's index) for all treatments. Total cover and plant diversity recovered steadily once herbicide application stopped. Species richness results of herbs, the dominant growth form, were similar to those of total species richness. However, shrub species richness usually did not vary by treatment. Our results suggested repeated herbicide application may be harmful to species richness of some families (e.g. Rosaceae) and native species. Therefore, forest managers should minimize the time period of repeated applications to reduce harming noncrop species.

The abundance and species diversity of regenerating individuals from three regeneration mechanisms (seed bank, seed rain, and bud bank) were measured for up to three years post-treatment. Potential germinable seeds for the seed rain were the largest among mechanisms for all treatments. Herbicide application had significantly reduced the abundance for all mechanisms. Plant diversity results were similar to those of abundance but less significant. Nevertheless, treatment in the previous year usually had more influence on the results for seed bank and seed rain than in the sampling year, but bud bank results were affected mainly by treatment in the sampling year. More native species than exotic species were recorded within the same treatment for bud bank, but less native species for seed bank and seed rain. Both native and exotic species richness decreased after spray for all regeneration mechanisms.