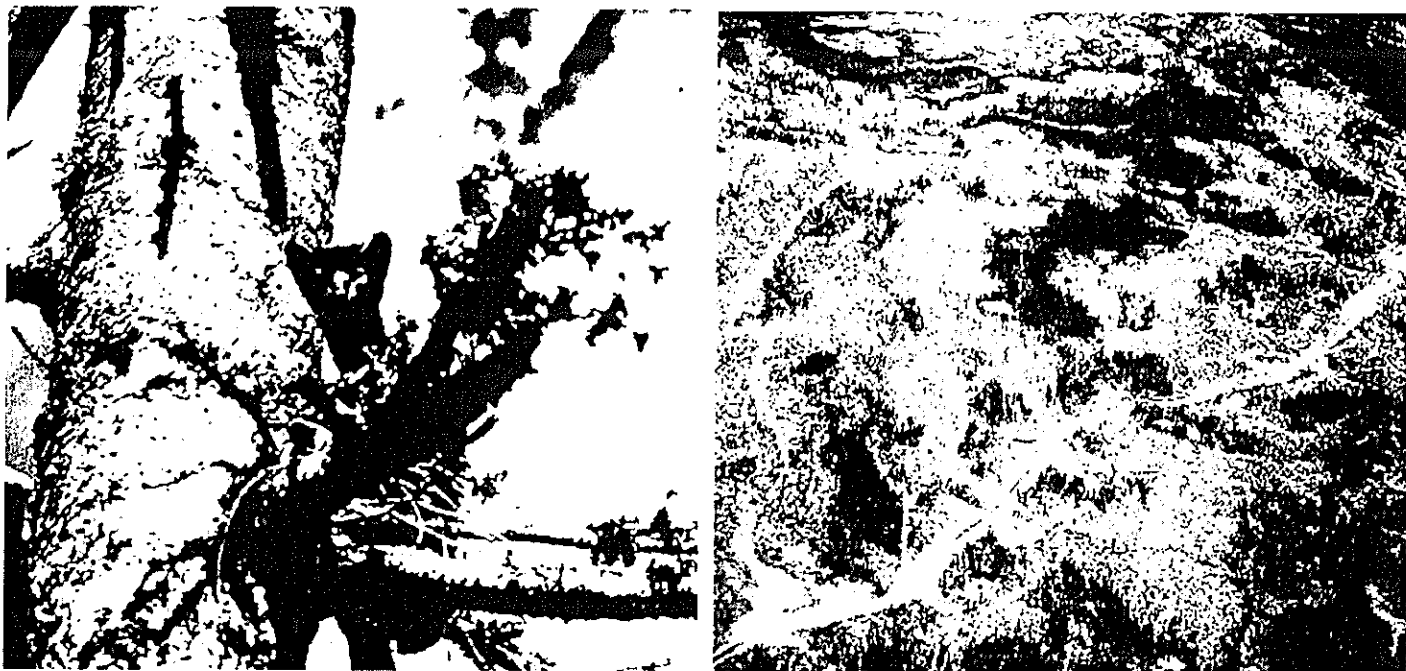


Responses of Newfoundland Marten to a Modified Harvest Strategy

March 2000, Interim Progress Report



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Corner Brook Pulp and Paper Ltd.

Western Newfoundland Model Forest

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INTRODUCTION

Commercial forest harvesting represents one of the largest human-induced impacts on forested landscapes in Newfoundland. Forest ecosystems are modified by forestry practices and these changes affect the distribution and abundance of wildlife. To achieve non-timber objectives, management agencies and forest harvesting companies are now considering wider application of partial and modified silvicultural systems in order to maintain wildlife habitat and biodiversity. While there has been considerable study of the effects of logging on selected species, there are few data on the majority of smaller organisms that comprise the bulk of the region's biodiversity. Forest carnivores such as marten have frequently been the target of conservation concern because of their association in some regions with older forests and sensitivity to landscape-level habitat alteration (Thompson 1988, Thompson 1991, Thompson and Harestad 1994).

The Newfoundland population of the American Marten (*Martes americana atrata*) was designated by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) as threatened in 1986 and subsequently uplisted to endangered in 1996. A Newfoundland Marten Recovery Plan was drafted and submitted to RENEW (Recovery of Nationally Endangered Wildlife) in 1995 (Forsey et al. 1995). Several factors may have contributed to its decline, including habitat loss due to logging, and mortality due to accidental snaring/trapping, however, one of the key elements of the recovery of Newfoundland Marten is to ensure that adequate habitat exists for population maintenance and expansion in landscapes that are subject to logging.

Marten make extensive use of mature and overmature softwood stands, however the underlying mechanisms for their use of these stands is not well understood (Thompson and Harestad 1994). Studies have indicated that individual marten avoid cutovers (Snyder 1985, Snyder and Bissonnette 1987, Bissonnette et al. 1989, Fredrickson 1990). However, knowledge of the effects of logging on marten population abundance and use of an area at a landscape scale is necessary to integrate marten habitat management objectives into the forest management planning process.

The objectives of this study include the following:

- (1). To evaluate and compare the effects of traditional harvesting to a modified harvest strategy (designed to leave additional forest unharvested and connected to larger stands) on the persistence of marten on the landscape.

(2). To develop a logistic predictive model (by comparing habitats in areas where marten are present to areas where marten are absent) that identify and rank habitat variables at the landscape scale (including logging) that contribute to marten persistence. This model would hopefully be able to be used to further refine the important elements of marten habitat suitability in areas that are subject to logging.

The following hypothesis will be tested: (1) resident marten will persist in areas subject to logging, but at lower abundance than prior to the initiation of harvesting, and (2) marten abundance in areas subject to modified harvesting (by including larger leave areas) will be greater than those areas harvested using traditional methods.

This research will further our understanding of the ecological effects of forest harvesting on marten in insular Newfoundland. Most importantly, it will likely be used to formulate adaptive harvest management strategies that mitigate their impacts on marten and specifically further refine the definition of habitat and the relationship between marten persistence/abundance and logging, in the absence of the confounding the influences of accidental snaring and trapping.

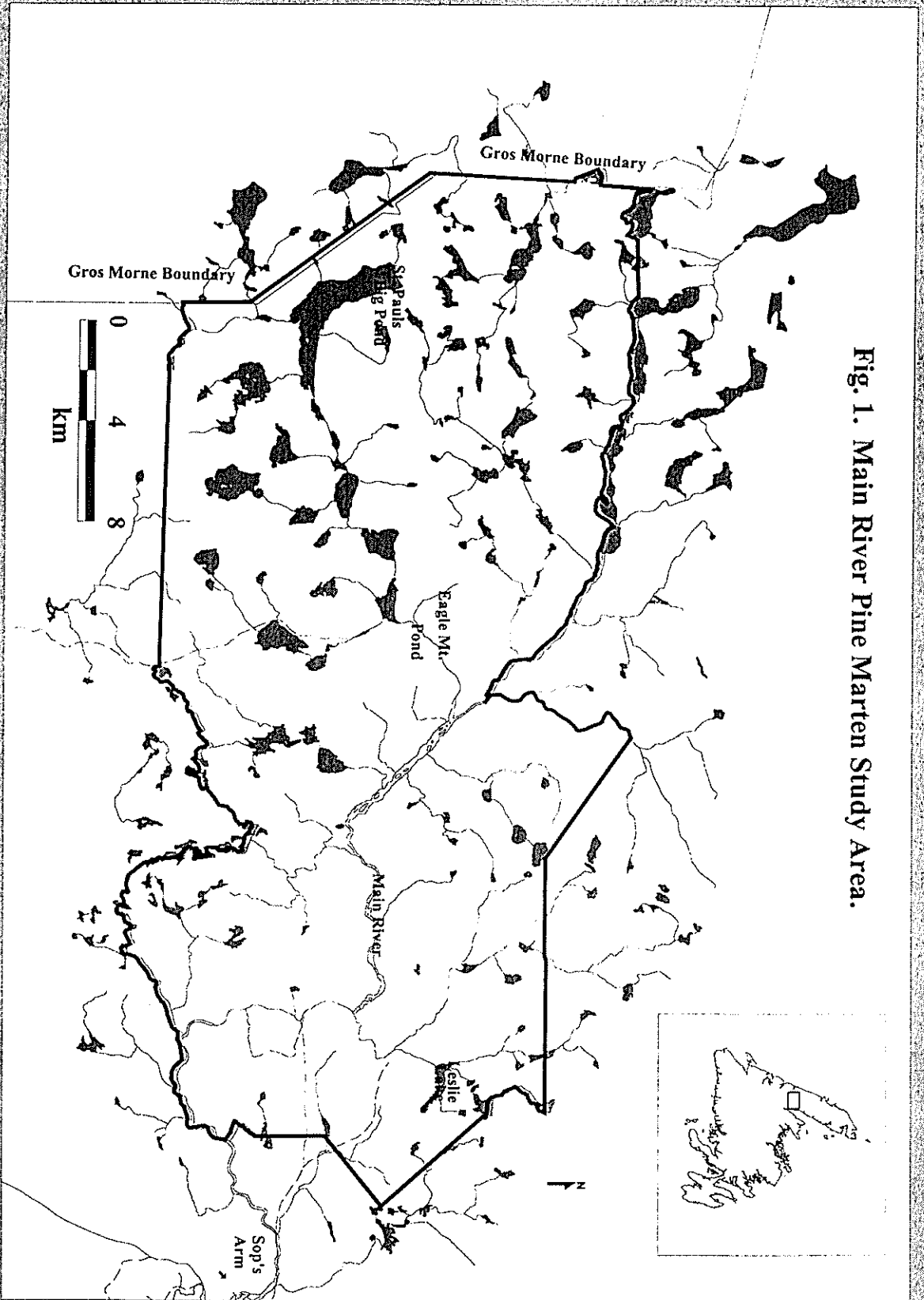
STUDY AREA

The 589 km² study area is located in the Main River watershed of the eastern side of the base of the Northern Peninsula. (Fig. 1) and closed to all snaring and dry land trapping. Marten were successfully introduced into the Main River watershed in the mid 1970's (Mayo 1976). There were no confirmed historical reports of marten in this area prior to their introduction (Mayo pers. Comm.).

The study area is bisected by the Northern Peninsula Forest Ecoregion (Eastern Long range Subregion) and the Long Range Barrens Ecoregion (Northern Long Range Barrens Subregion). Unlike many other areas of insular Newfoundland, snow cover is consistently permanent, and deep during the winter months and regularly present until late in the spring. Topography ranges from rolling to mountainous, with elevations ranging from 240 to 607 meters.

Forests consist of productive open balsam fir (*Abies balsamea*) with much black spruce (*Picea mariana*) and occasional white spruce (*Picea glauca*), white birch (*Betula papyrifera*) and larch (*Larix laricina*) interspersed throughout. These old growth softwood forests are naturally fragmented with numerous ponds, lakes, rivers, bogs, fens, riparian areas and softwood scrub.

Fig. 1. Main River Pine Marten Study Area.



The area is unique in that it has developed in the absence of widespread disturbances such as fire or defoliating insects which are common in the majority of other boreal forests. Many of the stands tend to be uneven aged with abundant younger trees in the understory and mid-canopy. The numerous individual dead and dying trees interspersed throughout the stands create small openings or gaps in the canopy, thus releasing advanced regeneration in the understory and creating multi-level forest structure.

Portions of the study area are to be logged by Corner Brook Pulp and Paper Ltd. over the next several years. Additional areas are to be left unlogged as part of an ecological reserve and as leave areas specifically left as potential marten habitat.

Potential sources of prey and carrion for marten (ie. alternatives to small mammals), including snowshoe hare (*Lepus americanus*), ruffed grouse (*Bonasa umbellus*), spruce grouse (*Dendragapus canadensis*), willow ptarmigan (*Lagopus lagopus*) red squirrel (*Tamiasciurus hudsonicus*) and moose (*Alces alces*) are all present, but notably scarce in the study area. Red fox (*Vulpes fulva*) are abundant and caribou (*Rangifer tarandus*) are present in small groups during winter.

METHODS

The focus of this study involves the use of intensive live-trapping to detect individual marten presence or absence by sex and age on selected sites (separated by approximately 2 km) distributed throughout the study area. Marten will be captured in live traps (18x18x48 cm) baited with beaver (*Castor canadensis*) meat and trap sites will be scented with commercial skunk lure. Each trap will be enclosed in a form fitting plywood box open only at the entrance end, with holes drilled in the side (to prevent condensation), covered in boughs and then covered with snow (during winter trapping sessions) to prevent marten from becoming wet or cold while in the trap. Traps will be monitored for capture on a daily basis for a minimum of 7 days during each trapping session. New animals captured will be transferred to a handling cone, immobilized with ketamine hydrochloride, sexed, weighed, pit tagged or ear tagged, and a first premolar tooth extracted (for aging by cementum analysis) before release at the capture site. Marten that are recaptures from the current or previous trapping sessions will be recorded as such and released at the capture site without further handling.

The number of captures per 100 trap nights will be used as a relative index of marten density. Multi-annual and within season recaptures will allow us to confirm residency of individual

marten. It will be assumed that repeated confirmation of marten presence reflects suitable habitat attributes in a broader area surrounding the capture locations.

Digitally corrected GPS locations of live trapping sites will be plotted against forest inventory maps for the area and the percent composition of habitat categories surrounding each trap will be extracted. Comparisons will be made of vegetation and landscape attributes (averaged over varying scales) of the areas around the marten live-trapping sites with marten detections to sites without detections using multiple logistic regression analysis. Vegetation attributes will include but not be limited to forest structure and composition, fragmentation, diversity, amount of area harvested, slope aspect elevation. Landscape diversity will be estimated by Shannon-Wiener's equation (Krebs 1989) using the proportions of different cover types and used as a variable in the regression analysis. Micro-habitat characteristics including tree height and DBH, slope aspect, distance to nearest habitat edge, and percentage of overhead cover will be measured at each trap site and also be assessed for relationships with live-trapping success. Attributes that significantly affect marten presence or absence can then be described. Multiple logistic regression was chosen as the appropriate method for the statistical analysis because of the binary nature of the response variable (presence - absence) (Brito et al. 1999).

Sampling units monitored for presence/absence will act as control areas up until such time as they become subject to logging activities. Before and after comparisons are statistically powerful and recommended because every experimental unit can serve as its own control, but contemporaneous control is also necessary in order to avoid the dubious assumption of homogeneity over time (Krebs 1999). Contemporaneous control for environmental changes (independent of logging) will be accomplished through a staircase design (Krebs 1999, Walters et al. 1988) by monitoring treatment areas 2 years before logging and then beginning treatments (ie. logging) during successive years and by establishing live-trapping stations and monitoring marten presence annually in areas where no logging will occur during the course of the study. Adjustments to the effective sample size (due to possible spatial and/or temporal auto-correlation) in significance tests will be made based on a measure of the spatial covariance of the variables. The possibility of detecting the same marten at more than one sample unit will be controlled for by pit-tagging of individual captured marten.

This monitoring will continue in the study area prior to, during and after the harvesting is completed. The expected completion date for data collection is March, 2004.

PRELIMINARY RESULTS AND FUTURE DIRECTIONS

Preliminary live trapping efforts in 1995 indicated that the study area had a viable marten population with the capture of 8 marten (5 female; 3 male) in the core of the study area and worthy of further investigation. The initial years of the study involved the monitoring of marten presence or absence on systematically distributed live-trapping sites throughout the study area prior to the initiation of logging in the area. This task required the establishment of a base camp, and layout of an extensive network of traplines in the study area and required several months of field work by a several conservation officers, and biologists.

The results of the March 1998 trapping effort resulted in 18 individual marten captured within the study area (7 males and 11 females) Table 1. The mean age of marten captured during 1998 was 1.71 years for males and 3.71 for females. Results of the aging of the remaining marten are pending. Tagging operations continued during October 1998 and March 1999. The live trapping during that time frame resulted in the capture of 22 individual marten (10 males and 10 females). Of these 20 animals captured, 6 (3 males and 3 females) were recaptures from 1998, indicating a significant turnover in the population. The results for October 1999/ March 2000 resulted in the capture of 20 marten (9 males and 11 females) with similar trapping effort as the previous year and in the same trapping locations. The turnover rate in the population declined considerably during these latest trapping session with 16 (7 male and 9 female) marten being recaptures from previous trapping sessions. The captures per 100 trap nights for the study area are similar to the results in other high density marten areas in the province, indicating the likelihood of similar marten densities in the Main River Study Area.

Several meetings were held with Corner Brook Pulp and paper Ltd. in 1999 in order to finalize a mutually agreeable harvest management strategy. An agreement in principle was reached and harvest management guidelines (including significant leave areas) are being applied as part of the experimental approach. A Memorandum of Understanding (MOU) between CBPPL and the Department of Forest Resources and Agrifoods describing commitments of both parties to the study is expected to be signed in April, 2000.

A small mammal trapping program will be initiated in the fall of 2000 and continued annually for the life of the study, in order to relate small mammal abundance to marten presence or absence and to develop a general indices of vole abundance in the study area. Marten scats will also be collected when encountered (17 scats collected to date) and analyzed in order to determine food habits in an area where snowshoe hares are largely absent.

Table 1. Marten live trapping effort and trapping success for the Main River study area, March 1998, March 2000.

| Trapping Period | Trap Nights | Captures* | | | Captures/100 Trap Nights |
|--------------------|-------------|-----------|--------|--------|-----------------------------|
| | | Male | Female | Total | |
| March 1998 | 468 | 7 | 11 | 18 | 3.85 |
| October 1998 | 149 | 2(0) | 0 | 2(0) | 1.34 |
| March 1999 | 510 | 9(3) | 11(3) | 20(6) | 3.92 |
| October 1999 | 143 | 2(1) | 4(3) | 6(4) | 4.20 |
| March 2000 | 505 | 7(6) | 7(6) | 14(12) | 2.77 |
| Total | 1775 | | | | 3.38 |

* Numbers in parenthesis refer to the number of marten that were recaptures from previous trapping sessions.

The study will continue to focus on describing marten presence or absence and its association with habitat features (including logging) on the landscape. Success of the study depends on consistent trapping effort annually throughout the study area. The live capture, assessment of presence/absence of marten and habitat associations around trapping locations will therefore continue to be conducted annually up until March 2004.

The next important phase of the study will be to integrate trapping results, micro-habitat of trapping locations, and forest inventory statistics (including updated forest harvesting areas) into a GIS based database in order to evaluate the contributions of habitat variables to marten presence and or absence on the landscape as described in (Haslett 1990).

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