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The Long-term Effects of Pre-commercial Thinning on the Abundance of Small Mammals

Submitted by

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Background

In New Brunswick, Canada, the use of pre-commercial thinning (PCT) increased 2.3 fold between 1990 and 2003[1]. Given the large forest area treated with PCT, it is important to understand the effects of this silvicultural practice on wildlife, including small mammals. Small mammals have potential as indicators of sustainable forest management because they have important functional roles including; the dispersal of seeds, spores and propagules of vascular plants, bryophytes and fungi; the mixing of soil, decomposed organic matter, and litter; providing prey for many predators; and as consumers of plants and invertebrates[2, 3].Compared to other silvicultural practices, the response of small mammals to PCT is not well understood.

Small mammals are associated with elements of forest structure that can be altered by forest management. PCT can cause a number of structural changes that could affect small mammals, either positively or negatively. Pre-commercial thinning creates gaps in the overhead canopy cover, increases the amount of downed woody debris, and increases the amount of ground vegetation. Understory vegetation is one of the key factors affecting abundance of small mammals[3, 4, 5, 6]. Coarse woody debris is known to be important to small mammals on the forest floor because it can provide protective cover, travel ways, nesting and burrowing sites, moist microclimates and food in the form of fungi, plants, and invertebrates[6, 7, 8, 9, 10]. Although the size of the debris from thinning is smaller than CWD, with the large number of pieces together, it may provide these same benefits to small mammals.

Forest structure changes over time, so it is important to investigate the response of small mammals to PCT for several years following treatment to evaluate long-term ecological effects. Few studies have examined the temporal effects of PCT on small mammals. This project is one of several projects within a larger study evaluating the effects of PCT on various taxa.

Project objectives

1) To determine if pre-commercial thinning affects the abundance of various forest floor small mammal species.
2) Identify relationships between vegetation and stand structure variables and the abundance of small mammals in pre-commercially thinned and un-thinned sites.
3) Identify any relationships that may exist between observed response to PCT and small mammal body size.
4) Test for a relationship between small mammals and downed woody debris produced from thinning using experimental manipulations.

Project Design and Methods

I will examine the long term response of small mammals to PCT at 5, 10, and 20 years after thinning by comparing the abundance of small mammals in thinned sites to un-thinned control sites of the same age. I will also compare the abundance between different age categories for the thinned sites and un-thinned sites to determine how abundance may differ with time.

Capture techniques including; pitfall traps and Sherman live traps will be used to capture small mammals in each site. Abundance will be calculated using the number of captures per 100 trap nights in order to determine the use of thinned and un-thinned sites by small mammals.

All sites were clearcut and allowed to naturally regenerate. The PCT sites and corresponding control sites are similar with respect to age (time since clearcut) and forest type (Black Spruce dominant, Eco-site 2) but the control sites were not thinned. I will sample 10 replicates (based on a POWER test) of each age category for the thinned and un-thinned sites to ensure a large enough sample. Each site is sampled for 7 consecutive nights.

I will conduct experimental manipulations of downed woody debris in plantations where existing debris is minimal to test whether small mammals are associated with the small (≤10 cm) downed woody debris from thinning as they are with CWD. I will sample 3 replicates before and after small downed woody debris or CWD has been added to the site and 3 replicates of the control sites with no debris added.

Characteristics of the stand structure and ground vegetation including; % cover of ground vegetation, coarse woody debris (volume), number of stumps and snags, tree species, size, and height, and % canopy cover will be recorded in all sites. This information will be used to characterize the sites and to identify correlations between these variables the abundance of small mammals.

Progress to date

During the 2005 summer field season I sampled 16 sites. I captured a total of 567 individuals including; 102 red-backed voles, 266 shrews, 66 deer mice, 61 red squirrels, 28 flying squirrels, 12 woodland jumping mice and 32 eastern chipmunks.

Changes to project

I will no longer be using Tomahawk live traps to capture squirrels in the sites. The abundance of red squirrels (*Tamiasciurus hudsonicus*) in each site will still be documented by recording the number of squirrel calls heard in each site along the transect.

During the 2005 field season a systematic ground search was performed in each site to determine the abundance of salamanders. Depending on the success of initial sampling during the 2006 season this may not be continued due to very low detection rates during the 2005 season using this method.

I added the experimental manipulation of downed woody debris to the project for the 2006 field season. Given the importance of CWD to small mammals and the potential that the smaller debris from thinning may provide the same benefits to small mammals as CWD it is important that this be investigated.

Future work

Outstanding issues – Finding un-thinned control sites for the 2006 field season and scarified plantation sites for the experimental manipulation.

Current work – Planning for 2006 field work and identifying *Sorex sp.* captured in summer 2005.

2006 summer field season – I will be sampling the remaining sites and conducting the experimental manipulation of woody debris. I will be attending the SFMN conference in June to present a poster on my project.

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