

Management implications of forest dynamics, succession, and habitat relationships under differing levels of silviculture in New Brunswick mixedwood forests

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J.D. Irving, Limited

Fundy Model Forest



Presented by Canadian Model Forest Network and Fundy Model Forest

1:00 pm - 1:10 pm

Introduction**J.D. Irving, Limited, Fundy Model Forest & Sustainable Forest Management Network Research Program**

Dr. David MacLean, Dean, Faculty of Forestry and Environmental Management and President, Fundy Model Forest

1:10 pm - 1:30 pm

Effects of pre-commercial thinning on the abundance of herbaceous species

Keri La France, Masters student, UNB Faculty of Forestry and Environmental Management

Pre-commercial thinning (PCT) is an important tool in wood production and it is important to understand the impacts of this treatment on other ecosystem components. Herbaceous species are of particular interest because they play an important role in nutrient cycling and energy flow and represent the majority of plant species diversity in forest stands. The objectives of this project are: 1) to determine if environmental conditions and individual species abundance differ between PCT and unthinned stands; and 2) to determine if individual species response is influenced by the environmental characteristics associated with PCT. The study area included two areas in central New Brunswick, one area near Coles Island and the other in the Acadia Research Forest. PCT sites and unthinned controls were sampled along an age range of 16-42 years. Environmental conditions were measured at both the stand-level (CWD, stem density, diameter and tree height) and the quadrat-level (slash, substrates and ground disturbance). Visual estimates of percent cover for individual species included all vegetation <1m in height. PCT sites differed from unthinned sites in that they initially had lower stem density, fewer snags per hectare and increased slash cover. Despite these differences, analyses of individual species did not provide any compelling evidence to suggest that the initial or long-term pattern of species composition was different between the two treatments. Changes in species composition were more closely associated with increasing stand age rather than treatment, suggesting that the effects of PCT on herbaceous species do not exceed the range of natural variability found in these study areas.

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1:30 pm - 1:50 pm

Effects of pre-commercial thinning on forest bryophytes in managed stands: an evaluation of pre-commercial thinning in the Acadian Forest

A. D. Witkowski and K.A. Frego, UNB Saint John Department of Biology

The Acadian forest of New Brunswick, the interface between boreal and deciduous forests, supports a wide variety of bryophytes that are important in many aspects of the forest ecosystem. This primitive plant group is thought to be particularly sensitive to changes in their microhabitats and substrates, such as those caused by clear-cut forest harvest and subsequent tree-planting. Pre-commercial thinning (PCT) is a management approach whereby a clear-cut stand is allowed to regenerate naturally, and growth of target species is encouraged by removal of less desirable trees ("thinning") approximately 15 yrs after harvest. While this treatment reduces the mechanical substrate disturbance associated with site preparation and planting, it is difficult to predict the impacts of re-opening of the recovering tree canopy, addition of coarse wood and stumps, and decrease in trunks. This project compares bryophyte community characteristics of similarly-aged managed stands that have experienced PCT vs unthinned stands. Overall bryophyte composition was similar, and suggested less impact than other forest management scenarios. The implications of the relative impacts will be discussed in terms of other management practices and of the suites of species that differed between treatments.

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1:50 pm - 2:10 pm

Effects of pre-commercial thinning on small mammals

Julie Henderson, Masters student, UNB Faculty of Forestry and Environmental Management

Pre-commercial thinning (PCT) is a silviculture treatment used by forest managers to increase growth of desired tree species and enhance timber production. Although widely used, its effects on many taxa, including small mammals are not well understood. Given that maintenance of biodiversity is a goal of many forest managers, understanding the impacts of PCT on small mammals is important. PCT has the potential to affect small mammals by causing changes to within-stand forest structures such as woody debris, ground vegetation and canopy cover. The objectives of this project are to: 1) document differences in forest structures in pre-commercially thinned stands compared to unthinned stands 5, 10 and 20 years after treatment; 2) determine if PCT influences the abundances of small mammals and 3) identify which components of the forest stand structure are influencing small mammal abundance. We measured ground vegetation and stand structure variables and abundance of small mammals including, voles, mice and shrews in 27 pre-commercially thinned and 19 similar unthinned control sites. Small mammals responded in a species specific manner to treatment and stand development. Preliminary results suggest that PCT has a neutral effect on abundances of deer mice (*Peromyscus maniculatus*), masked shrews (*Sorex cinereus*), pygmy shrews (*Sorex hoyi*) and maritime shrews (*Sorex maritimensis*), while abundances of red-backed voles (*Clethrionomys gapperi*) and smoky shrews (*Sorex fumeus*) were lower in pre-commercially thinned sites. Relationships between stand structure variables and species abundance will be discussed.

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2:10 pm - 2:30 pm

Brown creeper response to experimental selection harvesting

Jean-François Poulin, Marc-André Villard and Samuel Haché

Chaire de recherche du Canada en conservation des paysages, Université de Moncton

A recent meta-analysis suggests that the Brown Creeper is one of the bird species most sensitive to partial harvesting in North America. In a previous study, the Brown Creeper was shown to exhibit a negative, threshold response to harvesting intensity. The first objective of this study was to determine whether (a) the threshold found in creeper occurrence (66 trees ≥ 30 cm dbh/ha) is lower than eventual thresholds in its nesting requirements, and (b) the conservation of this species can be achieved through moderate-intensity harvest systems. In northern hardwood stands, we compared habitat structure at nest sites and at sites not used by creepers at various scales. Habitat variables at the local scale accounted for the majority of explained variation in nest-site selection. We found significant thresholds in the densities of large trees and snags and in the area of untreated mature forest. The second objective consisted of quantifying the immediate post-harvest demographic response of this species to experimental single-tree selection. We monitored individuals and nests in 5 pairs of 25-ha sites (1 control; 1 treatment). The density of nests was significantly lower in harvested sites than in controls and the number of pairs encountered in the sites was also lower. The treatment did not have a significant impact on seasonal reproductive success, but fledging success of the first breeding attempt tended to be higher in control sites. Our results suggest that creeper response to the treatment is proximately linked to a decrease in the density of nesting pairs.

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2:30 pm - 2:50 pm

The effects of forest fragmentation on the survival, fecundity and movement ability of the northern flying squirrel in southern New Brunswick

Matt Smith, PhD student, UNB Faculty of Forestry and Environmental Management

The loss and fragmentation of habitat is considered an important threat to global biodiversity. The amount of mature forest in southern New Brunswick has declined 1-2% per year since 1993, and may be below the critical habitat thresholds required for some mature forest specialists. The northern flying squirrel (*Glaucomys sabrinus*) is often considered an indicator of older forests due to its preference for dead trees for shelter, larger trees for gliding, and diet of fungi associated with mature forests. In this study, we will collect population estimates for survival and fecundity using mark-recapture techniques. I predict that the survival and reproductive output of flying squirrels will be lower in highly fragmented landscapes vs. non-fragmented landscapes due to lower resource availability and increased movement outside of the patch. To better understand the effects of fragmentation on movement ability, we will track juvenile and adult movements using radio telemetry. I will study the movement ability of adult flying squirrels in two ways: 1) continuous monitoring of nightly movements within their home range; and 2) homing experiments in which adult flying squirrels are moved varying distances across different landscape structures from their home range and nightly movement patterns are recorded. The homing success and time taken to return home will be used to test the prediction that flying squirrels movements are more restricted in fragmented landscapes. The final outcome of this project will be the incorporation of the survival, fecundity and movement parameters into a population viability model to investigate the long term survival of flying squirrels under different forest management scenarios.

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2:50 pm - 3:10 pm

Afternoon Break

3:10 pm - 3:30 pm

Dynamics of mixedwood stands in Northwestern New Brunswick

Luke Amos-Binks, Masters student, UNB Faculty of Forestry and Environmental Management and Dr. David MacLean, Dean and Professor, UNB Faculty of Forestry and Environmental Management

Conversion of mixedwoods to agricultural fields, the northern migration of white-tailed deer, Eastern spruce budworm outbreaks (*Choristoneura fumiferana* Clem.) and forestry practices have all contributed to the current declined state of mixedwoods in the Acadian forest. Given the long fire return intervals and effective fire protection within the Acadian forest, the major disturbance regime is dictated by outbreaks of eastern spruce budworm. In order to improve the management of mixedwood forest in this region, a better understanding of the long term stand dynamics is required. The objectives of this project are 1) to determine patterns of natural stand dynamics from 1946-2006, based upon GIS data for a 189,000 ha landbase in northern New Brunswick, 2) to quantify changes in species composition in a selection of mixedwood stands using photo-interpretation of a sequence of aerial photos, and 3) to reconstruct the dynamics of sample stands representing the major natural mixedwood transitions from 1946-2006. Analysis of landscape and stand data has indicated high variability in temporal patterns of species composition, with a general shift towards increased hardwood content. Plots representing five different patterns of natural mixedwood transitions have been sampled to determine stand dynamics from 1946 to 2006. Reconstruction of sample stand dynamics will allow estimation of severity and duration of previous spruce budworm outbreaks and mortality, the resulting stand composition changes, and understory recruitment that has led to changes in species composition within stands. The combination of these data will provide information regarding the driving mechanisms behind the dynamics of mixedwood stands.

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3:30 pm – 3:50 pm

Incorporating bio-energy production into forest planning scenarios

Jean-Francois Carle, Masters student, UNB Faculty of Forestry and Environmental Management

In 2005, the government of New Brunswick (NB) commissioned a provincial Task Force to evaluate different land uses on Crown land. The mandate is to develop forest management alternatives that promote healthy wood supply, conservation of natural resources, and the use of renewable sources of energy. We are exploring the feasibility of biomass and bio-energy production under various forest management scenarios for all 3.3 million hectares of Crown land in NB. Objectives of this study are 1) to develop a framework using a wood supply model (developed by the Task Force) to provide optimal alternative scenarios to manage the forest for increased forest bio-energy production and sustainable timber supply and 2) to illustrate the area allocated to various forest management actions, stand types, habitats, vegetation communities, and a variety of socio-economic and environmental variables from applying this framework to Crown land over a 100 year planning horizon. The NB Growth and Yield Unit Database has been modified to calculate and forecast above-ground biomass as a function of tree size, species, and stand type, in addition to the currently projected timber volume. Spatial Woodstock forest modeling software and linear programming is being used to evaluate 12 bio-energy scenarios, with various objective functions (i.e. Maximizing Energy or Timber Production) and feedstock (i.e. harvest residues, pulpwood, and willow plantation). Scenario analyses will provide an effective framework to assist in land-use decisions by identifying trade-offs between forest values, and to evaluate feasibility and benefits of biomass and bioenergy production from Crown land in NB.

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3:50 pm - 4:10 pm

Forest zoning scenario effects on timber and non-timber values

Chris Ward, Masters student, UNB Faculty of Forestry and Environmental Management

Triad zoning results in forest management specialization where a specific and different set of values is managed for in each zone, to provide a full set of values at the forest level through the collective outcomes across all zones. Past research into zoning has focused primarily on timber supply outcomes, with little focus on the effects on social and environmental forest values. Here, thirteen forest value indicators were used to describe outcomes in social, economic and environmental terms. Thirty-six triad scenarios were forecast for one Crown license in New Brunswick using Remsoft's Woodstock forest modeling software. Area allocated to reserve and intensive zones were varied in 5% increments from 10-35%; the balance of area was allocated to the extensive zone. The intensive zone was composed of plantations of mainly spruce species, while no treatments were eligible in the reserve zone. Harvests designed to retain the composition and structures created by natural disturbance were conducted in the extensive zone. Results show that, on this license, the area of reserve can be increased without a reduction in the average annual harvest, but this requires a simultaneous increase in intensive management. Although some scenarios had very similar timber production possibilities, the forest conditions that were forecast varied greatly, and thus, so too did the levels attained for any individual social or economic indicator. This reveals that zoning affords managers much flexibility in providing benefits from the forest, but that efforts to increase the provision of some benefits will inevitably reduce the provision of others.

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4:10 pm - 4:30 pm

J.D. Irving, Limited: Incorporation of research results into forest management

Gaetan Pelletier, Management Forester, J.D. Irving, Limited

Continuing Education Credits:

Continuing Education credits have been assigned to the daylong Sept. 9 Silviculture/Forest Management Workshop which includes the above presentations.

The following credits have been assigned for the entire workshop: ARPFNB (17) and CIF (5.5)

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