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ASSESSING THE VIABILITY OF THE OLDER-GROWTH FOREST COMMUNITY IN THE FUNDY MODEL FOREST:

PROGRESS REPORT #2

by

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1. Introduction

Throughout North America, wildlife habitat is becoming increasingly small and isolated in a human-impacted landscape. As a consequence, small populations of animals that depend on relatively rare structural habitat characteristics are becoming increasingly insulurized. By their very nature, small populations are vulnerable to random events and fluctuations in demographics. These decrease the likelihood of long-term persistence of small populations.

Current forest cover projections for New Brunswick suggest that older conifer and mixed forests will be significantly depleted in 25-40 years. Furthermore, the remaining older forest will be restricted to small isolated forest fragments. For Parks Canada, this raises the questions: can Fundy National Park provide sufficient habitat to support viable populations of species that depend on older forests, and if not, what is the landscape-level habitat prescription that will ensure viable metapopulations of older-growth dependent species? To begin to answer these questions Parks Canada, as a partner in the Fundy Model Forest, initiated a series of investigations to examine the viability of species that depend on older forest. Parks Canada was particularly interested in this issue because of its mandate to maintain the ecological integrity of the National Parks it manages.

To address these questions, the approach taken by Parks Canada was Population Viability Analysis (PVA). PVA is a relatively new tool used to make predictions about the extinction risk posed to small populations. PVA performs a systematic evaluation of the relative importance of factors that place populations at risk. By varying input parameters, what-if scenarios can be explored to determine management options. This approach is being employed at Fundy National Park. Parks Canada is also acting as a focal point for the technological transfer of this new approach to managing small populations.

These questions are being specifically addressed by examining the population and habitat viability of three species dependent on older forests: pileated woodpecker (Dryocopus pileatus), northern flying squirrel (Glaucomys sabrinus), and marten (Martes americana). To accomplish this we are collecting population structure, fecundity, and survivorship data as well as determining habitat preferences and critical habitat features.

This progress report will address the five original components of the research program: Population Viability Analysis Workshop, Pileated Woodpecker Project, Northern Flying Squirrel Project, Marten Project, and the Small Mammal Project. Each component will include a brief description of the approach that is being taken and the progress to date.

2. Population Viability Analysis Workshop

2.1 Background

Population and habitat viability assessment is a procedure that allows managers to simulate, using computer models, extinction processes that act on small populations and therefore assess the long-term viability of those populations. A number of interacting demographic, genetic, environmental, and catastrophic processes determine the vulnerability of a population to extinction. These four types of extinction processes can be simulated in computer models and the effects of both deterministic and stochastic forces can be explored. In turn, the outcome of various management options, such as reducing mortality, and increasing available habitat can also be simulated. Thus, viability analysis can be a powerful tool for assessing management options used to benefit small isolated populations.

One of the goals of our proposal was to host a population viability workshop at Fundy National Park. The objectives were to educate the resource management community in the Maritimes about population viability assessment, and to conduct preliminary viability assessments for our three study species as part of a hands-on educational workshop.

2.2 Progress to Date

On 26-28 October 1993, a workshop entitled "Conserving Species Dependent on Older Forests: A Population Viability Workshop" was co-hosted by Parks Canada and the Fundy Model Forest. A total of 106 people participated in the workshop, representing a broad spectrum of the scientific and wildlife management communities. There were representatives from the Province of New Brunswick; State of Maine; Fundy Model Forest, several Universities from the Atlantic Region and abroad, Canadian Wildlife Service; and from Parks Canada Atlantic Region, Quebec Region, and Headquarters. Stephen Flemming of Parks Canada was the organizer and chaired the workshop sessions.

The agenda consisted of a symposium session, computer simulation workshop, ecosystem management field trip, and several opportunities for informal discussions. The symposium had several key-note speakers including Dr. Resit Akcakaya (Applied Biomathematics), Dr. Robert Lacy (Chicago Zoological Park and the Captive Breeding Specialist Group of the IUCN), Dr. Daniel Harrison (Univ. of Maine at Orono.), and Daniel Rosenberg (Oregon State University). In addition, several local speakers gave important and informative seminars, including Dr. Mark Roberts, Mike Sullivan, Stephen Woodley, and Stephen Flemming. It is our intention to publish the workshop proceedings in the Parks Canada Ecosystem Science Review Report Series. Stephen Flemming and Harry Beach will edit and assemble the proceedings. As of this writing, the manuscripts have been submitted and are being edited. The paper will be submitted for publication by May 1995.

3. Pileated Woodpecker Research Project

3.1 Background

Most studies suggest that the Pileated Woodpecker (Dryocopus pileatus) is associated with older forests. However, little work has been directed at assessing the susceptibility of the Pileated Woodpecker to forest fragmentation. It is known that Red-cockaded Woodpeckers (Picoides borealis) are sensitive to forest fragmentation. Given the large home range of the Pileated Woodpecker, fragmentation could also pose a threat to this species.

Small forest fragments may be insufficient to provide minimum food and shelter requirements for the Pileated Woodpecker. Hence, the species may be restricted to large fragments and the forest interior of Fundy National Park. The distribution and abundance of the species is being determined by conducting spring vocalization (including tree hammering) surveys along transects in all major habitat types and fragment sizes in the Greater Fundy Ecosystem.

Forest fragments may offer few and/or poor quality shelter trees. To assess this possibility, trees and habitat used for nesting and roosting are being examined to determine shelter habitat characteristics, and to ascertain if any differences occur between birds inhabiting the forest interior versus those in forest fragments. Nest and roost trees are being compared to trees chosen at random (corresponding home ranges) in both study areas.

Overall, habitat quality may be poor or insufficient in forest fragments. Assessment of habitat selection is being aided by the use of radio-telemetry. Twenty adult and juvenile Pileated Woodpeckers will be fitted with radio transmitters. Locations of radio-tagged birds will be used to determine home ranges. Detailed habitat information is being recorded for each home range. These data will then be contrasted with those recorded for random sites.

Carpenter Ants (Camponotus spp.), which comprise the bulk of the Pileated Woodpecker diet, typically occupy old or dead trees. These trees may be of limited number in small forest fragments, and hence, foraging habitat may be limiting. Foraging habitat is being documented by noting their choice of foraging trees. Foraging tree attributes will be assessed by contrasting selected trees with trees chosen at random.

Finally, this study is examining dispersal and survivorship of Pileated Woodpeckers by continuous monitoring of radio-tagged birds over a period of years. Combined with the abundance and habitat data, this will contribute to an assessment of the population and habitat viability of the Pileated Woodpecker in the Greater Fundy Ecosystem.

3.2 Progress to date

Population estimates of Pileated Woodpeckers in Fundy National Park (forest interior) and the surrounding fragmented forest were conducted in 1993-94. The preliminary estimate for the Park is 37 pairs, or one pair per 5.6 km^2, which is a very high density. A similar density estimate for the surrounding commercial forests can not be made at this time as the sample is not yet fully stratified. This problem stems from not yet having an updated forest cover map for

the Fundy Model Forest. With further censusing in spring 1995, density estimates will be accomplished and the impact of fragmentation, if any, on population density and distribution will be established.

In spring 1994, radio-transmitters were placed on seven birds (three adults, four juveniles), four of which later died (one through transmitter complications, three through natural predation). Of the remaining birds, one (adult) is located inside the Park and two (1 adult, 1 juvenile) are located in the surrounding forest fragments. Home range data was collected on each of these birds on a daily basis throughout the summer, and on a weekly basis during the fall and winter. Additional birds will be captured during the 1995 field season so that our original goal of 20 birds will hopefully be achieved. This component of the project will require one or two more years to complete. To aid us in locating birds outside the Park, a nest contest has been initiated to encourage people to look for nests in their woodlots[1].

Over the course of the 1993 and 1994 field seasons, data were collected on 380 foraging trees and 29 nest and roost trees. Several differences were detected in the characteristics of foraging trees between the Park and the surrounding study area. Trees used for deep excavation foraging were larger in the Park than outside. In the fragmented forest study areas, choice of tree species used for foraging is more diverse, and foraging patterns differed. For shelter trees, no differences have yet been detected in terms of size. Trees used for nesting and roosting have an average diameter at breast height of 51 cm. This suggests the possibility that there may be a minimum size requirement for shelter trees. The point may be the availability of appropriate trees rather than differences in size. Foraging data and nest/roost site selection data will continue to be collected for Fundy National Park and surrounding areas in 1995. In addition, we will be conducting snag surveys in the two study areas to determine if there are any differences in snag availability.

4. Marten Research project

4.1 Background

Heavy trapping and habitat destruction caused the extirpation of Marten (Martes americana) from southern New Brunswick. Fifty individuals were reintroduced to Fundy National Park in the 1980's. This study documents the viability of this population by examining aspects of population density, habitat use, and food habits.

Population densities are being determined through winter track transects. We will test whether or not the fragmented forest surrounding the Park supports fewer Marten than the forest interior. Marten home ranges in the fragmented area are suspected to be larger in order to satisfy energy requirements.

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1 We have advertised a reward of $300 for the confirmed location of each new Pileated Woodpecker nest supplied to us. Ads have been placed in Naturalist publications throughout the region.

Back-tracking of Marten is providing data on winter habitat utilization, structural components of habitat, and foraging activity. Individuals have been fitted with transmitters and are radio-tracked to determine home range and habitat selection at the landscape level. We intend to test the assumption that old growth conifer forest is optimal habitat, by determining whether it is used in greater proportion than is available.

Maternal dens and summer and winter resting sites may be located by homing in on stationary Marten or by following tracks to winter resting sites. Den characteristics and the surrounding forest will be described and compared to sites chosen at random. We suspect that Marten den sites will be located further from forest edge than expected by chance and that larger forest fragments will consequently be preferred.

Information on food habits will be verified by using scat analysis. This will indicate if foraging activity is an accurate indicator of prey consumed.

Dispersal of kits may be monitored through radio-tracking in subsequent years. Information on dispersal distances is of value in understanding the impact of the surrounding fragmented forest on the Marten population. The harvested area is suspected of isolating the Fundy population, thereby reducing the possibility of genetic exchange and population enhancement.

This study will provide the basis on which to make an informed decision regarding the possibility of further enhancement of this population by reintroduction, and will provide additional information to test assumptions on which marten habitat supply models are currently based.

4.2 Progress to date

Trapping for marten commenced in the spring of 1993, with disappointing results. A total of 1323 trap nights throughout the Park failed to yield any Marten. Consequently, it was decided to postpone further trapping efforts until late fall, as it was felt that good natural hunting conditions and a low density of animals made spring-summer a poor time of year to trap.

Trapping resumed in December for a total of 934 trap nights. Five male martens, three adults and two juveniles were captured and radio-collared. These animals were radio-tracked to determine home ranges for a period of approximately nine months until batteries in the transmitters wore out. Efforts to recapture Marten commenced in November 1994 with modest success. After 435 trap nights only two animals have been recaptured. Efforts to capture additional animals within the Park are continuing.

To date, good home range data have been collected on three animals through radio-telemetry. Limited information has been obtained on the remaining two animals due to the inaccessibility of their home ranges, and the limitations of radio-telemetry in rugged terrain. These data are currently being analysed. Data collection will continue for the 1995 field season.

Originally, our intent was to locate maternal den sites and to monitor kit dispersal through radio-telemetry. As trapping efforts to date have succeeded in the capture of only male animals, it now seems unlikely that these goals will be realized.

Habitat requirements are continuing to be addressed through fractal analysis of winter

back-tracking data. This work should be completed by spring of 1995, and will tell us much about habitat requirements during the critical time of year: winter.
Winter track transects are being conducted both inside and outside of the Park to determine population densities and to locate additional Marten territories. To date, Marten tracks have only been found in one location outside the Park, which may indicate that fragmented areas support fewer Marten. Due to poor snow conditions this winter, collection of track transect data may be continued next year.

5. Northern Flying Squirrel Research Project

5.1. Background

Some studies have suggested that the Northern Flying Squirrel (Glaucomys sabrinus) may be dependent on old-growth forests. It has even been described as a keystone species in the ecology of Pacific Northwest forests because it is a significant disperser of mycorrhyizal fungi. Older forest attributes are found in Fundy National Park but are rare in the surrounding area. In this study, we will ascertain if the Northern Flying Squirrel is being viably maintained in the Greater Fundy Ecosystem, and will determine if it is a keystone species in this ecosystem.

Choice of habitat components by the Northern Flying Squirrel has been examined at the landscape, stand, and home-range levels through the use of radio-telemetry. This allows an assessment of whether or not this species depends on older-forests in the Northeast. Nest site selection has been documented to determine the importance of snags as critical habitat. Moreover, if old-growth attributes are important, we expect to find higher densities of squirrels in older forests.

In the Pacific Northwest, the Northern Flying Squirrel is an obligate fungivore. In this study, food-habits are being assessed through the collection and examination of faecal pellets. Scat is collected during trapping efforts, and is subsequently examined using a microscope and spore key. This will determine if mycorrhyizal fungi are an important constituent in the diet of the Northern Flying Squirrel in the study area.

Dispersal in populations of Northern Flying Squirrels has not been described. Yet, this is vital to understanding the potential effect of forest fragmentation on population viability. Hence, we have radio-tagged Flying Squirrels and noted dispersal patterns. Further, we are using homing behaviour to conduct habitat permeability experiments for clearcuts and plantations which surround Fundy National Park.

This study will contribute toward a better understanding of the ecology of this potentially vital species. It will contribute to a population viability assessment, and will allow us to determine if the species is an integral link in maintaining the integrity of Fundy National Park.

5.2. Progress to date

The Northern Flying Squirrel project consists of three main components: habitat characteristics, diet, and habitat connectivity. The habitat characteristics part of the project has been the principal work of Shawn Gerrow, a graduate student from Acadia University. The field work for this component is now complete.

Flying squirrels were live-trapped at locations in Fundy National Park and in the surrounding fragmented forest. A total of 2983 trap nights resulted in the capture and recapture of 294 squirrels, of which 54 were radio-tagged. Over a period of nearly 18 months, radio-tracking of individuals was conducted nightly to determine home range and micro-habitat use, and during the day to identify nest site locations. This resulted in the home ranges of 18 Northern Flying Squirrels being delineated using over 500 specific tree locations. Habitat data within these home ranges was collected for both squirrel use sites and random sites. These data include forest cover, vertical structure, snag and ground cover attributes. In addition, data on over 100 nest sites were collected. Although habitat data are currently being analysed, initial impressions are that Northern Flying Squirrels prefer older conifer dominated stands, and that use of this habitat resulted in better over-winter survivorship. This component of the project will be completed by spring 1995.

Population estimates of Northern Flying Squirrels in Fundy National Park and the surrounding fragmented forest have been conducted during the last two years using the capture/mark/
recapture technique. So far, results indicate that Flying Squirrels rarely occur in fragmented areas. Work will continue throughout the coming field season, to determine the relative abundance of Northern Flying Squirrels in terms of major cover types, forest ages, forest fragment types, and fragment sizes. This data should be available by fall 1995.

Over 160 scat samples have been collected from Northern Flying Squirrels to date. These samples are currently being analysed for the presence of spores of hypogeous mycorrhizal fungi. So far, these fungi have been identified in 96% of the scats analysed (N = 150). Therefore, it appears that Northern Flying Squirrels in this area, as in the Pacific Northwest, may be a keystone species in the dispersal of hypogeous mycorrhizal fungi, which are in turn vital for vigorous and healthy forests. This phase of the project will be completed by spring 1995.

The final component of this project involves habitat connectivity, and is primarily the work of Maryse Bourgeois, a graduate student at Acadia University. Again, twenty-three squirrels were live-trapped and radio-tagged. Throughout the summer, experiments were conducted within the Park to determine the extent and range over which Northern Flying Squirrels will home if displaced. The results of fourteen trials concluded that Flying Squirrels will home up to 3 km in a contiguous landscape. Using the Park data as a control, trials were then initiated to determine if animals found in the fragmented forest could move across varying man-made landscapes such as open canopy plantations (recently planted clearcuts), naturally regenerating stands, small select cuts, or plantations. The time and direction in which these individuals homed was used to measure the extent to which various landscapes may provide biological barriers to Northern Flying Squirrels. By using this approach we can provide data on how landscape configurations can limit natural dispersal among populations of Northern Flying Squirrels, which can in turn isolate populations and increase their vulnerability to local extinctions. To date, nine trials have

been run in fragmented areas using four different landscape scenarios. Preliminary results indicate that males will home up to 2 km and females approximately 1 km in a fragmented landscape if connections exist. Strip cuts, large cut blocks, and 15 year old natural regenerated stands were not crossed by Flying Squirrels and appear to constitute barriers to dispersal. Additional trials will be conducted during the 1995 field season, with the data set expected to be completed by autumn.

6. Small Mammal Research Project

6.1 Background

During the summer of 1993, when it became clear that marten trapping was going to have to be postponed until winter, we sought to conduct other work that related to our current projects. In particular, we felt that a better understanding of small mammal numbers and diet could be helpful in rounding out the results of our marten and northern flying squirrel field studies.

Several marten studies have indicated the importance of prey availability on marten distribution and abundance. Understanding patterns of small mammal abundance and species composition in forest interior cover types and plantations of different ages could help to illuminate marten distribution patterns in the Fundy Model Forest.

It is becoming increasingly clear that small mammals may be important dispersers of hypogeous fungi, including those fungal species that form mycorrhizal associations with the roots of plants. Roots of most higher vascular plants, including those of commercial forest species, form obligatory mycorrhizal associations with fungi. Plant vigour is tied to mycorrhizal fungi, and may be indirectly tied to the abundance and movements of small mammals.

The goal of this preliminary study was to begin to document small mammal distribution and species composition patterns on the landscape, and to determine the relative importance of the various small mammal species in the dispersal of mycorryhizal fungi. This project will help to explain marten distribution on the landscape, and test whether or not the Northern Flying Squirrel is the most important species for dispersal of hypogeous fungi spores.

6.2 Progress to date

This study examined the abundance and diets of mouse, vole, and squirrel species found in Fundy National Park and sites surrounding the Park. Study sites were established at locations both inside and outside of the Park in a variety of cover types. Small mammals were live-trapped, marked, and released to estimate abundance. Faecal samples were collected from the live traps and placed in vials with 70% ethanol. The traps were then thoroughly cleaned before being reset.

A total of 2220 trap nights yielded over 300 captured small mammals of eight different species. Species abundance and diversity was found to be greater in the forest interior study sites

(Park).

Scats were examined under a dissecting microscope, and the presence or absence of hypogeous mycorrhizal fungal spores ascertained. When spores were encountered, they were identified to genus. A representative sample (N = 150) of scats have been examined for spore analysis. The spores of hypogeous mycorrhizal fungi were found in 75% of the scats examined. This indicates that other species of small mammals besides the Northern Flying Squirrel are likely important in the dispersal of hypogeous mycorrhizal fungi spores.

This project will continue during the 1995 field season to increase the sample size for rarer small mammal species.

ASSESSING THE VIABILITY OF THE OLDER-GROWTH FOREST COMMUNITY IN THE FUNDY MODEL FOREST: THIRD YEAR REPORT

REPORT TO FUNDY MODEL FOREST

Compiled and edited by :

S.P. Flemming, J.Watts, and E. Gerrow

March 1996

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Contributions to this report were made by members of our research team, namely:

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1. Introduction

Throughout North America, wildlife habitat is becoming increasingly small and isolated in a human-impact landscape. As a consequence, small populations of animals that depend on rare structural characteristics of habitat are becoming increasingly insularized. By their very nature, small populations are vulnerable to random events and fluctuations in demographics. These decrease the likelihood of long-term persistence of small populations.

Current forest cover projections for New Brunswick suggest that older conifer and mixed forests will be significantly depleted in 25-40 years. Furthermore, the remaining older forest will be restricted to small isolated forest fragments. For Parks Canada, this raises the following questions. Can Fundy National Park provide sufficient habitat to support viable populations of species that depend on older forests? If not, what is the landscape-level habitat prescription that will ensure viable metapopulations of older-growth dependent species? To begin to answer these questions, Parks Canada as a partner in the Fundy Model Forest, initiated a series of investigations to examine the viability of species that depend on older forest communities. Parks Canada was particularly interested in this issue because it is mandated to maintain the ecological integrity of its National Parks.

To address these questions, a Population Viability Analysis (PVA) approach was taken. PVA is a relatively new tool used to make predictions about the extinction risk posed to small populations. PVA performs a systematic evaluation of the relative importance of factors that place populations at risk. By varying input parameters, what-if scenarios can be explored to determine management options. This approach is being employed at Fundy National Park. Parks Canada is also acting as a focal point for the technological transfer of this new approach for managing small populations.

This study seeks to address questions of ecological integrity by examining the population and habitat viability of three species dependent on older forests: pileated woodpecker (*Dryocopus pileatus*), northern flying squirrel (*Glaucomys sabrinus*), and marten (*Martes americana*). To accomplish this we are collecting population demographic data as well as determining habitat preferences, critical habitat features, and assessing habitat fragmentation effects. ~~This~~ The progress report will address the seven components of the research program: Population Viability Analysis Workshop, Pileated Woodpecker Habitat Project, Northern Flying Squirrel Habitat Project, Northern Flying Squirrel Landscape Connectivity Project, Small Mammal Mycophagy Project, Marten Habitat Project, and the Marten Fractal Analysis Project. Each component ~~will include~~ a brief description of the approach that has been taken, and an overview of the progress to date.

2. Population Viability Analysis Workshop

2.1 Background

Population and habitat viability assessment is a procedure that allows managers to simulate using computer models extinction processes that act on small populations and therefore assess the long-term viability of those populations. A number of interacting demographic, genetic, environmental, and catastrophic processes determine the vulnerability of a population to

extinction. These four types of extinction processes can be simulated in computer models and the effects of both deterministic and stochastic forces can be explored. In turn, the outcome of various management options, such as reduced mortality, and increased available habitat can also be simulated. Thus, viability analysis can be a powerful tool for assessing management options used to benefit small isolated populations.

One of the goals of our proposal was to host a population viability workshop at Fundy National Park. The objectives were to educate the resource management community in the Maritimes about population viability assessment, and to conduct preliminary viability assessments for our three study species as part of a hands-on educational workshop. This was to be done at the onset of the four year project to introduce the PVA concept to the Fundy Model Forest constituency.

2.2 Progress to Date

On 26-28 October 1993, a workshop entitled "Conserving Species Dependent on Older Forests: A Population Viability Workshop" was co-hosted by Parks Canada and the Fundy Model Forest. A total of 106 people participated in the workshop, representing a broad spectrum of the scientific and wildlife management communities. There were representatives from the Province of New Brunswick; State of Maine; Fundy Model Forest, several Universities from the Atlantic Region and abroad, Canadian Wildlife Service; and from Parks Canada Atlantic region, Quebec region, and Headquarters.

The agenda consisted of a symposium session, computer simulation workshop, ecosystem management field trip, and several opportunities for informal discussions. The symposium had several key-note speakers, including Dr. Resit Akcakaya (Applied Biomathematics; co-developed RAMAS population viability analysis programs), Dr. Robert Lacy (Chicago Zoological Park and the Captive Breeding Specialist Group of the IUCN: author of Vortex, a population viability modeling program), Dr. Daniel Harrison (Univ. Of Maine at Orono; Habitat Association of Marten), and Dr. Daniel Rosenberg (Oregon State University; Northern flying Squirrel). Several local speakers also gave important and informative seminars, including Drs. Mark Roberts, Stephen Woodley, Stephen Flemming, and Mr. Mike Sullivan.

On the second day of the workshop, a computer simulation session was held. Drs. Lacy and Akcakaya introduced their respective programs (Vortex and Ramas/space). The participants were then broken into three groups, one for each study species. Using available data, each group set out to identify information deficiencies, and attempt to conduct a preliminary viability assessment. Because of the large holes in the data, the models could not progress very far. Still, the computer simulation session was regarded by all participants as useful and informative.

Ecosystem management field trips were led by Graham Forbes and Shawn Gerrow. The theme was "forest fragments and landscape function". This theme was used in both field trips, one on black bears, and the other on northern flying squirrels. The participants seemed to enjoy the speakers and were particularly happy to see these field projects first hand.

The workshop introduced Population Viability Analysis as a tool in landscape management to resource managers in the Maritimes. It also accomplished its goal of beginning to assess the threats posed to the ecological integrity of Fundy National Park by evaluating the

population and habitat viability of three species dependent on older forests. The workshop proceedings are in the process of being published as a Parks Canada Atlantic Region Paper. This will soon be circulated throughout the Fundy Model Forest and Parks Canada.

In this final year of the research program, we plan to run full PVA's on the study animals using the program RAMAS/GIS. The study area will be the Fundy Model Forest case study area. The viability of the study species will be assessed for the current day landscape, and the future projected landscape based on the best management practices proposed by the partnership of the Fundy Model Forest. This will provide one of the few tests of the Fundy Model Forest management plan. This project will be a cooperative effort of Drs . Flemming and Akcakaya.

3. Pileated Woodpecker Habitat Project

3.1 Background

Most studies suggest that the pileated woodpecker is associated with older forests. However, little work has been done on this species east of the Rockies, and no studies exist for northeastern North America. Moreover, no work has been directed at assessing the susceptibility of the pileated woodpecker to forest fragmentation. Yet, it is known that the red-cockaded woodpecker (*Picoides borealis*) is sensitive to forest fragmentation (Conner *et al.* 1995). Given the large home range of the pileated woodpecker, and the fragmented distribution of mature and overmature stands, the landscape configuration of the Fundy Model Forest could conceivably pose a threat to this species.

It seems plausible that small forest fragments may be insufficient to provide minimum food and shelter requirements for the pileated woodpecker. If this were the case, one would predict that the species is restricted to large forest fragments. Alternatively, pileated woodpeckers may maintain larger home ranges in fragmented landscapes to piece together sufficient habitat to survive. Discerning between these requires an information base on the species distribution. Hence, the distribution and abundance of the species is being determined by conducting spring vocalization (including tree hammering) surveys. These are being done along transects in all major habitat types and fragment sizes in the Fundy Model Forest case study area and throughout Fundy National Park.

Overall, habitat quality may be poor or insufficient in forest fragments. Assessment of habitat selection can be aided by the use of radio-telemetry. Birds fitted with radio- transmitters can be located throughout their home range, and the locations in turn can be plotted on forest cover GIS data set to provide detailed habitat use information. The habitat use data of woodpeckers can then be contrasted with the proportion of each habitat type on the landscape. Using this approach, one can ascertain the specific habitat attributes that were used and then assess if these are similiar to those used in integral non-fragmented forest lands. If they are significantly different, this could provide a line of evidence for poor quality habitat in forest fragments.

Forest fragments may offer few and/or poor quality shelter trees. This is because fragments are often select cut or constitute faster rotation periods. To assess this possibility, trees and habitat used for nesting and roosting can be examined to determine shelter tree habitat

characteristics, and to ascertain if any differences occur between birds inhabiting the forest interior versus those in forest fragments. Nest and roost trees can be compared to trees chosen at random within corresponding home ranges in both study areas.

Carpenter Ants (*Camponotus spp.*), which comprise the bulk of the pileated woodpecker diet, typically occupy declining or dead trees. These trees may be of limited number in small forest fragments, and hence, foraging habitat may be limiting. Data can be collected on trees used for foraging, and contrasted with trees chosen at random to address this concern.

3.2 Progress to Date

Vocalization Surveys

For three seasons running, we have been conducting pileated woodpecker spring vocalization surveys. The survey technique that has been developed has demonstrated a high degree of repeatability and will provide an overall landscape picture of distribution and abundance. Still, before anything substantive can be said we require one more season to complete the data set. This spring (1996), we will be conducting surveys throughout the Fundy Model Forest Case Study Area to examine relative abundance on the landscape. This will provide critical data to be used in the final population viability assessment planned for autumn 1996.

Habitat Use

To date, 23 pileated woodpeckers have been banded and fitted with radio-transmitters. As ten of these birds were adults, our original objective of radio-tagging 10 adults and 10 juveniles was achieved. This sample has permitted us to collect habitat use and home range data for pileated woodpeckers in the park and the surrounding fragmented forest. Using radio-telemetry triangulation, over 330 good positions (less than 0.4 km 95% error ellipse) have been established for these birds to date (at time of writing, 25 March 1996). These positions have been plotted on the 1993 forest cover GIS data set, and attributes for these sites have been extracted. To date, an analysis on the 227 sites collected during the summer have been completed. Once we cease collecting data in June 1996 (we will remove transmitters from birds), the complete analysis will be pursued.

The structural characteristics of stands are being quantified by walking in on radio-tagged pileated woodpeckers. Once a used site is found, four photographs are taken of the stand. To date, this has been done for 58 woodpecker and 58 random sites. The structure (branch, trunk, leaves, ground, etc.) at each of 125 random points on slides for each site are determined. The data have been analyzed for the summer period.

Pileated woodpecker summer habitat use in Fundy National Park and the surrounding fragmented forest (3adults in each) was analysed. This preliminary analysis constitutes part of Peter Lawrance's Honours Thesis completed in March 1996. The complete analysis is presented in the thesis. Only a few main points are presented here.

A comparison was made of the availability of forest stand types relative to their use by pileated woodpeckers. The use of the four forest stand types was significantly ($P < 0.001$)