Fundy Model Forest

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Report Title: The Relationship between Intensive Forestry and Cavity Nesting Birds. Project Summaries 1994, 1995, 1996

Author: S. Woodley

Year of project: 1996

Principal contact information:
Forest Ecologist
Natural Resources Branch
Canadian Parks Service
25 Eddy St.
Hull, Quebec
K1A 0H3
Phone: 1-819-994-2444

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The Fundy Model Forest…
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"The Fundy Model Forest (FMF) is a partnership of 38 organizations that are promoting sustainable forest management practices in the Acadian Forest region."

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Canadian Forest Service
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Conservation Council of New Brunswick
Fisheries and Oceans Canada
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Fundy Environmental Action Group
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University of NB - Saint John Campus
Village of Petitcodiac
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The Relationship Between Intensive Forestry and Cavity Nesting Birds
Project Summaries
1994, 1995, 1996

FUNDY
MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Fundy Model Forest
181 Aiton Road
Sussex East, NB E4G 2V5
Ph: (506) 432-2806
Fx: (506) 432-2807
Email: fundyfor@nbnet.nb.ca

Update Report - November 1994

The Relationship between intensive forestry and cavity nesting birds.

Stephen Woodley
Forest Ecologist
Parks Canada

Project Summary:

In managed forests, where the objective is even-aged, short-rotation stands, there is often a critical shortage of older, large trees to provide nest sites for cavity-nesting birds. There has been considerable research on this problem in the forests of northwestern North America, but almost no research in the Acadian forest. This research investigates the limitations of intensive forest management for populations of cavity-nesting birds in the Fundy Model Forest. The goal of the research is to develop an understanding of the relationship between intensive forest management and populations of cavity-nesting birds. The final outcome will be the development of prescriptions for forest management that would provide for viable populations of native cavity-nesting birds in an intensively managed forest.

The following questions are posed by this research:

1. Are populations of cavity nesting birds limited in intensively managed forests in the GFE.

2. Are species of cavity nesting birds limited by a lack of suitable cavities or is it due to another habitat factor.

3. Which forest management techniques might be used to provide useful nesting cavities. Forest management strategies

field researchers on site from May 1 until mid August, with additional personal when required. A total of 220 person days were spent on the following aspects of the project:

1. All ten research plots of 5 hectares were surveyed for foraging and nesting cavity nesting birds. Each plot was surveyed 6 times between late may and mid August. Standard spot-mapping protocols were used to assess densities of nesting and foraging birds. Any natural nests were recorded and nesting success determined.

2. All 120 artificial nesting cavities were checked throughout the period from March 30-Aug. 15. Active nests were closely followed to determine clutch size, nesting success and nest predation. Data was also collected on all species (e.g. mammals and insects) using the artificial cavities.

3. A survey was conducted in all 10 research plots on the densities of naturally occurring cavities. There were intensive surveys that counted all holes and recorded information on tree species, DBH, hole size, and hole height.

4. Detailed vegetation surveys were conducted on all 10 research plots. Information was collected on % cover, species present, stem densities, presence of coarse woody debris, vertical and horizontal canopy cover.

Is a lack of cavities limiting bird populations in the managed forest - An average of 13 % of artificial cavities were used in the managed forest, indicating a unsatisfied demand. One treatment had 25% of the artificial cavities used. However, use of the artificial cavities was almost all by 3 species of open-country birds - northern flicker, American kestrel and tree swallow. The only exception was one nest of boreal chickadees on the 18 year old plantation. We conclude that most cavity nesting birds do not use the managed forest because of other habitat factors than available nest sites.

Natural cavities don't appear to be limiting in the natural forest, especially in the budworm zone. The cavity survey showed an abundance of natural cavities and these were favoured. Only one artificial nest cavity was used in the reference forest.

In the 4 species that nested in the managed forest, reproduction does not seem to be impaired, as indicated by the reproduction rates recorded in the artificial cavities. No predation was recorded from the 14 nests studied.

The future:

We plan to run this study for at least one additional year. The 120 artificial nest are still in place and will be followed. In addition we plan to conduct additional survey work on the following:

- Increased concentration on surveying cavity nesting bird populations on sites where natural snag trees have been left. There are some excellent sites such as the large stands of maple that were killed by herbicide on the west side of Fundy National Park.

Fundy Model Forest
Interim Research Project Report 1995

The relationship between intensive forest management and cavity nesting birds.

Woodley, Stephen J.
Forest Ecologist
Natural Resources Branch
Canadian Parks Service
25 Eddy Street
Hull, Quebec
K1A OH3

Tel. 819-994-2446
Fax. 819-994-5140

Bill Freedman
Professor
Biology Department
Dalhousie University
Halifax
Nova Scotia
B3H 4J1

Tel. 902-494-3737
Fax. 902-494-3736

Project Summary:

The purpose of the Fundy Model Forest is to demonstrate landscape level forest management in which a range of values are obtained and respected. It is accepted that forest management should not compromise the maintenance of native biodiversity. This goal has been agreed to by the model forest partnership. A guild of species likely to be affected by intensive forest management is cavity nesting birds. Intensive forest management changes the landscape to a mosaic of younger age-class forests. Such forests have fewer older, decayed trees and thus tend to have fewer nesting cavities from decay, storm damage etc. A decline in the number of decayed trees will also tend to reduce woodpecker populations. Woodpeckers, as primary nesters, are an important agent to create cavities for other cavity nesters.

In managed forests, with even-aged short rotation stands, these is often a critical shortage of older, large trees to provide nest sites for cavity nesting birds. There has been considerable research on this problem in the forests of north western North America, but almost no research in the Acadian forest. Through this research, the Fundy model forest could provide useful guidelines for forest management throughout the Maritimes.

This research is investigating the limitations for populations cavity nesting birds in the managed forest. Research is being done in three ways (1) by comparing population densities of cavity nesters in managed vs. unmanaged forests; (2) by experimentally providing artificial cavities as a measure of cavity deficiency; and (3) by examining the importance of specialized silviculture techniques to provide cavity nesting sites.

Objectives:

Specific research objectives are as follows:

1. To determine if populations of cavity nesting birds are limited in intensively managed Acadian forests. Because cavity nesting birds cover a wide range of species, responses of individual species are anticipated to be variable.

2. To determine if species of cavity nesting birds that show reduced populations in the managed forest are limited by a lack of suitable cavities.

3. To determine the role of various forest management techniques in providing useful nesting cavities. Forest management strategies will include leaving snags, providing nest boxes, leaving remnant islands in clearcuts and use of different size clearcuts.

Project Description:

There are four related questions to be answered by this research.

1. Are populations of cavity nesting birds limited in intensively managed Acadian forests.

2. Are species of cavity nesting birds that show reduced populations in the managed forest limited by a lack of suitable cavities or is it due to another factor.

3. Which forest management techniques might be used to provide useful nesting cavities. Forest management strategies will include leaving snags, providing nest boxes, and leaving remnant islands in clearcuts.

4. Are there differences in the level of utilization by cavity nesters of edges versus the middle of clearcuts or plantation forests.

Work conducted in 1994

The following parts of the project were conducted in 1994:

1. Numbers of cavity nesting birds were counted using control versus manipulated habitat types. In 1994, we conducted 6 intensive surveys for cavity nesting birds in each of 10 plots, for a total of 60 surveys. In each plot numbers of cavity nesting birds using the plots for nesting or foraging were recorded. The resulting densities can be can be compared previous survey work in the Fundy area (e.g., Christie, 1993)

2. The use of the artificial cavities and reproductive performance of cavity nesters was measured in each of the 120 artificial cavities in 10 plots. At each plot, there were 4 replicates of 3 different sizes of cavities (small, medium and large). To examine the impact of edge and clear-cut size, one-half of the artificial cavities were established 30 meters from an edge and the other half were established 100 from an edge. We measured nesting success at cavities at different distances from edges to try and establish a relationship between use and clear-cut size.

3. The densities and types of natural cavities were surveyed on each of the 10 research plots. For each cavity tree located, information was taken on species, DBH, height, nest use and cavity opening.

4. The relationship between cavity nesting birds and vegetation was assessed at each plot by recording detailed data on vegetation data, including, species, cover and vertical and horizontal structure.

Our selected treatments were as follows:

Community Type	Number of Nest Boxes	Total
Treatment 1		
Control old softwood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 2		
Control old mixed wood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Control old mixed wood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 3		
15 - 20 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
15 - 20 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 4		
< 5 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
< 5 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 5		
5-10 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
5-10 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 6		
15 year old Jack Pine in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Total 6 treatments		**120 boxes**

Interim Results for 1994 field season

The data collected this summer has not yet been fully analyzed. However the following preliminary results are available:

1. 15 species of cavity nesting birds were recorded as either nesting or foraging in the research plots.

2. Most species of cavity nesters do not use clear-cuts or plantations up to 20 years of age, either for nesting or foraging. Only 5 of 15 species of cavity nesters were recorded using or nesting plantations less than 20 years old or clearcuts.

3. Approximately 10 % of artificial cavities are used in the managed forest, indicating a unsatisfied demand. In some young plantations 25 % of the cavities were used. However, only expected "open country" birds use the cavities in the managed forest - flickers, kestrels, swallows. Thus leaving snags after clearcuts would benefit these 3 species but be of no value to the other 11 species of cavity nesters.

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4. Reproduction of the four species of cavity nesting birds in clearcuts and plantations is in the managed forest is not impaired.

5. Natural cavity densities don't appear to be limiting in the reference forest, especially in areas impacted by spruce budworm.

The future

For 1995, we will continue to increased concentration on sites where natural snag trees have been left. We also plan to re-survey the 120 artificial cavities. In addition we will conduct density surveys in the locations listed below. Finally we will compile a list of trees species, sizes and conditions used by cavity nesters to pass on to management agencies.

Treatments for Survey of Densities of Cavity Nesting Birds

Using standard grid reference census techniques, each of the treatments listed below will be censused at least 6 times during the May 1 to August 1 period. Notes will be taken on bird presence, location, sex, age (e.g. adult or juvenile), behaviour (e.g. calling, display, foraging) and nesting. Where possible 20 ha. plots will be established using hip chain and flagging tape

1. reference forest - Laverty Corner, inside Fundy National Park
2. reference forest - Marvin Lake Road, inside Fundy National Park
3. 1988 black spruce plantation with pesticide killed yellow birch - west side of Fundy National Park
4. 1978 black spruce plantation - near Irving Tower, Shepody Road
5. 15 year old black spruce plantation with pesticide killed trees on the West side of the park
6. old selection cut - private land (Clark Phillips and Susan Tyler)
7. new selection cut - private land, near Sussex
8. natural regeneration, 30 years old - crown land, north west of park

seen as one of the most important biotechnological contributions of this century [Lemieux (1993)].

BIBLIOGRAPHY

Guay, E. Lachance, L. & Lapointe R.A. (1982) «Emploi des bois raméaux fragmentés et des lisiers en agriculture» Rapports techniques 1 et 2, Ministère des Terres et Forêts du Québec, Québec. 74 pages.

Guay, E. Lapointe, R.A. & Lemieux, G. (1991) «La restructuration humique des sols» Ministère des Forêts du Québec et Université Laval, ISBN 2-550-22289-X FQ91-3070 , 14 pages.

Koslowsky, G. & Winget, C.H.1964) «The role of reserves in leaves, branches, stems and roots on shoots and growth of Red Pine» Amer. Journ. Bot. **52**: 522-529.

Lemieux, G. (1993) «Le bois raméal fragmenté et la méthode expérimentale: une voie vers un institut international de pédogenèse» in Les actes du quatrième colloque international sur les bois raméaux fragmentés» édité par le Groupe de Coordination sur les Bois Raméaux, Département des Sciences forestières, Université Laval, Québec. (Canada) ISBN 2-550-28792-4 FQ94-3014, p. 124-138.

Lemieux, G. (1993) «A universal pedogenesis upgrading processus: RCWs to enhance biodiversity and productivity» Food and Agriculture Organization (FAO) Rome, ISBN 2-921728-05-2, 6 pages.

Lemieux, G. (1992) «L'aggradation des sols par le patrimoine microbiologique d'origine forestière» Escola Superior Agrária de Coimbra PORTUGAL, ISBN 2-550-26521-1 publication n°: FQ92-3099 10 pages.

Lemieux, G. & Goulet, M. (1992) «"Sylvagraire" und "Sylvasol", neue Wege zum Aufgradieren von Acker -und Waldböden. Düsseldorf, 4 pages.

Lemieux, G. & Tétreault, J.-P. (1993) «Les actes du quatrième colloque international sur les bois raméaux fragmentés» édité par le Groupe de Coordination sur les Bois Raméaux, Département des Sciences forestières, Université Laval, Québec (Canada) ISBN 2-550-28792-4 FQ94-3014, 187 pages.

Leisola, M.S.A & Garcia, S. (1989) «Lignin degradation mechanism» in «Enzyme systems for lignocellulose degradation» Galway, Ireland, Elsevier publication pp 89-99.

Seck, M.A. (1993) «Essais de fertilisation organique avec les bois raméaux fragmentés de filao *(Casuarina equisetifolia)* dans les cuvettes maraîchères des Niayes (Sénégal) in Les actes du quatrième colloque international sur les bois raméaux fragmentés» édité par le Groupe de Coordination sur les Bois Raméaux, Département des Sciences forestières, Université Laval, Québec (Canada) ISBN 2-550-28792-4 FQ94-3014, p. 36-41.

Swift, M.J. (1976) «Species diversity and structure of microbial communities» in J.M. Anderson & A. MacFaden editors *Decomposition processes* Blackwell Scientific Publications, Oxford, p. 185-222.

Toutain, F. (1993) «Biodégradation et humification des résidus végétaux dans le sol: évolution des bois raméaux (étude préliminaire)» in «Les actes du quatrième colloque international sur les bois raméaux fragmentés» édité par le Groupe de Coordination sur les Bois Raméaux, Département des Sciences forestières, Université Laval, Québec (Canada) ISBN 2-550-28792-4 FQ94-3014, p. 103-110.

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The Relationship between Intensive Forest Management and Cavity Nesting Birds

by Stephen J. Woodley

Fundy Model Forest
Research Project Report 1996

The relationship between intensive forest management and cavity nesting birds.

Woodley, Stephen J.
Forest Ecologist
Natural Resources Branch
Canadian Parks Service
25 Eddy Street
Hull, Quebec
KIA OH3

Tel 819-994-2446
Fax 819-994-5140

Bill Freedman
Professor
Biology Department
Dalhousie University
Halifax
Nova Scotia
B3H 4J1

Tel 902-494-3737
Fax 902-494-3736

Project Summary:

The purpose of the Fundy Model Forest is to demonstrate landscape level forest management in which a range of values are obtained and respected It is accepted that forest management should not compromise the maintenance of native biodiversity This goal has been agreed to by the model forest partnership A guild of species likely to be affected by intensive forest management is cavity nesting birds Intensive forest management changes the landscape to a mosaic of younger age-class forests Such forests have fewer older, decayed trees and thus tend to have fewer nesting cavities from decay, storm damage etc A decline in the number of decayed trees will also tend to reduce woodpecker populations Woodpeckers, as primary nesters, are an important agent to create cavities for other cavity nesters

In managed forests, with even-aged short rotation stands, these is often a critical shortage of older, large trees to provide nest sites for cavity nesting birds There has been considerable research on this problem in the forests of north western North America, but almost no research in the Acadian forest

This research is investigating the limitations for populations cavity nesting birds in the managed forest Research is being done in three ways (1) by comparing population densities of cavity nesters in managed vs unmanaged forests; (2) by experimentally providing artificial cavities as a measure of cavity deficiency; and (3) by examining the importance of specialized silviculture techniques to provide cavity nesting sites

Objectives:

Specific research objectives are as follows:

1 To determine if populations of cavity nesting birds are limited in intensively managed Acadian forests Because cavity nesting birds cover a wide range of species, responses of individual species are anticipated to be variable

2 To determine if species of cavity nesting birds that show reduced populations in the managed forest are limited by a lack of suitable cavities

3 To determine the role of various forest management techniques in providing useful nesting cavities. Forest management strategies will include leaving snags, providing nest boxes, leaving remnant islands in clear-cuts and use of different size clear-cuts.

Project Description:

There are four related questions to be answered by this research.

1. Are populations of cavity nesting birds limited in intensively managed Acadian forests

2 Are species of cavity nesting birds that show reduced populations in the managed forest limited by a lack of suitable cavities or is it due to another factor.

3. Which forest management techniques might be used to provide useful nesting cavities Forest management strategies will include leaving snags, providing nest boxes, and leaving remnant islands in clear-cuts

4. Are there differences in the level of utilization by cavity nesters of edges versus the middle of clear-cuts or plantation forests.

Work conducted in 1995

The following parts of the project were conducted in 1995:

1 Numbers of cavity nesting birds were counted using control versus manipulated habitat types. In 1995, we conducted 6 intensive surveys for cavity nesting birds in each of 10 plots, for a total of 60 surveys. In each plot numbers of cavity nesting birds using the plots for nesting or foraging were recorded. This year, plot size was expanded to 20 hectares

Using standard grid reference census techniques, each of the treatments listed below was censused at least 6 times during the May 1 to August 1 period. Notes will be taken on bird presence, location, sex, age (e.g. adult or juvenile), behaviour (e.g. calling, display, foraging) and nesting. Where possible 20 ha. plots were established using hip chain and flagging tape

a reference forest - Laverty Corner, inside Fundy National Park
b reference forest - Marvin Lake Road, inside Fundy National Park
c 1988 black spruce plantation with pesticide killed yellow birch - west side of Fundy National Park - (new plot in 1995)
d 1978 black spruce plantation - near Irving Tower, Shepody Road
e 15 year old black spruce plantation with pesticide killed trees on the West side of the park - (new plot in 1995)
f older selection cut - private land (Clark Phillips and Susan Tyler) - (new plot in 1995)
g new selection cut - private land,(near Sussex Picadelly Road) - (new plot in 1995)
h natural regeneration, 30 years old - crown land, north west of park - (new plot in 1995)

2. The use of the artificial cavities and reproductive performance of cavity nesters was measured in each of the 120 artificial cavities in 10 plots At each plot, there were 4 replicates of 3 different sizes of cavities (small, medium and large). To examine the impact of edge and clear-cut size, one-half of the artificial cavities were established 30 meters from an edge and the other half were established 100 from an edge We measured nesting success at cavities at different distances from edges to try and establish a relationship between use and clear-cut size.

3. The densities and types of natural cavities were surveyed on each of the new research plots. For each cavity tree located, information was taken on species, DBH, height, nest use and cavity opening.

4 For each of the new plots, the relationship between cavity nesting birds and vegetation was assessed at each plot by recording detailed data on vegetation data, including, species, cover and vertical and horizontal structure

Our selected treatments for the artificial cavities were as follows:

Community Type	**Number of Nest Boxes**	**Total**
Treatment 1		
Control old softwood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 2		
Control old mixed wood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Control old mixed wood stand in Fundy National Park	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 3		
15 - 20 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
15 - 20 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 4		
< 5 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
< 5 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Treatment 5		
5-10 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
5-10 year old softwood plantation in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12

Treatment 6 15 year old Jack Pine in Fundy Model Forest	3 sizes by 2 replicates by 2 distances from edge	12
Total 6 treatments		**120 boxes**

Preliminary Results

The data collected have not yet been fully analyzed However the following preliminary results are available:

1 16 species of cavity nesting birds were recorded as either nesting or foraging in the research plots

2 Most species of cavity nesters do not use clear-cuts or plantations up to 20 years of age, either for nesting or foraging. Only 6 of 16 species of cavity nesters were recorded using or nesting plantations less than 20 years old or clear-cuts.

3. Approximately 10 % of artificial cavities are used in the managed forest, indicating a unsatisfied demand. In some young plantations 25 % of the cavities were used. However, in general, only expected "open country" birds use the cavities in the managed forest - flickers, kestrels, swallows. There are individual exceptions, for example, a wood duck nested in a 1989 black spruce plantation A general conclusion is that leaving snags after clear-cuts would benefit the 3-4 open country species but be of little or no value to the other 11 species of cavity nesters

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4. Reproduction of the five species of cavity nesting birds found using clear-cuts and plantations is in the managed forest is not impaired.

5. Natural cavity densities don't appear to be limiting in the reference forest, especially in areas impacted by spruce budworm. However, preferred cavity nesting trees such as large trembling aspen are rare closer to the Fundy coast.

Costs for 1996

2 researchers salaries -	14,000	
vegetation plot contract -	2,000	
truck rental -	3,200	
housing -	1,260	
equipment -	1,121	
travel -	3,214	
total costs	6795.00	not including salaries for Woodley and Freedman

Follow-up

1. The field phase of the project is completed. All the nest boxes and plot markers were removed in November, 1995, with the exception of a set of 12 nest boxes left for public display along highway 114 (at the request of the Fundy Model Forest)

2. The data should be all analyzed and final report produced by June, 1996. The results will be published in a scientific journal. Preliminary results have already been incorporated into the biodiversity management guidelines developed by the Fundy Model Forest.

3. This project is complete except for the analysis phase. No further funds have been requested from sponsoring agencies, including the Fundy Model Forest