

Small mammals and stand structure in young pine, seed tree, and old-growth forests in southern British Columbia

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INTRODUCTION

Alternative silvicultural systems to clearcutting are receiving considerable attention in the Pacific Northwest forests of North America. Understanding the implications of these harvesting systems on stand structure and biodiversity through time is a fundamental aspect of forest ecosystem management. This study was designed to test the hypotheses that:

1. stand structure attributes (species diversity and structural diversity of herb, shrub, and tree layers) will increase from young pine to seed-tree to old-growth forest; and
2. as a measure of wildlife habitat diversity, species richness and diversity of small mammal communities on the forest floor will increase in a similar manner.

MATERIALS AND METHODS

The study area was within mixed Douglas-fir (*Pseudotsuga menziesii* var. *glauca*)–lodgepole pine (*Pinus contorta* var. *latifolia*) forests within the Montane Spruce biogeoclimatic zone near Summerland in south-central British Columbia. This retrospective study had three replicate stands each of 17-year-old “young pine” (clearcut harvested), “seed-tree” composed of young pine with Douglas-fir seed-trees, and uncut “old-growth” composed primarily of Douglas-fir and lodgepole pine. Stand structure (coniferous tree layers) and understorey vegetation (moss, herb, and shrub-deciduous tree layers) were measured in each stand. Habitat diversity was measured by the species richness, species diversity, and structural diversity of these vegetative layers. Small mammal communities on the forest floor were sampled intensively from 1995 to 1997 in all stands.

RESULTS AND DISCUSSION

Mean total percent cover and crown volume index of herbs and mosses were similar among treatment stands. These measurements for shrub and deciduous tree layers were highest in young pine stands and lowest in old-growth stands. Mean species richness of herbs and coniferous trees was similar among treatment stands, but for shrubs and deciduous trees it was highest in the young pine stands. Mean

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species diversity in the herb and shrub-deciduous tree layers was similar among treatment stands, but for coniferous trees was higher in the seed-tree and old-growth stands than in the young pine stands. Mean species richness of height classes in herb and shrub-deciduous tree layers appeared consistently highest in the young pine, but for coniferous trees was highest in the seed-tree stands. Mean structural diversity of the shrub-deciduous tree layer was highest in the young pine and lowest in the old-growth stands.

Mean abundance of red-backed voles (*Clethrionomys gapperi*) was consistently higher in the old-growth stands than in young pine or seed-tree stands. Mean numbers of Northwestern chipmunks (*Tamias amoenus*), heather voles (*Phenacomys intermedius*), western jumping mice (*Zapus princeps*), montane shrews (*Sorex monticolus*), and common shrews (*S. cinereus*) were higher in the seed-tree or young pine stands than in the old-growth stands. Mean abundance of meadow voles (*Microtus pennsylvanicus*) was highest in seed-tree stands. Deer mice (*Peromyscus maniculatus*), long-tailed voles (*Microtus longicaudus*), and short-tailed weasels (*Mustela erminea*) had similar mean numbers among treatment stands.

Demographic parameters of survival and body mass of the major species were similar among treatment stands. Mean number of successful pregnancies was highest for red-backed voles in old-growth forest and for Northwestern chipmunks in seed-tree stands. Mean species richness and diversity of small mammals was higher in the seed-tree and young pine stands than in the old-growth stands.

Timber harvesting in mixed Douglas-fir–lodgepole pine forests should use the seed-tree system, which provides natural stand structure attributes to help manage the forest landscape for biodiversity objectives.

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