

Old-growth structural attributes in managed forests: Is there a vision?

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INTRODUCTION

Management of forested landscapes for biological diversity is a major objective across North America. Perhaps the greatest potential to diversify future forests lies in the vast areas of young second-growth stands, which may be managed silviculturally to accelerate ecosystem development. We designed this study to test several hypotheses related to large-scale pre-commercial thinning over a range of stand densities at ages 17–27 years. We hypothesized that such management over the 10-year period since treatment would enhance:

- productivity and old-growth structural features (crown volume, diameter, and height growth) of lodgepole pine (*Pinus contorta*) crop trees;
- stand structure attributes (species diversity and structural diversity of herb, shrub, and tree layers); and
- species richness and diversity of small mammal communities on the forest floor.

MATERIALS AND METHODS

Study areas were located near Penticton, Kamloops, and Prince George in south-central British Columbia. Each study area had three stands thinned in 1988 to densities of about 500 (low), 1000 (medium), and 2000 (high) stems per hectare, with an unthinned juvenile pine and old-growth pine stand for comparison. Understorey vegetation was measured in all stands in 1990, 1993, and 1998. Stand structure (coniferous tree layers) was measured in 1998. Small mammal populations were sampled intensively in 1990, 1991, and 1998.

RESULTS AND DISCUSSION

Mean diameter increments of trees in the low-density stands were significantly higher than those in the medium- and high-density stands at all study areas. Mean height increments of trees were similar among stands. Trees in both the low- (42.3 m³) and medium-density (42.9 m³) stands had greater crown volumes than those in the high-density (27.3 m³) and unthinned (12.5 m³) stands. No difference in the volume of coarse woody debris on the forest floor was evident among stands.

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Crown volume index (biomass) of herbs was highest in the thinned stands by 1998, but no difference existed among stands for shrubs and trees; mosses were highest in the old-growth stands. Mean species richness and diversity of herbs, shrubs, and trees were similar among stands at 2, 5, and 10 years after thinning. However, mean species diversity and structural diversity of coniferous trees were significantly higher in the low- and medium-density stands than in the high-density and unthinned stands 10 years after thinning. Total structural diversity of all vegetation in the low-density stands was significantly greater than that of the medium-density, unthinned, and old-growth stands in 1998.

Mean abundance of red-backed voles (*Clethrionomys gapperi*) was consistently higher (2.1–3.3 times) in the old-growth than unthinned stands, and this value was higher than those in the thinned stands in 1998. Mean numbers of deer mice (*Peromyscus maniculatus*) were highest in the unthinned and high-density stands in 1990–1991, with no differences among stands in 1998. Northwestern chipmunks (*Tamias amoenus*) were at similar numbers among stands in 1990–1991 and at higher numbers in the low- and medium-density stands in 1998. Voles (*Microtus* spp., *Phenacomys intermedius*) and shrews (*Sorex* spp.) had similar mean numbers among treatment stands. Mean abundance of short-tailed weasels (*Mustela erminea*) was higher in the low-density stands than high-density, unthinned, or old-growth stands in 1990–1991, with no difference among stands in 1998. Mean species richness and species diversity of small mammals were highest in the low-density and medium-density stands.

Heavily thinned lodgepole pine stands appear to develop some old-growth structural attributes, such as large diameter trees, crowns, and structurally diverse vegetation understoreys. Small mammal communities on the forest floor appear to reflect the compositional and structural diversity of these managed stands. Replicate study areas covering three forest ecological zones have achieved these results. A snag creation program is required in these stands to provide habitat for cavity-using species. Responses of other species groups to these “old-growth” attributes should be monitored.

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