

**Pine Marten Baseline Project**

**Annual Report**

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**Prepared By:**

**Lesley Howes  
Pine Marten Baseline Project Leader  
Wildlife Biologist  
WNMF**

**Darren J. Fillier  
Wildlife Habitat Biologist  
WNMF**

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The objective of the Western Newfoundland Model Forest (WNMF) is to work towards the sustainable development of the forest in western Newfoundland and to integrate wildlife and timber management objectives (WNMF proposal). Essential to this process are accurate wildlife population estimates, species densities, discerning habitat requirements of resident wildlife, assessment of habitat availability, suitability, and accessibility both spatially and structurally, at this point in time as well as to be able to predict future populations and habitat status. This information will be used within a comprehensive Decision Support System needed to derive an Integrated Resource Management (IRM) plan for the WNMF.

A major component of the Integrated Resource Management plan will be the incorporation of Newfoundland pine marten population and habitat objectives. It is through the description of marten habitat that quantitative habitat, and associated population, objectives may be generated thereby permitting derivation of WNMF management goals as part of the IRM plan. Thus, the objective of the baseline component is to estimate population densities and relative abundances within various habitat types, and to define Newfoundland pine marten habitat through analysis of structure, site classification, and marten use data, collected in forest stands within the WNMF. Stand structure and site character is to be utilized in generating a stand level habitat definition.

This report does not include detailed statistical analysis due to the conclusion of the winter field season coinciding with the project leader vacating the marten baseline project leader position. Extensive data has been compiled, regarding fulfilment of the baseline project objectives and among the first duties of the new project leader will be analysis of such data. The preliminary analysis conducted for respective objective orientated data is reported but only as an initial step.

**Objective 1) To update information on the distribution of marten by means of bait stations.**

The pine marten distribution report for 1992-1993 has been completed. This report updates the information on marten distribution and investigates range extensions and reductions in western Newfoundland and in particular penetration into regenerating stands in the Meelpaeg Lake area towards central Newfoundland. The report discusses some concerns associated with the martens' limited range and the possibility that smaller subpopulations of marten may be isolated from each other. This project will be repeated in 1996.

Although the WNMF marten baseline project was not involved with this objective during the 1993 - 1994 fiscal year, the Newfoundland Wildlife Division did continue bait station work regarding marten distribution within this time period.

**Objective 2) Production of a GIS habitat map.**

A Geographic Information System (GIS) map of potential marten travel corridors between the Little Grand Lake and Victoria Lake areas has been generated based on corridor criterion/information gleaned from North American literature. This map, however, is based on 1986 aerial photo-interpreted forest inventory information and so is of limited value regarding stand classification of successional development stages. Travel corridors between the Little Grand Lake and Victoria Lake areas have been investigated none the less. The preliminary corridor definition is: softwood and softwood dominated mixedwood stands at the immature or older development stage having a crown closure in excess of 30% with the corridor comprised of aggregates of such stands in excess of 30 m in width with no limitation on length of such aggregates. Based on this map and preliminary corridor definitions, there is seemingly little chance that marten can transverse between these two areas. However, collection and processing of updated data is ongoing. Further information regarding travel corridor status is also being viewed. Genetic analysis will offer information on dispersal by revealing family relationships. If marten from the same families are located in different and seemingly separate areas, travel corridor definitions will need to be revised.

It is through improved habitat definitions for Newfoundland marten that the development of a WNMF habitat map may be achieved. Preliminary work has been done on a habitat suitability index (HSI) for marten within the WNMF. This work will continue as new information on marten habitat is gathered. Through this process habitat may be quantified thereby allowing generation of a GIS habitat map.

With current avenues to have more recent data digitized and available in a GIS format coupled with ground cruising information and the derivation of a critical habitat definition, a habitat map will be generated, in the near future, that represents the current state of the forest. The next step in the process will be to tie such indices to vegetative successional change through both intervention and non-intervention occurrences.

**Objective 3) Density estimates by means of live trapping and mark recapture.**

Field work and data collection to establish density, relative abundance, and population demographics of pine marten in the model forest area was begun September 27 and continued until November 23, 1993. Areas trapped included Little Grand Lake, Glitter Pond, and Puddle Pond. A total of 23 marten were captured during a total of 786 trap nights. The ratio of male marten captured to female marten was approximately 2:1.

Preliminary analysis suggests that there are  $24 \pm 11.76$  marten in the Little Grand Lake area. To generate a density estimate we have to identify the size of the Little Grand Lake area from which the animals were trapped. Total trapping area will be generated upon deriving habitat definitions for the species with subsequent establishment of habitat availability, generation of an overlay of marten home range information collected for the Little Grand Lake area, and creation of an empirical based marten trap attraction assumption. The density estimate will

follow and a more accurate estimate will be generated in the near future with improved habitat definitions and availability. This will be achieved through further marten baseline project work coupled with detailed energetics work by Bill Adair of Utah State University within the Little Grand Lake area.

Preliminary density estimate analysis has not yet been conducted for the Glitter and Puddle Pond areas. Such estimates are critical given the need for density comparisons between older and younger softwood successional seres. As with the Little Grand Lake area, such data is to be generated shortly.

**Objective 4) Radio telemetry studies to determine movement and habitat use. How do marten use the environment compared to the availability of different habitat types?**

This component of the study was directed at assessing marten habitat at the stand level, in areas outlined in the winter distribution report. Forest stands were classified using the Damman Forest Site Classification manual. Ground verification of forest service stand classes regarding Newfoundland Forest Service (NFS) type maps was also conducted. Habitat utilization classification attempted to determine which forest characteristics marten are attracted to in these areas. Field work has been carried out in Corner Brook Lakes, Victoria Lake and Little Grand Lake areas. Data analysis is currently under way. No preliminary results are available at this time.

This work coupled with telemetry location data will determine if habitat utilization is non-random and then determine which habitat types are used most and which are used the least. There is an apparent problem with the radio telemetry techniques identified in the original baseline proposal in addressing such stand level habitat utilization concerns. Conventional radio telemetry techniques via ground and fixed-wing locations have to great an error regarding animal locations associated with such techniques. Consequently, the habitat types being utilized for analysis purposes must be aggregates of stands due to the error associated with this location information. Although it remains to be seen if this database is ample for marten habitat definitions given data collection over the past year (1993 - 1994), some changes are potentially required in the conventional ground and air telemetry locations to answer the questions of habitat utilization.

One possible solution is that further telemetry locations be collected via helicopter. An alternative would be the purchase and use of Global Positioning System (GPS) collars. The latter being very expensive and technology limited. Regarding the former, fixed-wing flights give a relative idea where marten are located, but are good only for establishing home ranges. Helicopters because of their ability to locate marten within stands will permit collection of data pertaining to habitat utilization in addition to ascertaining home range sizes. This information can then be overlaid with track transects and tracking data for a more complete picture of marten habitat use. This would fulfil needs for completion of Objective 2 of the baseline project.

This is possible given current budget framework provided: prorating of baseline objectives indicate this as high priority; overlap with population work done for marten through related projects is extensive thereby reducing this component of the baseline work; and equipment rental and service costs minimized through the use of WNMF equipment for the baseline marten project purpose. This will be of discussion importance between the new project leader, Wildlife Division and Model Forest personnel.

Winter habitat work (subnivean access and track counts/census) has been completed with the help of forest inventory crews from NFS. A track census of marten was done in all stands in which summer habitat data was collected. Complete data sets for the number of stands of varying habitat types are available and are currently being analyzed. Track data is also available for the Copper Lakes area through Sue Forsey and Eric Baggs of Memorial University of Newfoundland. The tracking data pertaining to marten for this area is to be incorporated within the baseline parameters of this project.

### **Genetic Variability Study**

Recent techniques in molecular biology are able to answer questions regarding population genetics, ecology and behavioural ecology. We will be applying these techniques to marten in western Newfoundland. Where small subpopulations are isolated, the genetic variability within the population is limited and species in this predicament face extirpation in far shorter time than a species having a freely mixing population on the same landscape. Population differentiation will aid in the determination of the unit of management; ie. if subpopulations are indeed isolated geographically resulting in genetic isolation then management scenarios are different versus no such isolation. Consequently, we may want to consider the artificial mixing of subpopulations to help strengthen the gene pool thereby stabilizing the population. Establishment of travel corridors between such subpopulations to alleviate geographic isolation is another potential solution in avoiding extirpation.

### **Questions:**

- 1) Are there any genetic differentiation between subpopulations (are isolated populations genetically different?) and if so which ones?
- 2) What is the genetic variability within the marten population?
- 3) Which animals are breeding successfully and contributing to the genetic pool? Which males are fertilizing most of the females? How far are juveniles dispersing? Are litters from a single female fertilized by one or more males?

## Analysis

The Davidson lab at Memorial University of Newfoundland received 23 samples of pine marten hair for genetic analysis from three different areas (15 from Little Grand Lake/Marten Pond, 4 from Puddle Pond and 4 from Glitter Pond), in the fall of 1993. Three additional samples were sent in the spring of 1994 (one additional from Glitter Pond, one from Puddle Pond and a third from the Northern Harbour area). The objectives were to isolate DNA from the hair roots of live trapped animals and perform population genetics analysis using randomly amplified polymorphic DNA (RAPDs).

The analysis proceeds in three steps:

- 1) Find suitable random primers for amplification of pine marten DNA.
- 2) Extract total genomic DNA from pine marten hair root samples.
- 3) Screen samples with chosen primers to detect variability and possible genetic differentiation.

To date, steps 1 and 2 have been completed and step 3 is currently underway.

1) Fifteen suitable primers have been determined. This was accomplished using DNA isolated from pine marten muscle samples donated by the Wildlife Division to the Davidson Lab. Additional primers can be established using this DNA if necessary. The use of approximately ten primers is typical in most published studies.

2) High quality DNA has been extracted from almost all hair root samples. The exception are samples #55 from marten pond, #51, #52 and #54 from Glitter Pond. Marten #55 and #54 have been retrapped and additional hair samples have been forwarded to the Davidson lab. The remaining marten are expected to be retrapped and new hair samples collected from which DNA will be isolated.

3) Screening for polymorphisms is currently underway. Some variability has been detected and preliminary results suggest that the population at Glitter Pond is genetically distinct from those at Marten Pond and Puddle Pond. This observation is based on one individual (#53) and is therefore inconclusive until more individuals from that population are added to the overall sample.

## 1993 - 1994 Budget

The following table indicates detailed expenditures per month during the 1993 - 1994 fiscal year for the pine marten baseline project. All budgetary expenditures were monitored and prepared exclusively by the project leader.

Marten - Baseline 2-201	May	June	July	August	September	October	November	December	January	February	March	Total
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Salaries												
Vehicle Rentals			1152.41		3174.18	433.52		305.59				5105.7
Equipment Costs	78.91	832.89	1688.38	172.33	4758.81	217.34	96.72	149.68	1274.26	308.25	3912.12	13700.7
Contract Services							6114.26					6114.26
Purchase Services	25		324.98					40.12				390.1
Operational									285.39	4142.99	1454.17	5682.55
Accommodations		44.5										44.5
Groceries			69.03	242.68	416.43	634.25	447.55			735.12	685.93	3230.99
Airfare												0
Aircraft Charter						1718.42	2787.12	4707.54	965.14	6017.1	5307.62	21502.9
Gas	794.16			411.81	223.43	212.04	1014.6	292.04	388.96	376.94	641.55	4356.53
			24.4									24.4
Monthly Total	898.07	877.39	3500.2	826.82	8582.65	3215.57	10460.3	5494.97	2813.75	11580.4	12001.4	60351.7
93/94 Budget	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000
Balance	74101.9	73226	69724.3	68897.5	60314.67	57099.1	46638.9	41143.88	36230.13	26649.7	14648.3	14648.3

## Other

Additional focus pertaining to the pine marten baseline project is required. Demographic information is needed for this species and include, but are not limited to: juvenile survival/mortality rates; production information; adult survival/mortality rates; and testing of habitat definitions via population maintenance. Although information regarding population persistence and energetics are currently underway within the WNM for this species, overlap with these projects and division of labour amongst the projects must occur to achieve the highest benefit for the species. This allows for marten population and habitat management through modelling to be interwoven so as to achieve proper forest management planning.

Of considerable importance is the need to examine the effects of various timber harvesting methods on marten habitat, and corresponding populations, beyond work already done in this area. A study needs to be initiated regarding compromise between fibre and wildlife management that will allow marten to continue to use the forest, generate marten habitat, as well as allow for continued harvesting within the forest. An essential component of this is (are) the forest management simulation model(s) currently under development as part of the

WNMF Decision Support System. Such a study could also initiate the recommendations/conclusions regarding harvesting (modification of current techniques or "specialized" harvesting) produced through previous studies for marten in western Newfoundland. These concepts could be employed either in the final bastion of pristine marten habitat of the Little Grand Lake area or in areas being queued for harvest, in the near future, in the Copper Lake and Dorsal Pond areas.

This would require substantial cooperation amongst the Licensees (forest companies) wishing to operate in these areas, NFS, Wildlife Division and the WNMF. This type of cause and effect study would also establish the potential for further wildlife/forest management data collection through effects of silviculture (i.e. pre-commercial and commercial thinning, planting) on marten habitat and corresponding populations.

These additional items are presented for the purpose of discussion. These, and possibly other, become additional objectives for the pine marten baseline project and require prorating regarding their respective importance rating within the baseline project. Such prorating, policy, and technical advice continuation from the various resource agencies within the WNMF is required for the baseline project to be successful and the fate of the Newfoundland pine marten secured.