

American Marten in Unama'ki

The American marten (*Martes americana*) is a member of the mustelid family. Similar in size to a mink, it has chocolate brown fur, with an orange coloured throat and chest. Its long slender body, short limbs, broad feet, and sharp semi-retractable claws make the marten well adapted for climbing trees and travelling across the forest floor. In winter, the soles of the feet are densely furred allowing for easy movement through snow. Sexual dimorphism is pronounced with males averaging about 15% larger than females in body length and, at times, over 50% larger than females in body weight (Clark et al. 1987).

Historically, marten were found throughout Nova Scotia but are now found in low numbers in only two locations within the province. There is a population in southwestern Nova Scotia that is, at least, in part, a result of a "re-introduction" of 116 animals at Kejimikujik National Park, and a small relict population on Cape Breton Island (CBI). The marten was believed to be extirpated from the mainland of Nova Scotia by 1935, though a marten was trapped in 1979 in the south west. The relict CBI population is an insular, fragmented population with an estimated total population size considerably less than 100 animals. It is probable that the Cape Breton population has been isolated from the mainland for some 10,000 years.

Based on historic pelt exports, the CBI marten population was estimated to be between 800 to 1250 animals in the late 1800s (Scott 1998). Marten populations had declined on CBI by the early 1900s with only two records; one in 1935 and one in 1954 (Clarke 1942, Hagmeier 1956; Prescott (1980). The Cape Breton Island marten population was believed to have been virtually extirpated until confirmed records in the period 1959-69 (Scott 1998) indicated that a small number of animals still survived in the wild in isolated areas in and around the Cape Breton Highlands. Analysis of subsequent incidental sightings showed that the central highlands plateau had been vacated by marten following the extensive harvesting of budworm-killed balsam fir in the late 1970s. Systematic searching in 1997, by bait-station surveys, revealed that numbers were extremely low and that the species was apparently absent from large portions its suitable range (Scott 1998 and references therein). In addition to low numbers detected, the CBI marten population is split

into a northwestern Cape Breton Highlands National Park isolate and a southern Victoria County one which may be further fragmented. Most of the central plateau of the highlands has apparently been vacated by marten, with no records of any kind since 1979 (Scott 1998); this is presumably the result of extensive salvaging of budworm-killed timber in the 1970s and '80s.

Cutting was not a major disturbance factor on the Highlands until the mid-1970s, when an outbreak of spruce budworm (*Choristoneura fumiferana* Clem.) dramatically changed the forest conditions in the central CBI Highlands by killing 77% of the mature balsam fir stems by 1987 (Banks 1992). This mortality translated into an estimated loss of 32 million m³ of merchantable spruce and fir between 1974 and 1990 (Stora Enso 2006). To put this loss in perspective, this represents approximately 50% of the total softwood volume on Cape Breton Island (excluding Cape Breton Highlands National Park). In an attempt to minimize the loss of wood products and to salvage the useful timber, most of the infested areas were clear cut. During this period, considerable harvesting of yellow birch was also done, and many previous forestry operations have selected against yellow birch mixedwoods, replacing them with softwood forests. Art Lynds (in Scott 1998)

suggested that most of the salvaged areas were cleared of coarse woody debris, sprayed for competing vegetation, and replanted if there was insufficient balsam fir regeneration. Now, 30 years later, though there has been a significant decrease in the dominance of coniferous over deciduous trees, almost all of the previously affected forest is regenerating.

The major change has been the significant loss of stands of optimal or near-optimal forest for marten, especially in the south-central highlands, which has been vacated by marten since 1979. The degree of fragmentation of remaining optimal forest habitat is extreme. The loss of suitable marten habitat on Cape Breton Island, both in terms of quality and quantity, as a result of previous logging and salvage logging following the spruce budworm infestation has been severe.



Given the high fragmentation of optimal habitat, and extreme low marten population levels on CBI, it is probable that Allee effects are occurring in the population because most adults are isolated from potential mates and therefore reproductively inactive (Scott 2001). Further, there is likely to be an increased probability of inbreeding depression in those that do manage to reproduce because of the high probability of matings among related individuals (Scott 2001). The potential effect of deleterious genetic loading on the population is unknown, but must be considered a threat. Given the apparently extremely low numbers of marten, and the high degree of fragmentation of suitable habitat, it is very probable that recruitment is drastically reduced and the majority of the population consists of reproductively capable but isolated and thus reproductively inactive adults.

The NSMLRT believes that considerable effort must go towards maintaining and enhancing existing habitats, and eliminating accidental mortality, if the species is to survive. Past unregulated trapping and habitat loss or alteration are believed to be the two factors that have had the greatest impact on the CBI marten population. These two factors have had the combined effect of keeping the CBI marten population low by isolating sub-populations, limiting immigration/emigration opportunities, likely reducing adult reproductive activity. Over the past four years, CBI marten recovery efforts have included stewardship endeavours focussed on outreach and education. Target groups have included, but are not limited to, individuals involved in trapping and forest harvesting, aboriginal groups and the general public.

Trapping

Marten are readily captured in hare snares and many trap sets placed for other furbearers, such as mink. Over the past several years, NS DNR has partnered with the Trappers Association of Nova Scotia (TANS) to develop and hold workshops for fur harvesters stressing the importance of marten (and lynx) recovery. Two one-day trappers' workshops have been held in Cape Breton; one in Margaree (2003) and one in Sydney (2005) to educate trappers on the plight of the CBI marten population. Presentations on the general biology and ecology of marten, including habitat needs, were delivered at all of the workshops. Discussions on how to avoid incidental bycatch of marten in traps and snares set for other furbearers, by avoiding, or removing traps from areas where marten tracks are present, by using water-sets for mink, and by modifying snowshoe hare snares. Paul Tufts, President of TANS, made an impassioned plea to those present at all workshops to pay attention to the information provided and to work closely with team members to recover the marten. Also, as part of educating trappers about the marten a brochure entitled, "How to Avoid Incidental Take Of American Marten While Trapping or Snaring Mink and Other Furbearers." was produced (in both official languages) and posted on the internet at <http://www.speciesatrisk.ca/martenandlynx/>. In addition to the workshops, marten recovery presentations have been delivered at the annual Trappers' Convention in Kentville each year since 2001. This event is usually well attended with approximately 150 trappers participating. Another outreach effort involves placing a message in the NS Trappers' Newsletter annually, reminding readers that marten are provincially listed as endangered. TANS directors are also given updates on recovery initiatives every six months.

Current levels of fur harvesting in the CBI Highlands is very low (D. Anderson pers. comm. 2005), with limited trapping activity targeting coyote and occurring along the extensive road system. Snowshoe hare snaring pressure, a potential threat to marten populations, may occur as hare numbers rebound. Should hare snaring become an issue, it may be necessary to institute no snaring or modified snare zones similar to those in Newfoundland.

Habitat

The main problem facing the existence of the CBI marten is the current lack of optimal habitat as is evident based on height and basal area as criteria (Scott 2001). The NS Marten Recovery Team has been able to partner with industry, scientists, stakeholders and government agencies to ensure that long-term commercial harvest supply plans incorporate the habitat requirements of species at risk at multiple scales. Much of Cape Breton is privately owned, except in the Highlands where the majority of lands are held by the Federal Government in Cape Breton Highlands National Park, and the Government of Nova Scotia for Provincial Crown lands. Most of the latter is under long-term lease to Stora Enso for forest management. Considerable areas of mono-culture balsam fir forest exist in the Cape Breton Highlands. These stands lack the necessary structure to be anything other than marginal marten habitat throughout the mature stage. This current marten habitat bottleneck will likely last for another 10-20 years, based on modelling data from Stora Enso (Lock 2003). It is therefore necessary to plan, model, identify, and actively manage for future habitat at the landscape level to enable sufficient habitat to maintain marten over time. The Marten Recovery Strategy (NSMLRT 2002) suggests that right now a "minimum of 20,000 ha of conifer-dominated and mixedwood forest marten habitat is needed, in individual blocks no smaller than 500 ha during the next 10 years on the CBI Highlands, through various protection measures, such as harvesting and road construction restrictions, and proactive management of insect infestations".

Current legal protection for the Cape Breton marten population includes: Nova Scotia Endangered Species Act (Nova Scotia 1998a); Nova Scotia Wildlife Act (Nova Scotia 1998b); Nova Scotia Wilderness Areas Protection Act (Nova Scotia 1998c); Nova Scotia Forest Act (Nova Scotia 1998d) and Wildlife Habitat and Watercourses Protection Regulations (Nova Scotia 1989e); and Canada National Parks Act (Canada 2000).

The listing of marten in the Nova Scotia Endangered Species Act (NS 1998) gives the province powers to apply recovery actions, the goal of which is to prevent "any species in the Province from becoming extirpated or extinct as a consequence of human activities" and provides "for the protection, designation, recovery and other relevant aspects of conservation of species at risk in the Province, including habitat protection". The Act lends weight to the issue of species at risk habitat protection by prohibiting the destruction or disturbance of a specific dwelling place or area by individuals or populations of an endangered or threatened species [section 13 (c)].

Beyond the Nova Scotia Endangered Species Act, large sections of the highlands, containing or believed to contain most or all of the Cape Breton marten population fall under some level of protection. Cape Breton Highlands National Park protects 950 km² of highlands and coastal wilderness.

Seven Provincial Wilderness Areas (Wilderness Areas Protection Act 1998), totalling ~475.7 km², that may provide some protection to marten habitat in Cape Breton include: Pollets Cove-Aspy Fault (272.3 km²); French River (71.0 km²); North River (39.9 km²); Middle River (56.2 km²); Trout Brook (28.8 km²); Sugarloaf Mountain (7.5 km²); and, Margaree River (68.5 km²).

The Nova Scotia Wildlife Act makes it illegal to take, trap, kill or have possession of marten under the Fur Harvesting Regulations (Section 113), but also allows for the integration of "appropriate protective measures into policies for use on Crown lands, and in guidelines for forest management and other programs on privately owned land, to ensure adequate habitat for established populations of wildlife".

The Nova Scotia Forest Act provides for the effective management of all Crown lands including the maintenance or enhancement of wildlife and wildlife habitats, while the Wildlife Habitat and Watercourses Protection Regulations (Section 40) provides a regulatory framework to maintain legacy trees and habitat structure.

Initially, NS DNR suspended forest harvesting on four blocks, totalling ~530.6 km². This was prior to the establishment of a Marten Recovery Team and subsequent completion of a Recovery Plan. These moratoria areas, along with CBHNP and the Protected areas were thought to capture most of the available marten habitat and encompass most marten sightings. Since then, these blocks have been replaced by a Marten Habitat Management Zone where special forest management practices for marten can be undertaken.

To determine current and future marten habitat availability, the Habitat Subcommittee modelled growth for all forest stands in Northern Cape Breton and then determined whether or not the stands were suitable marten habitat. Here, marten habitat is considered to be all forested stands ≥ 6 m tall with a basal area ≥ 18 m²/ha and with a softwood basal area that is at least 30% of the stand's total basal area (NSMLRT 2004). These forecasts were made stand-by-stand until the year 2030. Stand volumes were grown according to the NS DNR forest inventory site classification system. Stand heights were forecasted based on the site class of the stand, while a maximum height of 14m was assumed for all stands not already exceeding this threshold. Softwood basal area was then calculated from the forecasted heights, crown closures and volumes. Due to the limited ability to properly forecast the future development of budworm killed stands, the model likely resulted in an underestimate of the future available habitat area. The results of this model show that, on Crown land, in this northern area there was about 50 000 ha of marten habitat in 2004, and predicts there will be over 100 000 ha in 2030 (Nova Scotia MLRT 2004).

Analyses of marten habitat available in northern Cape Breton (Nova Scotia MLRT 2004) indicates that currently, there are at least 30 patches of habitat of suitable size and forest structure for individual marten home ranges. Stand level forecasting shows an additional 25 home ranges, through forest succession, are possible by the year 2030. While modelling and locating these patches, consideration was given to functional connectivity among patches to facilitate demographic interactions for breeding, dispersal, and migration. The patches are adjoining, adjacent to one another, or



are adjacent to Stora Enso "steep slope reserves", "lynx habitat reserves", "connectivity management zones", "old growth reserves" (Lock 2003; Nova Scotia MLRT 2004), category C3 lands (lands specifically allocated to special uses and where other resource activities may be limited, modified, or denied) under the provincial Integrated Resource Management (IRM) scheme, and category C2 lands, where resource development may fall under certain restrictions. Core habitat for endangered species, such as the CBI marten, may be included as C3 lands in the future.



In addition to the creation of the Marten Habitat Management Zone, all forest harvesting on Stora Enso freehold and Crown land in northern Cape Breton is to leave 12 - 14 standing green trees per hectare, in addition to those required by the Wildlife Habitat and Watercourses Protection Regulations. Management would also focus on re-establishing the prominence of large old yellow birch as cavity trees.

To further interest among forest practitioners and large land owners in marten recovery on CBI, recovery efforts have included a workshop for forest practitioners, and individual contact with land owners. Attended by fourteen people, the workshop offered presentations on the general ecology and biology of marten, with an emphasis on habitat needs, forest harvesting and forest supply. Most of those in attendance either work for, or are sub-contracted by Stora Enso.

Cape Breton Marten Genetics

Historically, little was known about patterns of genetic variation in populations of American marten in the maritime regions south of the St. Lawrence River. The main goal of the analyses, conducted by the Laboratory of Genomic Diversity, was to describe patterns of molecular genetic variation in marten in the context of its evolutionary history, with specific attention on the Nova Scotia and neighbouring eastern populations (Johnson et al. 2004). Assessment of the uniqueness of the CBI population was of special importance given its legal status and high risk of complete extirpation. Given the current and historic potential barriers to gene flow among regional populations, such as the narrow (25 km) Chignecto isthmus connecting Nova Scotia to the North American continent, and the separation of CBI from the mainland since the early Holocene (nearly 10,000 years ago), it was thought that the CBI marten population, might be as genetically distinct from each other and from the main North American population as the subspecies *M. a. atrata* in Newfoundland (Johnson et al. 2004).

Because determining the genetic distinctiveness of the CBI marten population changes priority options for their recovery, blood, hair,

hide, and tissue samples were collected from wild-caught American marten from throughout their range. Collections included; seven samples of tissues from CBI, an additional 32 samples from across the province, and 160 samples from other areas of North America (Table 1). All samples were analysed by the Laboratory of Genomic Diversity, National Cancer Institute (USA). These analyses were required to establish whether there are any significant genetic differences between the CBI marten, those occurring on mainland Nova Scotia, the geographically

closest wild native population in northern New Brunswick, and other more western populations.

The genetic analyses of the CBI population relative to those of NS, NB, and other parts of Canada suggest that the CBI population, although not genetically unique, has a noticeable reduction in mtDNA and microsatellite genetic variation (Johnson et al. 2004). These reduced levels of heterozygosity, combined with indications that the size of the CB population is very small, raise the concern that without intervention, demographic and genetic trends will lead to increasing levels of inbreeding and increased probabilities of extinction (Johnson et al. 2004).

Translocation is considered the best way to recover marten in Cape Breton because of the small number of individuals within the current population, and the absence of nearby populations. Marten have been successfully reintroduced or translocated in several provinces and states in North America. Recent genetic analysis suggests that the marten in Cape Breton are genetically similar to other northeastern North American populations, but suffer from low genetic variation.

A study was undertaken by Parks Canada, in partnership with the Nova Scotia Department of Natural Resources and the Nova Scotia Marten Recovery Team, to determine the feasibility of translocating wild, live-trapped marten to Cape Breton. A team comprising scientists with expertise in marten, carnivores, genetics and Geographic Information System habitat analysis provided guidance in design and implementation of the study. Objectives of the study were to determine if there was an adequate amount and configuration of marten habitat and prey in Cape Breton, if there was a suitable source population available for reintroduction, determine the usefulness of a captive marten colony at Shubenacadie, to assess potential interspecific impacts, determine implementation and legal requirements, the development of a communications plan, monitoring techniques and evaluation criteria.

Past habitat assessments were used to determine the amount and configuration of suitable marten habitat in Cape Breton and to evaluate its capability to support a marten population. In Northeastern North America marten are closely-associated with extensive stands of mature/"overmature" pure or predomi-

nantly coniferous or mixed forest with tree cavities for denning and windthrown/fallen trees to provide additional shelter for prey mammals and subnivean entry points in winter. Currently, in northern areas of Cape Breton there is about 50 000 ha of marten habitat, and habitat forecasts predict there will be over 100 000 ha in 2030.

A marten augmentation in Cape Breton is not likely to adversely affect recovery of provincial or federal species of concern. Although lynx populations are very low on Cape Breton currently, their numbers should increase as they rebound through the low of their cycle. Lynx use similar habitats and at times prey species as the marten, but co-existence in other parts of their range suggests that marten will not adversely affect lynx populations. Because marten are protected under the Nova Scotia Endangered Species Act, and there are provincial forest special management practices critical to habitat in Cape Breton for this species. An augmentation would not result in additional regulations for forest management practices on federal, provincial, or private lands, based on current statutes.

Eight potential reintroduction areas were identified based on the habitat assessment, the marten habitat management zone, and level of habitat protection (Federal Park or Provincial Wilderness Area). Initial releases will take place near the Trout Brook, North River, and Middle River Wilderness Areas, and two locations (Cheticamp River and Aspy) within Cape Breton Highlands National Park.

Genetic analyses and logistical considerations suggest that marten from New Brunswick would be the most suitable source population for translocation to Cape Breton. This population is capable of sustaining the removal of thirty to fifty marten a year over three years, starting in the fall of 2006. After three years of translocating marten from New Brunswick, an opportunity exists to release captive-bred marten currently being held at the Shubenacadie Wildlife Park. Using captive-bred animals necessitates the development of a pre-release training program and the construction of pre-release training facilities. Captive-bred marten can be used after three years of translocating marten to supplement those animals already released to reach the 90 - 150 animal, and sex ratio goals for the overall project. It also offers a chance to test if releasing captive-bred marten can be used effectively.

A number of cooperators and stakeholders are interested in a marten augmentation. Some have contributed to the assessment, including Stora Enso, Parks Canada, and the Nova Scotia Department of Natural Resources. Other cooperators, the Department of Natural Resources, the Trappers Association of Nova Scotia, and Unimaki Institute of Natural Resources have offered support in implementing the plan and assistance with monitoring. Monitoring will include the use of radio-collared animals, track-plates, remote cameras, live-trapping, snow track surveys, carcass collection and incidental reports.

The project will be evaluated through the different stages of capture, transport, holding and release to determine if changes in protocol are necessary, after each year of release, and two, five and ten years after releases have been completed. These evaluations should look at: whether the target of 90-150 translocated animals was met, whether mortality rates were acceptable, if released marten helped to link the separate sub-populations, if the extent of the population increasing into lowland areas, and if there an indication that there is a free-living viable population of marten on CBI two, five and ten years after release?



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