

RECOVERY PLAN FOR THE AMERICAN MARTEN (*MARTES AMERICANA*) IN NOVA SCOTIA



**A report prepared for the Nova Scotia Department of Natural
Resources and Renewables**

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PREFACE

Under the *Nova Scotia Endangered Species Act (1998)*, a Recovery Plan must be developed for species listed as Endangered or Threatened under the Act and include the following:

- Identification of the needs and threats to recovery of the species;
- The viable status needed for recovery;
- The options for recovery as well as the costs and benefits of these options;
- The recommended course of action or combination of actions to achieve recovery of the species;
- A schedule for implementation of the recovery plan including a prioritized listing of recommended actions;
- Identification of habitat; and,
- Identification of areas to be designated as core habitat for the species.

The goals, objectives, and actions identified in this Recovery Plan are based upon the best available information on the species and are subject to modifications and/or revisions as new information becomes available. Recovery of species at risk is a shared responsibility and the collaborative approach emphasized in this document is reflective of this. Implementation of the actions and approaches identified in this plan are subject to budget constraints, appropriations, and changing priorities.

ACKNOWLEDGEMENTS

The Province of Nova Scotia contracted NovaSila Wildlife Consulting Inc. to develop the draft Recovery Plan in consultation with the Recovery Team. This Recovery Plan was reviewed by the Recovery Team with input from the following individuals:

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- *Soren Bondrup Nielsen*

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EXECUTIVE SUMMARY

American Marten (*Martes americana*) are found across much of northern North America. This includes most of Canada and Alaska as well as the Great Lakes, northern New England, and along the Rockies. However, American Marten have experienced a significant range contraction in Ontario, Nova Scotia, New Brunswick, and Newfoundland. Records show that American Marten were once widely distributed throughout Nova Scotia. The species is currently found in two distinct subpopulations: one on the Mainland in the southwest and one on Cape Breton Island.

American Marten prefer older forest with tall trees (> 8 m) and abundant coarse woody debris. These habitats provide protection from predators and have abundant small mammal populations, the major food source for this species. American Marten generally avoid large forest openings. They also favour larger forest patches likely due to this species having large home ranges for their body size, and that both sexes are highly territorial to others of the same sex.

The major threats faced by American Marten today include habitat loss and fragmentation due to forest harvesting practices, combined with climate change effects that may alter dominant forest cover and/or decrease snowfall. American Marten have larger spatial requirements, lower population densities and lower reproductive rates than many other mammals of a comparative size. These life-history traits mean that American Marten are more susceptible to population declines and that the negative impacts of events normally lasts long after the threat ends. This also limits the ability for population to recover after events and recovery is slow.

The long-term recovery goal (>20 years) for American Marten is to maintain and promote a self-sustaining and ecologically functioning population within the province. This will require at least 500 individuals in each American Marten subpopulation. The short-term goal is to gain a better understanding of the American Marten range in Nova Scotia, especially on the Mainland, which will facilitate better population monitoring and more effective habitat protection.

Effective landscape-level planning provides an inherent link to American Marten conservation measures and their recommended actions, including habitat management and population monitoring. Progress towards the recovery of American Marten in Nova Scotia will be reviewed every five years and this Recovery Strategy will be revised at a maximum of ten-year intervals.

RECOVERY FEASIBILITY SUMMARY

The recovery of American Marten in Nova Scotia is considered technically and biologically feasible based on the four criteria laid out by Environment and Climate Change Canada as part of the Species at Risk Act recovery process:

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Yes. Indications are that the Cape Breton American Marten populations is stable or increasing in recent years. For an American Marten population to maintain their long-term genetic diversity they must maintain a population above 100 individuals (Hillman 2014). After the last spruce budworm outbreak in Cape Breton, the American Marten population experienced an estimated 80% decline due to habitat loss exacerbated by salvage logging (Scott 2001). Based on this, at least 500 individuals in a population are needed to withstand a similar decline. All indications are that there are more than 250 American Marten in Cape Breton. The Mainland population is currently being assessed.

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Yes. Each of the two American Marten populations require somewhere between 225 to 440 km² of high-quality habitat to maintain a minimum viable population of 100 individuals. We have set a long-term population goal of 500 individuals in each population, so we would need 5 times this space (1125 to 2200 km²) to achieve this goal. American Marten have been observed in 1070 km² of Cape Breton and 1300 km² of the Mainland. In total, 6521 km² of Nova Scotia (Cape Breton: 2258 km², Mainland: 4263 km²) meet the minimum habitat requirements for this species, so there is sufficient suitable habitat to support population objectives.

3. The primary threats to the species or its habitat can be avoided or mitigated.

Yes. The primary threat to American Marten in Nova Scotia is a decrease in mature forest associated with wood harvesting. Loss of mature forest from natural disturbance is exacerbated by removal of coarse wood debris (CWD) due to salvage logging. An additional threat is incidental harvest (bycatch) by trapping of other furbearers, in association with extensive road access and increased access to marten habitat by competing or predatory mammal species, such as Coyote, Bobcat and Lynx. Climate change also has the potential to cause habitat shifting and alteration. All of these, except for climate change-related threats, can be mitigated. Ongoing evaluation and monitoring of the effects of climate change on American Marten is required.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Yes. Many recovery actions for the American Marten are underway in Nova Scotia with some indication of success. Ongoing and novel approaches to monitoring and assessing population trends and habitat availability can be expected within the lifetime of this plan (ten years).

The Recovery Team concludes that the recovery of American Marten in Nova Scotia is technically and biologically feasible based on the criteria discussed above.

Table of Contents

PREFACE.....	3
ACKNOWLEDGEMENTS	4
EXECUTIVE SUMMARY	5
RECOVERY FEASIBILITY SUMMARY.....	6
1. NSSARWG ASSESSMENT SUMMARY	9
2. SPECIES STATUS INFORMATION	10
3. SPECIES INFORMATION	11
3.1 Species Description	11
3.2 Population and Distribution	11
3.3 Species Needs.....	15
3.4 Dwelling Place	20
4. THREATS	20
4.1 Threat Assessment.....	20
4.2 Description of Threats.....	30
5. POPULATION AND DISTRIBUTION OBJECTIVES	32
5.1 Viable Status for Recovery.....	32
5.2 Long-term Population and Distribution Objective	32
5.3 Short-term Population and Distribution Objective.....	33
5.4 Rationale	33
6. BROAD STRATEGIES AND GENERAL APPROACHES TO RECOVERY	34
6.1 Actions Completed or Underway.....	34
6.2. General Approaches to Recovery	36
6.3 Narrative to Support the Recovery Options Planning Table	43
7. RECOMMENDED COURSE OF ACTION(S) FOR RECOVERY	45
8. IDENTIFICATION OF CORE HABITAT.....	47
8.1 Core Habitat Definition and Attributes	47
8.2 Identification of the Species' Core Habitat.....	48
8.3 Activities Likely to Result in the Destruction of Core Habitat	49
8.4 Schedule of Studies Related to Core Habitat	50
9. MEASURING PROGRESS.....	52
9.1 Performance Indicators.....	52
9.2 Review of Past Recovery Objectives.....	53

9.3	Monitoring.....	55
10.	REFERENCES	56

LIST OF FIGURES

Figure 1.	Approximate range of American Marten in Nova Scotia based on 529 observations between 2000-2021 (Cape Breton = 193, Mainland = 336).	13
Figure 2.	American Marten observations from 2000 to 2021 in Cape Breton (n = 193) with red dots referring to the location of American Marten reintroduction sites.	14
Figure 3.	American Marten species distribution based on sightings from 2010 to 2020 (n = 256).	16
Figure 4.	American Marten core habitat area in Nova Scotia (Mainland = 4428, Cape Breton = 2109 km ²).	49

LIST OF TABLES

Table 1.	NatureServe conservation status ranks for the American Marten in Canada.....	10
Table 2.	Threat calculator assessment	22
Table 3.	Recovery planning table	36
Table 4.	Recovery actions and implementation schedule of activities in support of recovery	45
Table 5.	Activities Likely to Result in Destruction of Core Habitat	50
Table 6.	Schedule of Studies to Identify Core Habitat.....	50

1. NSSARWG ASSESSMENT SUMMARY *

Assessment Summary: 2019

Common Name: American Marten (Cape Breton population; Mainland population)

Scientific Name: *Martes americana*

Status: Endangered

Reason for Designation: Small population size and limited localized occurrence resulting largely from historic unregulated trapping during the 1800's. More recently habitat change including fragmentation due to a spruce budworm outbreak in the 1970s, forest harvesting practices, and other human activities. Climate change effects on habitat and interspecific interactions may also impact American Marten populations in Nova Scotia.

Nova Scotia Occurrence: Cape Breton population: Inverness County, Victoria County; Mainland population: Shelburne County, Digby County, Annapolis County, Yarmouth County, Kings County, and Queens County.

Status History: The Cape Breton population of American Marten was listed as Endangered under the Nova Scotia Endangered Species Act in 2002, at this time the Mainland population of American Marten was deemed data deficient.

In 2019, the Cape Breton population was reassessed as Endangered, and the Mainland population assessed as Endangered for the first time¹. Both populations were assessed as endangered based on their small population size, restricted distribution, increasing threats, and ongoing need for management to sustain populations. Until new information becomes available about the origins, population size and trends, and threats of each population, the populations will be listed separately under the Endangered Species Act.

* The following definitions are applicable in this section and elsewhere: NSSARWG (Nova Scotia Species at Risk Working Group); COSEWIC (Committee on the Status of Endangered Wildlife in Canada); NSESA (Nova Scotia Endangered Species Act); SARA (Species at Risk Act).

2. SPECIES STATUS INFORMATION

American Marten are classified as Furbearers under the *Nova Scotia Wildlife Act*, and it is illegal to trap or kill American Marten or damage their dens in Nova Scotia. American Marten have a NatureServe status rank of G5 (globally secure), though the Nova Scotia population is ranked S2 (imperiled). Nova Scotia American Marten are not currently listed under the federal *Species at Risk Act*, and American Marten are common through most of the rest of their current range in Canada.

Upon review by the Nova Scotia Species At Risk Working Group (NSSARWG) in 2019, both the Cape Breton and Mainland populations of American Marten were individually designated as Endangered. While limited new data were available, increasing threats to the population from forestry practices, habitat alteration and climate change were determined to place the small, localized populations at heightened risk. Research on the Mainland population needs to continue to fully understand population size and recovery needs. It is not known if the Mainland population is derived of animals of historic origins, if it is derived from introduced individuals, or some combination of both.

Table 1. NatureServe conservation status ranks for the American Marten in Canada (NatureServe 2023)*

Global (G) Rank ^a	National (N) Rank ^b	Subnational (S) Rank ^c
G5	N5	S5 – Alberta S5 – British Columbia S3 – Newfoundland S5 – Labrador S5 – Manitoba S4 – New Brunswick

¹ Listing is in progress as of 16 July 2023.

		S5 – Northwest Territories S2– Nova Scotia SU – Nunavut S5 – Ontario SX – Prince Edward Island S5 – Quebec S4S5 – Saskatchewan –5 - Yukon
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^a G-Rank – Global Conservation Status Rank, G1 = Critically Imperiled; G2 = Imperiled; G3 = Vulnerable; G4 = Apparently Secure; G5 = Secure

^b N-Rank –National Conservation Status Rank, N1 = Critically Imperiled; N2 = Imperiled; N3 = Vulnerable; N4 = Apparently Secure; N5 = Secure

^c S-Rank – Sub-national (provincial or territorial) ranks, S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; and S5 = Secure. B = breeding; and U = Unrankable.

*A full list of definitions can be found in Definitions of NatureServe Conservation Status Rankings at https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.887112/Martes_americanana

3. SPECIES INFORMATION

3.1 Species Description

American Marten have a long and slender body with short limbs. The head is triangular with a sharp pointed nose and prominent rounded ears. The tail is long and bushy, extending about half the body length. The feet are broad, with five toes and semi-retractable claws and are densely furred in the winter. The American Marten has long, dense, silky fur that ranges from pale buff to dark brown, with the legs, back, and tail typically darker than the head. The American Marten is known for its prominent bib on the throat and chest, which may be buff to orange in colour.

Across the range of American Marten, adult females weigh 280-850 g with a head and body length ranging from 32-40 cm. Adult males are larger, weighing 470-1250 g with a head and body length ranging from 36-45.5 cm (Clark et al., 1987). In Mainland Nova Scotia, females weighed an average of 544 g (n=8; range: 498-598 g) and males weighed an average of 842 g (n=4; range: 748-918 g) (Berlo, 2006). Marten are members of the Mustelidae Family. Fisher and Mink are other members of this family that American Marten are often misidentified as. Fisher are larger in size than American Marten and have dark brown fur. But like the American Marten they can often be found in trees. Mink are similar in size to the American Marten but have short ears and legs. They have dark brown fur with a white chin and white patches on throat, chest and stomach. Mink are also semi-aquatic so are often found close to water.

3.2 Population and Distribution

Global, National and Nova Scotia Range

American Marten are found in coniferous and mixed forest habitats across much of northern North America, occurring throughout most of Canada and Alaska as well as the Great Lakes, northern New England, and the western regions of the United States (Proulx et al., 2005; Nature Serve, 2023). The global range of American Marten has contracted from its historical range, particularly in the southeast (Clark et al., 1987; Kelly, 2005).

The American Marten's Canadian range has contracted considerably from its historic distribution in Ontario, Nova Scotia, New Brunswick, and Newfoundland (Bateman, 1980). The species is considered extirpated from Prince Edward Island (Nature Serve, 2023).

Historical records from the 1800s showed that the American Marten was once widely distributed throughout Nova Scotia (Scott, 1998). The species is currently found in two distinct populations: one on the Mainland of Nova Scotia and one on Cape Breton Island. On the Mainland, American Marten are more commonly found in Digby, Yarmouth, Annapolis, and northern Queens counties, with confirmed occurrence in Shelburne, Kings, and southern Queens counties. There have been scattered sightings throughout central and eastern Mainland counties, particularly in Halifax, Hants, Guysborough, Colchester, and Lunenburg. Most of the sightings are unverified reports, though some have been confirmed through carcasses, photographs, or verification of tracks (Figure 1). In Cape Breton, the range is centred around the highlands of Victoria and Inverness counties. There are no confirmed sightings or incidental harvest records for Richmond County. Snow track surveys in Richmond counties from 2005 to 2021 did not detect any American Marten (NSDNRR, unpublished data). However, in recent years there have been confirmed sightings of American Marten on the edge of Cape Breton County.

The only American Marten population that has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is the Newfoundland Marten (*Martes americana atrata*). The species is currently listed under SARA (since 2009) as Threatened, but in 2022, was re-assessed by COSEWIC as Special Concern because of increase in distribution and abundance, previous underestimates, reduction of harvest mortality and introduction of Red Back Vole a common prey species for Newfoundland Marten (COSEWIC, 2022).

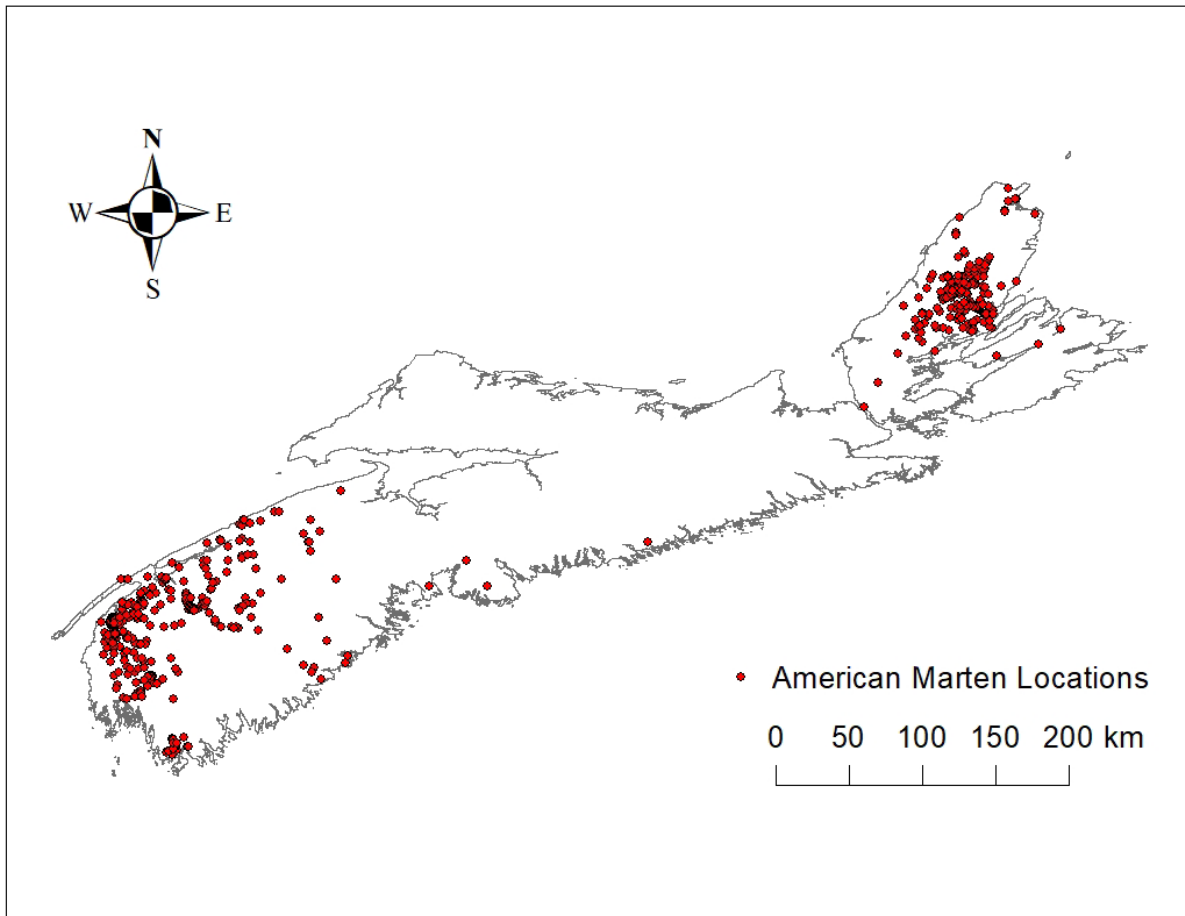


Figure 1. Approximate range of American Marten in Nova Scotia based on 529 observations between 2000-2021 (Cape Breton = 193, Mainland = 336). Observations were gathered using public and First Nations reports, incidental trapping records, and governmental surveys.

Population Size and Trends

American Marten were thought to be extirpated from the Mainland by the mid-1930s, but one was trapped in the late 1970s in Digby County (Scott, 2001). There are no current abundance estimates for Mainland Nova Scotia. American Marten populations in the Mainland have likely increased from their historic lows, at least partly as a result of the reintroduction of 116 individuals between 1987 and 1994 into Kejimikujik National Park (Nova Scotia American Marten Recovery Team, 2006). American Marten on the Mainland are currently being studied, using baited camera traps, to assess abundance and distribution. Densities appear to be consistently higher in Digby County compared to the other counties based on telemetry data, sightings records, and baited camera traps from 2000-2021.

In the late 1800s, it was estimated there were between 800 and 1,250 American Marten on Cape Breton Island (Scott 2001). This population drastically decreased in the early

1900s with only two records in 1935 and 1954 (Clarke 1942; Hagmeier 1956). In the late 1970s, after many years with no American Marten sightings at all, a few encounters of American Marten were recorded in western Cape Breton in and adjacent to the Highlands. This was attributed, at least in part, to animals forced out of normal secluded Highland territories by the extensive wood salvage operation conducted following the spruce budworm infestation of that time. Before the release of 128 American Marten from New Brunswick from 2007-2009 in the Highlands of Cape Breton as part of prescribed Recovery Plan activities, the Cape Breton population was estimated to contain less than 50 individuals and likely no more than 15 to 30 (Scott, 2001). Since this release, Nova Scotia Natural Resources and Renewables has been monitoring this population using public and First Nations reports, incidental trapping records, snow track surveys and baited camera traps. Records show that since release American Marten have spread into much of the surrounding area (Figure 2).

On the Mainland limited data is available regarding the historical or current American Marten population sizes but monitoring effort in this region have greatly increase in recent years. Further study is required for both American Marten populations in Nova Scotia.

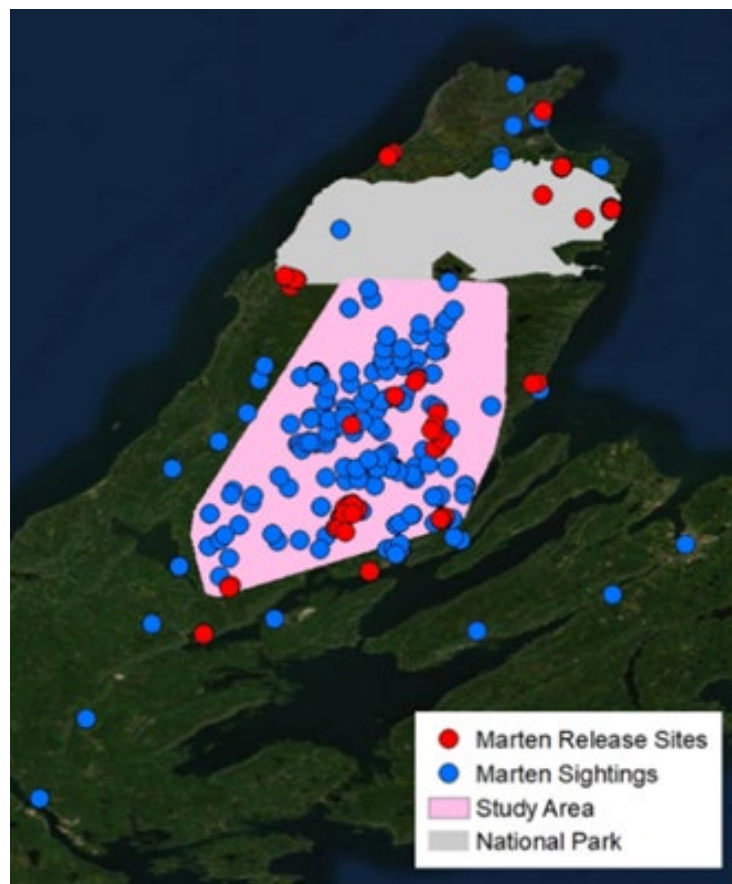


Figure 2. American Marten observations from 2000 to 2021 in Cape Breton (n = 193) with red dots referring to the location of American Marten reintroduction sites. Observations

were gathered using public and First Nations reports, incidental trapping records, and governmental surveys.

3.3 Species Needs

Habitat Requirements

American Marten habitat must meet the species' requirements for prey abundance, predator avoidance, and thermoregulation, and provide adequate denning and resting sites (Berlo, 2006). As such, American Marten are generally associated with mature to old-growth conifer and mixed-wood forests with dense canopy cover, abundant coarse woody debris and horizontal structure, sufficient snow depth to provide subnivean spaces during winter, and high prey densities (Bowman and Robitaille, 2005; Proulx et al., 2005; Cushman and Wasserman, 2017; Thompson et al., 2012). In Nova Scotia, American Marten are also found in other forest types including mid-successional (9-12m), coniferous forests, and mature deciduous forests that contain high volumes of vertical and horizontal cover and diverse species composition (Proulx et al., 2005; Thompson et al., 2012).

American Marten tend to avoid large patches of sparse forest or open canopy, though they will occasionally cross large openings or make use of clearings near forest edges (Buskirk and Ruggiero, 1994; Shirk et al., 2014; Soutiere, 1979). Habitat fragmentation may have negative effects on occupancy, abundance, fitness, hunting success, and dispersal patterns (Andruskiw et al., 2008; Chapin et al., 1998; Howell et al. 2016; Johnson et al. 2009; Moriarty et al. 2011; Potvin and Bertrand, 2004; Proulx et al., 2005; Thompson et al. 2012).

Preferred denning sites for American Marten include hollow logs, stumps, crevices under rocks, squirrel middens, ground burrows, and holes in standing trees (Bateman, 1982; Evans, 1986; Ruggiero et al., 1998). It is not known if high-quality den sites are a limiting factor, though suitable sites are likely uncommon in managed forests where there is little coarse woody debris, few snags, and smaller diameter trees (Buskirk and Ruggiero, 1994; Farnell et al., 2020; Thompson et al., 2012). Preferred resting sites for American Marten are in cavities, branches, hollow logs, and nests of other species (Sanders, 2014).

Several habitat models have been created using Nova Scotia occurrence data. Recently, a species distribution model, based on maximum entropy modelling, for Nova Scotia records from 2010 to 2020 found that American Marten preferred areas with at least 70% forest cover (unpublished data, NS DNRR). They were more likely to occur in areas with more softwood trees but also showed a preference for mixed wood forest over pure conifer forests. American Marten were also more likely to be found at higher elevations and areas with greater average snow depth. Further, American Marten preferred areas that were less disturbed and fragmented (Figure 3). Occupancy models from Cape Breton showed that American Marten prefer forested areas with larger

thicker trees and higher forest cover. These results fit with earlier studies of the province (Berlo 2006; Jeppesen 2008).

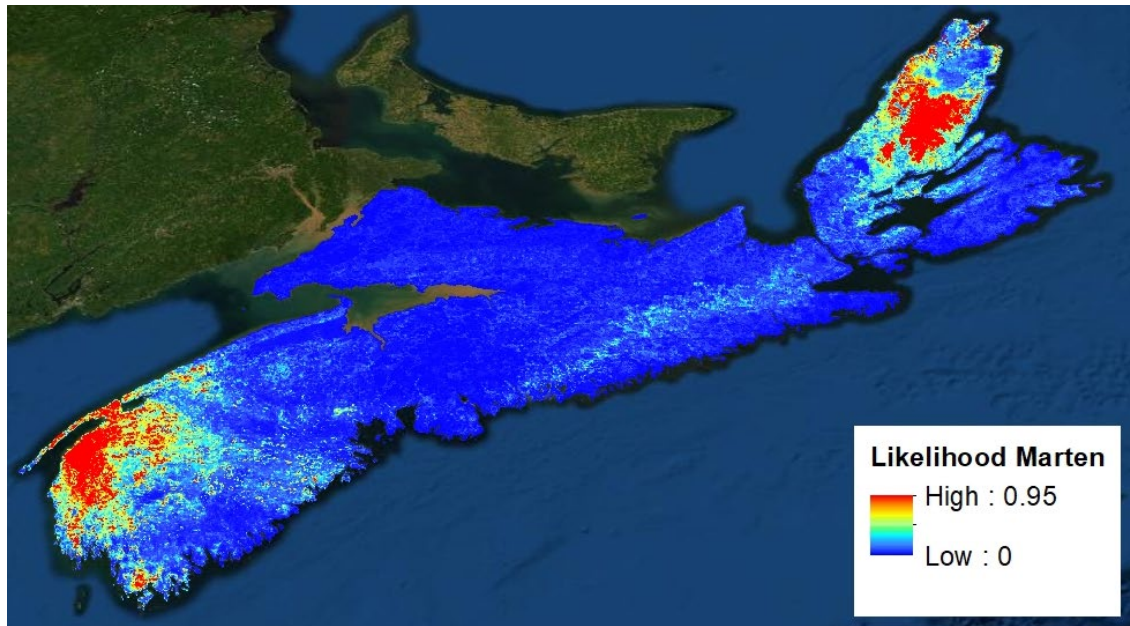


Figure 3. American Marten species distribution based on sightings from 2010 to 2020 (n = 256). Map was generated using maximum entropy modelling and sighting data was thinned so that all sightings were at least 200 m apart to minimize spatial autocorrelation.

Survival Habitat

An American Marten population must have at least 100 individuals to maintain its long-term genetic diversity (Hillman 2014). However, American Marten in Cape Breton experienced an estimated 80% decline after the last spruce budworm outbreak due to extensive salvage logging (Scott 2001). Based on this, at least 500 individuals are needed to withstand another similar decline. One hundred American Marten require between 225 and 440 km² of high-quality habitat; however, five times that is required to maintain 500 individuals in each population. This range is based on the average American Marten home range size in this region (Pelletier 2005; Berlo 2006; Godbout and Ouellet et al. 2008; Fuller et al. 2010; Sirén et al. 2015). American Marten home ranges tend to increase in size in the northern, or more winter severe parts of their range (Smith and Schaefer 2002). The lower end of this estimate (i.e., 225 km²) is based on American Marten home range estimates from New Hampshire (Sirén et al. 2015) and the relatively mild southwestern Nova Scotia (Berlo 2006) and the upper value (i.e., 440 km²) is derived from home ranges reported in Maine (Fuller et al. 2010), New Brunswick (Pelletier 2005), and Quebec (Godbout and Ouellet 2008).

In Nova Scotia, an assessment of forest cover attributes identified 6521 km² of area (Cape Breton: 2258 km², Mainland: 4263 km²) that meets the minimum habitat requirements of American Marten. Further, American Marten have been observed over more than 1070 km² of Cape Breton and 1300 km² of the western Mainland (see Section 8.2)

Between 2018 and 2020, intensive trail camera monitoring by NS DNRR covering a 2006 km² study area south of Cape Breton National Park, found that American Marten occupied 52% (48% to 68%) of the study area (Figure 1). In eastern Quebec, American Marten have an average home ranges of 4.4± 0.7 km² (Godbout and Ouellet 2008). Assuming American Marten in Cape Breton have similar home range sizes as those in Quebec, that the American Marten population surveyed had an equal number of males and females, and that individuals did not have overlapping territories, we would estimate an American Marten population of 237 (95% CI: 189-369) individuals. This estimate does not include American Marten living outside the study area, such as those living in Cape Breton Highlands National Park, or the area north of the National Park.

Habitat Trends

Cape Breton

In Cape Breton, the available habitat for American Marten has declined by 80% (Scott 2001) from historical levels due to a wide-ranging, severe budworm infestation from 1974-1981 and subsequent large-scale forest harvest operations. These salvage harvesting operations created a network of roads that increased access for trapping and recreational use, and potentially facilitated use of the area by competing carnivore species (Scott, 1998). While the spruce budworm outbreak created conditions that may have been suitable for American Marten (Payer and Harrison, 2000), the resulting clearcutting and removal of coarse woody debris rendered the habitat unsuitable for the species across much of the landscape.

Within Cape Breton Highlands National Park, over-browsing by hyperabundant moose populations has halted forest regeneration and resulted in the conversion of 11% of the Park to grass-dominated savannah (Smith *et al.*, 2015). From 2015 to 2018, Parks Canada and the Unama'ki Institute of Natural Resources implemented a plan to restore the boreal forest in areas of hyperabundant moose. The plan included testing fenced moose enclosures, tree planting, and removing moose from an area to evaluate options for forest restoration (Smith *et al.*, 2015).

In the early 2000s, it was estimated that optimal American Marten habitat remained in less than 1% of land in western Cape Breton, and a habitat shortage could continue for 10-20 years (Nova Scotia American Marten Recovery Team, 2006). A 2010 study regarding American Marten habitat (Jeppesen, 2010) found approximately 118,000 ha (35.5% of forest stands) met the criteria for high-quality American Marten habitat in at least 3 of 4 models that were tested. However, these patches of suitable habitat were fragmented across the landscape. Based on recent habitat suitability modelling (NS DNRR, unpublished data) a total of 2391 km² of habitat in Nova Scotia (Cape Breton 1072 km², southwest 1319 km²) has a greater than 33% chance of supporting American Marten (Figure 2).

Most provincial crown lands in Cape Breton within the American Marten known range are under a Forest Utilization License Agreement (FULA) between the Port Hawkesbury

Paper (PHP) and the province. Forests in this area are managed for multiple values with a focus on timber production for the pulp and paper industry. In these areas, industry is required to identify and preserve features of high conservation value and to implement special management practices (SMP) developed by the province – including an SMP for American Marten (Doucette and Miller, 2015).

The current (2006) Endangered American Marten Special Management Practices has provided for the management of the PHP FULA forest area within the Cape Breton Highlands to maintain and enhance habitat values for American Marten. Thirty “American Marten patches” (forest areas) are in place, each a minimum of 500m in size, circular in shape and each managed to meet the following requirements: including a minimum of 60% of forest stands with total BA ≥ 18 m²/ha, softwood percent ≥ 30 , and height ≥ 6 metres within a defined American Marten Habitat Management Zone.

Mainland Nova Scotia

Although a significant amount of the area remains forested, Mainland Nova Scotia forests have undergone considerable changes since European settlement (Loo and Ives, 2003). The majority of forests have been extensively and repeatedly logged, resulting in a simplified forest structure and composition (Farrow and Nussey, 2013; Loo and Ives, 2003). Recent forest management practices dominated by clear-cutting have increased the proportion of even-aged, early-successional forest types and decreased the proportion and age of shade-tolerant, late-successional forests (Farrow and Nussey, 2013). Forests, more than 100 years old are also much less extensive than they were historically. Regenerating forests following extensive harvesting tend to lack key characteristics of American Marten habitat, such as large-diameter trees, abundant coarse woody debris, and canopy openings with understory regeneration, even after reaching maturity (Farrow and Nussey, 2013; Loo and Ives, 2003; Farnell et al. 2020).

Habitat Protection / Ownership

Cape Breton

In total, there is currently 2258 km² of suitable American Marten habitat in Cape Breton - 39.8% falls on provincial crown lands where commercial forestry can occur and 27.8% of this area is federally or provincially protected. The remaining 32.4% is either municipally or privately owned. Based on the 2020 Nova Scotia Forest Inventory, 8.3% (565 km²) of the forest in the Cape Breton American Marten area would be classified as late-successional forest with 26.6% of this forest being in protected areas.

Mainland Nova Scotia

The Mainland Nova Scotia bioregion, as defined by the Nature Conservancy of Canada (NCC), includes the nine western-most watersheds in the province, encompassing all of

Digby, Yarmouth, Shelburne, Queens and Annapolis counties, and western portions of Kings and Lunenburg counties (Farrow and Nussey, 2013): an area corresponding roughly to the extent of occurrence of American Marten on the Mainland. As of 2013, there were 199,923 ha of protected areas in the bioregion (12.35%) and another 81,602 ha (5.04%) of area with either proposed or pending protected area status. The largest, contiguous protected area is formed by Kejimikujik National Park and National Historic Site and the Tobetic Wilderness Area in the interior of the region, which together encompasses 141,880 ha (Farrow and Nussey, 2013). The region consists of 37.5% provincial crown land, 2.6% federal land, and 59.9% small private, municipal, and Aboriginal land holdings (Farrow and Nussey, 2013). Outside of protected areas, intensive forest harvesting continues to occur as well as associated forest road development (Farrow and Nussey, 2013).

Biological Needs, Ecological Role, and Limiting Factors

American Marten are generalist predators that feed on a variety of small animals. Voles (*Clethrionomys gapperi*) are often considered a staple prey item (Buskirk and Ruggiero, 1994; Scott, 1998); however, American Marten will opportunistically eat other small mammals, birds, eggs, carrion, berries, and other plant matter (Spencer and Zielinski, 1983).

Litters of one to five kits are born between March and April (average 2.85 kits per litter; Buskirk and Ruggiero, 1994) and remain with their mother until late summer. Young American Marten disperse from their natal range during the fall of their first year to establish their own territories. Stage-based matrix models developed by Buskirk et al (2012) suggest that adult survival drives population trends more than fecundity. Using demographic data from the northeast regional, annual adult survival must be at least 75% for the population to be stable (Payer and Harrison 2000; Pelletier 2005).

American Marten have more extensive spatial requirements, lower population densities, and lower reproductive rates than many other mammals of a comparative size, but similar to other mustelids. The average home-range size for American Marten living in eastern Quebec is $5.5 \pm 1.0 \text{ km}^2$ for males and $2.6 \pm 0.6 \text{ km}^2$ for females (Godbout and Ouellet 2008). In New Hampshire American Marten home ranges were $2.95 \pm 0.27 \text{ km}^2$ and $1.55 \pm 0.20 \text{ km}^2$, respectively for males and females (Sirén 2015). These home range sizes seem reasonable for Nova Scotia, as previous radio-telemetry work shows American Marten in the Province have had home ranges of around 2.85 km^2 ($n = 2$) (Berlo 2006). However, American Marten home range size varies between seasons (Sirén et al. 2015). Additionally, habitat composition and latitude affect American Marten home range size. American Marten with home ranges containing more mixed forest tend to have smaller home ranges (Sirén et al. 2015), while American Marten living at higher latitudes have much larger home ranges than those to the south (Smith et al 2002). This trend is likely linked to the lower resource availability at higher latitudes.

These factors all increase American Marten susceptibility to decline and limit their potential recovery (Buskirk and Ruggiero, 1994). The delayed implantation of embryos results in up to a one-year lag in the age of first parturition (Hoberg et al., 2012), and limits American Marten to one litter per year. These life-history traits indicate American Marten may need longer periods to recover from population declines than other similarly sized mammals.

3.4 Dwelling Place

American Marten den in hollow trees, logs, rocky crevices or in burrows (Bateman, 1982; Evans, 1986; Ruggiero et al., 1998; Nowak 2005). Those dens or dwelling places may occur in various forest types depending on the seasonal requirements to meet life history needs. It is not known if den sites are uncommon in managed forests where there is little coarse woody debris, few snags, and smaller diameter trees (Buskirk and Ruggiero, 1994; Thompson et al., 2012). Preferred resting sites for American Marten are in cavities, branches, hollow logs, and nests of other species (Sanders, 2014). American Marten habitat must meet the species' requirements for prey abundance, predator avoidance, and thermoregulation, and provide adequate denning and resting sites (Berlo, 2006). As such, American Marten are generally associated with mature to old-growth conifer and mixed-wood forests with dense canopy cover, abundant coarse woody debris and horizontal structure, sufficient snow depth to provide subnivean spaces during winter, and high prey densities (Bowman and Robitaille, 2005; Cushman and Wasserman, 2017; Proulx et al., 2005; Thompson et al., 2012). In Nova Scotia, dwelling places are part of the definition for identified core habitat required for the recovery and survival of a species. Under the Nova Scotia Endangered Species Act, it is illegal to destroy, disturb or interfere with the specific dwelling place or area occupied or habitually occupied by an endangered or threatened species, such as a den or preferred resting place as identified above.

4. THREATS

4.1 Threat Assessment

The American Marten threat assessment (Table 2) is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) within the area of interest (global, national, or subnational). Limiting factors are not considered during this assessment process. For purposes of threat assessment, only present and future threats are considered. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats, are presented in the Description of Threats section.

Differences in scope, severity, timing, or impact between Cape Breton (CB) and Mainland Nova Scotia have been indicated in the table where applicable.

Table 2. Threat calculator assessment.

Threat #	Threat description	Impact ^a		Scope ^b	Severity ^c	Timing ^d	Comments
1	Residential and commercial development	Unknown		Unknown	Unknown	Unknown	
1.1	Housing and urban areas	Unknown		Unknown	Unknown	Unknown	
1.2	Commercial and industrial areas	Unknown		Unknown	Unknown	Unknown	
1.3	Tourism and recreation areas	Unknown		Unknown	Unknown	Unknown	Unknown impact of recreational trails and ski hills
2	Agriculture and aquaculture	Low		Restricted	Slight	High	
2.1	Annual and perennial non-timber crops	Unknown		Unknown	Unknown	Unknown	Lack of information on blueberry/cranberry or other fruit crop farming issues
2.2	Wood and pulp plantations	CB *	Low	Restricted	Slight	High	Conversion of mature forests to forest plantations.
		ML *	Negligible	Small	Negligible	High	
2.3	Livestock farming and ranching	CB-Negligible ML - Unknown		CB-Negligible ML - Unknown	CB-Negligible ML - Unknown	CB-Negligible ML - Unknown	Escaped mink competition and disease
2.4	Marine and freshwater aquaculture						Not Applicable
3	Energy production and mining	Negligible		Negligible	Negligible	High	
3.1	Oil and gas drilling						Not Applicable

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
3.2	Mining and quarrying	Negligible	Negligible	Negligible	High	Mining and quarrying activities are ongoing and growing in numbers across the province. Gold mining exploration has been occurring in new and historic areas.
3.3	Renewable energy				Moderate	In 2022-23, there are about 2 dozen approved projects or proposals for multi-turbine Wind farms across the province. Wind farms are predicted to cause loss of habitat, increase fragmentation, and increased access due to creation of service roads. Cumulative impacts across landscapes are expected to heighten impacts but are not adequately considered in proposals or by approval conditions.
4	Transportation and service corridors					
4.1	Roads and railroads	CB- Negligible ML-Unknown	CB – Restricted ML - Unknown	CB- Negligible ML- Unknown	CB-High ML-High	Very few reported road mortalities across Nova Scotia. Increased incidental trapping risk. Increased access by competitors and/or predators and fragmentation of habitat.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
						ML –lack of data related to populations and any roadkill
4.2	Utility and service lines	CB- Negligible ML-Unknown	CB- Negligible ML-Unknown	CB- Negligible ML-Unknown	CB-High ML-High	
4.3	Shipping lanes					Not Applicable
4.4	Flight paths					Not Applicable
5	Biological resource use	Medium	Large	Moderate	High	
5.1	Hunting and collecting terrestrial animals	CB – Negligible ML- Negligible	CB – Negligible ML- Negligible	CB- Negligible ML- Unknown	CB- Negligible ML-High	Incidental catch and attraction to bait piles causing predator- prey interactions. In addition, there has been an increase in reported incidents of Marten being kept in captivity.
5.2	Gathering terrestrial plants					Not Applicable
5.3	Logging and wood harvesting	CB-Medium ML- Very High - High	CB-Large ML- Pervasive	CB - Moderate ML-Extreme	CB-High ML-High	Forest harvesting fragments habitat, reduces area of mature forests, reduces coarse woody debris and horizontal structure, increases access by competing predators and people. Biomass harvesting or salvage harvesting concerns – removal of coarse woody debris.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
						<p>CB- a large part of range is within Cape Breton Highlands National Park and provincial Wilderness Areas. Forest management on crown land through ecological forestry as well as provisions of existing American Marten SMP.</p> <p>ML – % of private lands and loss of habitat for species, Existing provincial Wilderness Areas together with Kejimikujik National Park provide habitat protection. Forest management on Crown lands through ecological forestry. Private land stewardship is also needed.</p> <p>Recent changes to forest management (through the Lahey report) may improve habitat for American Marten. (i. e. mature forest retention).</p>
5.4	Fishing and harvesting aquatic resources					Not Applicable
6	Human intrusions and disturbance	Low	Small	Slight	High	
6.1	Recreational activities	CB – Low ML- Negligible	CB – Restricted	CB – Slight	CB- High	Logging roads create areas for recreational use such as

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
			ML- Negligible	ML - Negligible	ML- Negligible	snowmobiling, multi-use trail, etc.
6.2	War, civil unrest, and military exercises					Not Applicable
6.3	Work and other activities		Unknown	Unknown	Unknown	Various research activities.
7	Natural system modifications	Unknown	Unknown	Unknown	Unknown	
7.1	Fire and fire suppression	Unknown	Unknown	Unknown	Unknown	Loss of forest habitat to forest fires and experimental controlled burns.
8	Invasive species/other problematic species/ problematic genes	Unknown	Unknown	Unknown	Unknown	
8.1	Invasive non-native/alien species/diseases	Unknown	Unknown	Unknown	Unknown	
8.2	Problematic native species/diseases	CB- Unknown ML -Unknown	CB-Unknown ML – Pervasive	CB- Unknown ML-Unknown	CB- Unknown ML-High	Possible interactions with coyotes and fisher, including predation and competition for prey; potential for high parasite loads. Introduced moose in CB prevent forest maturation. Brought in from non-native species, Aleutian disease from feral mink escapes, particularly on the Mainland.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
						Salvage harvesting after a spruce budworm outbreak could have a negative effect on American Marten by removing coarse woody material, reducing structural complexity, and creating open areas.
8.3	Introduced genetic material	Not A Threat	Pervasive	Neutral or Potential Benefit	Moderate	Additional planned reintroductions could occur in the future; used individuals from NB for past introductions but not clear whether current individuals are a result of those introductions.
8.4	Problematic species/diseases of unknown origin	Negligible	Negligible	Negligible	High	Canine distemper, rabies, and Covid-19 may affect American Marten. On the Mainland, American Marten in the SW were tested for disease from 2009 to 2011. Aleutian disease was tested for in the American Marten population opportunistically from 2003-2006. one American Marten tested positive in 2003
8.5	Viral/prion-induced diseases	Negligible	Negligible	Negligible	High	Ability to fight unknown disease is reduced in small populations.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
8.6	Diseases of unknown cause	Negligible	Negligible	Negligible	High	Ability to fight unknown disease is reduced in small populations.
9	Pollution	Negligible	Negligible	Negligible	High	
9.1	Household sewage and urban wastewater	Negligible	Negligible	Negligible	High	
9.2	Industrial and military effluents	Negligible	Negligible	Negligible	High	
9.3	Agricultural and forestry effluents	Negligible	Small	Negligible	High	Impacts of pesticides and/or herbicides from silviculture is unknown.
9.4	Garbage and solid waste	Negligible	Negligible	Negligible	High	
9.5	Air-borne pollutants	Negligible	Negligible	Negligible	High	
9.6	Excess energy	Negligible	Negligible	Negligible	High	
10	Geological events					Not Applicable
10.1	Volcanoes					Not Applicable
10.2	Earthquakes/tsunamis					Not Applicable
10.3	Avalanches/landslides					Not Applicable
11	Climate change and severe weather	Unknown	Pervasive	Unknown	High	
11.1	Habitat shifting and alteration	Unknown	Pervasive	Unknown	High	Alteration to boreal forest, reduction in snow depth reducing competitive advantage.

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Comments
11.2	Droughts	Unknown	Pervasive	Unknown	High	May increase risk /severity of forest fires. See fire above.
11.3	Temperature extremes	Unknown	Pervasive	Unknown	High	Behavioral adaptations for severe cold; prolonged periods of extreme heat may be more influential.
11.4	Storms and flooding	Not A Threat	Pervasive	Neutral or potential benefits	High	Extreme wind events may affect forest structure; could create coarse woody debris but could subsequently reduce presence of mature trees.

* CB – Cape Breton Population, ML – Mainland Population

^a Impact – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^b Scope – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species’ population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small; Negligible).

^c Severity – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species’ population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight; Negligible; Neutral or Potential Benefit ≥ 0%).

^d Timing – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2 Description of Threats

The major threats faced by American Marten include habitat loss and fragmentation due to forest harvesting practices, combined with climate change effects that may alter dominant forest cover or decrease snowfall. This could increase competition and predation and reduce the availability of subnivean spaces that American Marten rely on for resting and hunting in the winter. Incidental trapping also remains a threat to the species in Nova Scotia.

American Marten have larger spatial requirements, lower population densities and lower reproductive rates than many other mammals of a comparative size. This means that this species may need more time to recover after a population decline. These life-history traits increase the impact of a threat to the population, over longer time frames.

Biological Resource Use – Logging and Wood Harvesting (CB-Medium, ML-Very High-High)

Forestry activities current pose the greatest threat to American Marten populations across North America (Buskirk and Ruggiero, 1994; Thompson et al., 2012). Across Nova Scotia, wooded areas are susceptible to harvest by the forest industry. Forest harvesting fragments habitat, reduces area of mature forests, reduces coarse woody debris and horizontal structure, increases access by competing predators and people (Thompson et al., 2012). Both populations are impacted by this threat, but the Mainland population is at a higher risk due to less land being protected by and a greater proportion of American Marten habitat being on private lands where forest management for American Marten may not be considered.

Invasive Species/Other Problematic Species/Problematic Genes and Diseases – Invasive Non-Native/Alien Species/Diseases (CB – Unknown, ML-Unknown), Problematic Native Species (CB-Unknown, ML-Unknown)

Interactions between American Marten and other native species such as coyotes and fishers may cause impacts on species recovery due to predation, prey competition, and introduction of parasites and disease (Fisher et al. 2013). However, across most of the American Marten home range this species co-occurs with fisher suggesting that the two species do not compete to the exclusion of either (Fisher et al. 2013; Croose et al. 2019). In Cape Breton, moose were introduced/reintroduced and can impede forest maturation and create gaps (grasslands) in the forested landscape resulting in at least a temporal reduction in the overall forested area; on the Mainland; historic mink farming may have introduced diseases such as Aleutian disease.

Agriculture and Aquaculture - Wood and Pulp Plantations – (CB- Low, ML – Negligible)

The impact of wood and pulp plantations is negligible to low across the province at the time of preparation of this plan but may increase and should be monitored in the context of the high production forestry leg of the ecological forestry triad. The conversion of a mature forest to a forest plantation would create unsuitable habitat for American Marten and their prey, although it is expected that most high production sites will preferentially occur in already disturbed areas and will avoid sensitive features like species at risk core habitat (although this will need to be monitored as additional details emerge). As per the Triad model described in the Lahey Report (2018), ten percent of Nova Scotia's Crownland will be set aside for high production forestry. This means clear-cutting and other treatments to support tree production will be allowed to occur in these areas. There will be a need to consider the impacts of high production forestry on American Marten populations going forward.

Transportation and Service Corridors – Roads and Railroads (CB-Negligible, ML - Unknown)

Few road mortalities of American Marten have been reported in the province. An increase in roads for various uses (e.g., logging) may increase predator access and incidental trapping occurrences (Croose et al. 2019).

Natural System Modifications – Fire and Fire Suppression – (Unknown)

Habitat present on the landscape to support American Marten and its prey species are impacted from many factors including loss of habitat from forest fires. Recently (in 2023), fire risk was high due to an extended period of dry conditions in western Nova Scotia and could be heightened by high fuel loads from increased storms due to climate change. At present, the impacts of recent large fires in Shelburne County in May/June 2023 on marten habitat are unknown.

Invasive Species/ Other Problematic Species/ Problematic Genes – Introduced Genetic Material (Not A Threat).

Nova Scotia populations of American Marten have been supplemented with American Marten from New Brunswick due to the similarities of their genetics. If there is a need for population supplementation, the New Brunswick population of American Marten may again be considered to aid in recovery of American Marten in Nova Scotia. It is not known if genetic structuring existed between original American Marten in Nova Scotia, and translocated American Marten from New Brunswick.

Climate Change and Severe Weather – Habitat Shifting and Alteration (Unknown), Droughts (Unknown) and Temperature Extremes (Unknown), Storms and Flooding (Not a Threat).

It is anticipated that Nova Scotia will see changes in weather patterns, increased storm events and other impacts of climate change. Many of these impacts have the potential to impact species at risk and their habitat, directly or indirectly. Impacts include risk of extreme wind, severe temperature fluctuations, and changes to behaviours and habitat.

Storms and flooding may have a positive impact on some forests for American Marten by providing increased coarse woody debris; however, blow down areas may be subject to 'clean up' or salvage, or may become more susceptible to forest fire.

Many threats were deemed 'negligible' or 'unknown' which could reflect a lack of information collected on that threat.

5. POPULATION AND DISTRIBUTION OBJECTIVES

5.1 Viable Status for Recovery

The limited distribution of American Marten in Nova Scotia and the existence of two isolated populations with no gene flow make these populations especially vulnerable to threats. Records suggest that this species' range in Nova Scotia has been significantly reduced since European settlement. Ongoing loss and fragmentation of forest to other land uses in Nova Scotia, combined with the impacts of forest management make it unlikely that American Marten will return to much of their former range. However, by reducing or eliminating threats to this species as outlined in this Recovery Plan, we may be able to down list this species in the future.

5.2 Long-term Population and Distribution Objective

The long-term recovery goal (>20 years) for American Marten is to maintain or grow the American Marten population in Cape Breton and to determine American Marten abundance and range in the southwest. This will be achieved by:

- Identifying optimal American Marten habitat on all land tenures, ensuring provincial Crown lands are managed to meet American Marten habitat conservation objectives and working with private landowners to ensure that American Marten are able to persist on these sites
- Working with foresters to ensure that spruce budworm mitigation does not negatively impact American Marten
- Managing direct and indirect threats to American Marten
- Working to determine the American Marten species range more accurately in Nova Scotia, especially in the southwest

A long-term numerical population goal of 1000 animals (500 on the Mainland and 500 on Cape Breton Island) has been established. This is based on an American Marten population needing at least 100 individuals in its population to maintain their long-term genetic diversity (Hillman 2014). After the last spruce budworm outbreak Cape Breton experienced an estimated 80% decline in its American Marten population due to habitat loss exacerbated by salvage logging (Scott 2001). Therefore, to maintain 100 individuals in each population we would need at least 500 individuals in a population to withstand another decline like this.

Research should focus on monitoring occurrence at known sites to determine population trends for this species. The Nova Scotia government will continue to assess American Marten occurrences as a way of identifying unknown American Marten populations.

5.3 Short-term Population and Distribution Objective

The short-term population and distribution objective for American Marten populations is to monitor the two known populations of this species in Cape Breton and southwestern Nova Scotia and ensure that there is no major net loss of American Marten in either of these regions. These goals will be achieved by maintaining habitat suitable for American Marten and by using various data collection methods including incidental captures, animal sightings, trail cameras, and genetic analysis of tissue samples.

5.4 Rationale

The population and distribution of American Marten in Nova Scotia is very restricted, with little opportunity for re-introduction into its historical range. However, the remaining habitat should still be capable of supporting viable American Marten populations.

6. BROAD STRATEGIES AND GENERAL APPROACHES TO RECOVERY

6.1 Actions Completed or Underway

The Government of Nova Scotia has taken a variety of management actions towards the recovery of American Marten. These actions provide a foundation for future recovery efforts for American Marten in Nova Scotia. These actions include:

- The province has tracked furbearer harvesting statistics since 1932 and will continue to do so to monitor the level of American Marten that are caught accidentally.
- Nova Scotia continues to work with the Nova Scotia Federation of Hunters and Anglers and the Trappers Association of Nova Scotia to minimize accidental trapping and snaring of American Marten through the Fur Harvester and Hunter Education courses and communication with their members.
- The province continues to distribute material within the annual Nova Scotia Hunting and Fur Harvesting Summary of Regulations booklet that outlines requirements for reporting nontarget species, including species at risk and laws protecting species at risk in Nova Scotia.
- The province has completed snow track survey transects since 2005 to improve knowledge on the distribution and abundance of the Cape Breton Island population.
- In 2020, the province held Recovery Action Forums in the Western, Central and Eastern Regions of Nova Scotia to discuss species at risk and compile knowledge and actions on most species.
- The Mammals Recovery Team completed an assessment of threats to Cape Breton American Marten to determine the relative contributions of various threats to the population.
- Nova Scotia published and implemented special management practices (SMP) for American Marten based on a defined American Marten Habitat Management Zone in Cape Breton, with additional forest management requirements for the Cape Breton Highlands as a whole. Nova Scotia through a FULA has identified and protected 30 American Marten home range patches in Cape Breton. The goal of the current SMP is to protect an additional 25 home range patches by 2030.

- The province developed guidelines in consultation with Port Hawkesbury Paper for commercial thinning of immature stands within the American Marten Habitat Management Zone and tested the feasibility of habitat manipulation of mature pre-commercially thinned forest habitat (Port Hawkesbury Paper, 2021).
- The province worked with other agencies to complete genetic analyses on American Marten in Cape Breton to describe the evolutionary history of American Marten in Nova Scotia. Future work will characterize the extent and patterns of genetic variation in each American Marten population.
- Nova Scotia supplemented the Cape Breton Island American Marten population with a total of 128 animals from New Brunswick from 2007-2009 and four captive-bred animals from Shubenacadie Wildlife Park. This reintroduction was successful leading the Cape Breton population to grow and spread into some of its historic range on the Island. There are currently no plans to release more American Marten into this population. On the Mainland, Kejimikujik National Park released 116 American Marten between 1987 and 1994 into the park (Scott, 2001). More baseline data is required to assess the Mainland population and success of this release. There are no plans to release more American Marten into the Mainland Population.

6.2. General Approaches to Recovery

Table 3. Recovery planning table which includes recovery measures, actions, and costs and benefits of recovery actions.

Recovery Measures	Threat(s) Addressed *	Actions	Priority* *	Cost***	Benefit
Habitat Protection, Management, and Stewardship					
Undertake landscape-level planning that considers American Marten habitat requirements:	2.2, 5.3, 9.3	<p>Incorporate biodiversity values when planning forest harvest, silviculture and forest roads.</p> <p>Consider the number and location of plantations on the landscape.</p> <p>Consider potential cumulative impacts of all forest harvesting and silvicultural practices on amount and quality of American Marten habitat available.</p> <p>Continue to implement the recommendations from the Independent Review of Forest Practices (Lahey, 2018).</p> <p>Integrate species at risk and biodiversity values into all aspects of ecological forestry, including in the matrix, the high production forestry zone and in</p>	H	\$\$	<p>Protection of known occurrences outside of designated areas of Core Habitat.</p> <p>Protection and maintenance of habitat for non-listed species and biodiversity benefits</p>

		<p>the conservation zone on Crown and private lands.</p> <p>Incorporate biodiversity values when planning forest plantations.</p>			
<p>Undertake landscape-level planning that considers American Marten habitat requirements</p> <p>Land-use planning to minimize habitat fragmentation.</p> <p>Manage causes of American Marten mortality</p> <p>Reduce access to tracts of suitable American Marten habitat</p>		<p>Decommission unused roads in American Marten core habitat.</p> <p>Provide input into environmental assessment processes to minimize creation of new roads and other access corridors.</p> <p>Limit potential for recreational use in key areas.</p> <p>Consider cumulative impacts of road networks and other access corridors on the landscape as related to habitat fragmentation.</p>	H	\$\$	<p>Achieve improved efficiency in recovery efforts</p> <p>Widespread benefit to biodiversity and valued ecological components by reducing widespread and common threats</p>
<p>Undertake landscape-level planning that considers American Marten habitat requirements.</p> <p>Land-use planning for forestry.</p>		<p>Audit proportion of Crown land leased by the province to Port Hawkesbury Paper to ensure compliance with Special Management Practices.</p>	M	\$\$	<p>Assess effectiveness of Special Management Practices to achieve recovery goals</p> <p>Improve SMPs to achieve better compliance</p>

<p>Land-use planning to minimize habitat fragmentation.</p>		<p>Continue to implement, assess, and improve Special Management Practices designed for American Marten habitat and supports recovery.</p> <p>Develop an SMP or guidance for forestry practices and other activities for the Mainland American Marten population.</p>	<p>H</p> <p>H</p>	<p>\$\$</p> <p>\$</p>	<p>Demonstrate the role of stakeholders in realizing recovery goals</p> <p>Demonstrate the effective protection of important habitats through Crown land stewardship</p> <p>Improve efficiency of decision-making in complex, over-lapping and cumulative land uses</p>
<p>Manage habitat to meet current and future needs for American Marten.</p> <p>Include species-specific habitat requirements in forest management planning</p>		<p>Incorporate American Marten as values in forest management planning.</p> <p>Include input and guidance from via the Species at Risk program for all legs of the Ecological Forestry triad.</p> <p>Continue modelling habitat to determine the threshold for habitat retention needed to meet American Marten recovery objectives.</p> <p>Continue to review literature and changes to recommendations for habitat for American Marten and</p>	<p>M</p> <p>H</p> <p>H</p> <p>M</p>	<p>\$</p> <p>\$</p> <p>\$\$</p> <p>\$</p>	<p>Improved efficiency in recovery efforts</p> <p>Achieve full ecological forestry benefits that come with a healthy biodiversity-rich ecosystems</p> <p>Avoidance of harmful impacts that act contrary to recovery</p> <p>Use of the best available information to inform decision-making</p>

		incorporate them into practices in Nova Scotia.			
<p>Manage habitat to meet current and future needs for American Marten.</p> <p>Reduce the risk of fire.</p>		<p>Continue fire index monitoring and suppression efforts by the Department of Natural Resources and Renewables.</p> <p>Continue public education during times of higher risk.</p> <p>Decommission roads and limit access to forested areas at times of high risk.</p> <p>Include disturbance from fire in planning for American Marten habitat management.</p>	H	\$\$	
<p>Manage causes of American Marten mortality.</p> <p>Manage population growth of problematic native species.</p> <p>Reduce access to tracts of suitable American Marten habitat</p>		<p>Monitor fisher population growth and manage fisher harvest by registered fur harvesters.</p> <p>Consult with Mi'kmaw harvesters to define solutions to limit fisher population growth in American Marten core habitat areas in Cape Breton.</p> <p>Limit access to Cape Breton Highlands areas by coyotes</p>	M	\$\$	

		<p>through managing and decommissioning roads.</p> <p>Monitor fisher population growth and limit growth of the fisher population in Cape Breton.</p>			
<p>Manage habitat to meet current and future needs for American Marten.</p> <p>Adaptively review and assess efficacy of current habitat management regimes.</p>		<p>Develop indicators of American Marten habitat alteration.</p> <p>Monitor changing climate and habitat conditions, and extreme weather events.</p> <p>Include monitoring and indicators in future forest and species management.</p> <p>Prioritize habitat conservation and restoration efforts in localized areas of deep snow.</p> <p>Habitat alteration may require reassessment of management plans to maintain desired forest composition.</p> <p>Iterative adaptive management of American Marten habitat.</p>	M	\$\$	

<p>Monitor impacts of climate change to American Marten and their habitat.</p> <p>Develop and monitor indicators</p>		<p>Disturbance resulting from severe weather events to be considered in landscape planning.</p> <p>Severe events may require reassessment of management plans to maintain desired forest composition.</p> <p>Iterative adaptive management of American Marten habitat.</p>	M	\$	
Surveys and Monitoring					
<p>Increase knowledge of distribution and abundance in NS</p>		<p>Develop and implement standardized survey protocols to support recovery objectives</p>	H	\$\$\$	<p>Potential to increase knowledge of distribution and abundance; provide baseline information to support recovery efforts.</p>
<p>Develop better modelling tools to support survey and monitoring efforts</p>		<p>Using available knowledge of habitat requirements, develop landscape level mapping of potential hotspots to facilitate focused survey efforts</p>	H	\$\$\$	<p>Potential to increase knowledge of distribution and abundance; opportunities to increase awareness and protection in relation to Crown Land activities.</p>
Communication, Outreach, and Education					
<p>Provide information to the public on the species and how to mitigate threats</p>		<p>Develop a website and brochure as part of a public awareness program on the species, its threats, and specific steps on how to protect the species.</p>	M	\$	<p>Raise awareness of the species; potential threat reduction on public and private land. Continue working with trappers and</p>

					hunters to avoid incidental catch and educate hunters

*Threat or Limitation should refer to the IUCN Threat Classification Table Rankings. Either the first level or second level threat ranking can be used depending on how the Broad Strategy affects the threat. Multiple threats can be addressed under a single Recovery Measure.

**Priority should be classified as High(H), Medium(M), or Low(L). “Priority” is a qualitative measure of the relative degree to which an approach will have a positive impact on the recovery objective. High priority conservation approaches are considered those most likely to have an immediate and/or direct influence on reaching the management objective for the species. Medium priority conservation approaches may have a less immediate or less direct influence on reaching the management objective but are still considered important measures to implement. Low priority conservation approaches will likely have an indirect or gradual influence on reaching the management objective and are more tied to increasing knowledge or public perception/education.

***Use the following to assign a cost estimate to proposed activities: Cost categories: \$ = < 10 000; \$\$ = 10 000-50 000; \$\$\$ = 50 000-100 000; \$\$\$\$=>100 000

6.3 Narrative to Support the Recovery Options Planning Table

Adaptive landscape-level planning initiatives aimed at conservation of American Marten in Nova Scotia should strive to adopt a holistic approach, considering community and ecosystem processes at local and temporal scales. Forestry management planning should consider both the extent and location of proposed silvicultural regimes, alongside the potential effects of various landscape mosaics on American Marten, their predators, and competitors within core American Marten habitat. Similarly, taking biodiversity considerations into account during environmental assessment processes could ensure ecosystem health in areas of confirmed American Marten presence. An understanding of both current and future threats facing the species are required for effective landscape-level planning and underlines the inherent link to other American Marten conservation measures and their proposed actions: habitat management, mortality management, and population monitoring.

It is important to note that in the context of the broad strategies to recovery, consideration should also be given to cumulative impacts of potential threats identified in Table 2 as “negligible”, namely service roads, pollution, invasive non-native species, and disease. The concerns associated with increased access from the development and maintenance of forestry roads also apply to utility and service lines, and service roads used for wind turbines or energy transmission networks. Increased use and access by humans can lead to an increased risk of pollution, either through wastewater effluents from forestry or agriculture, or from (illegal) dumping of garbage or other waste. Increased roads and corridors from development can also lead greater disturbance from humans and to greater access for predators such as coyotes and bobcats. Further, these access corridors effectively fragment habitat for American Marten, as a species that has been shown to avoid crossing gaps and open areas.

The moose population in Cape Breton Island is also contributing to habitat fragmentation, as over-browsing by high densities of the species impedes forest maturation creates unforested (grassland) gaps within the landscape. A scientifically sound, approach should include an adaptive moose management regime aimed at achieving an ecologically sound population size and the minimization of impact on protected American Marten.

Similarly, ongoing management of species that are common carriers of canine distemper will reduce the risk of mortality from the disease. American Marten on the Mainland are also potentially at risk of Aleutian disease, which may be transmitted from farmed mink. Better practices and enforcement for mink farming, including escape prevention, carcass and manure management could reduce the likelihood of a relatively small population of American Marten from being negatively affected by an outbreak.

As with all adaptive management practices, ongoing monitoring, assessment, and revision are key to long term success. Research and monitoring should address knowledge gaps, including population trends and abundance, fecundity, recruitment,

and survival rates. In the case of recovering self-sufficient American Marten populations on the Mainland and on Cape Breton Island in a changing climate, effective assessment requires the development of indicators of habitat alteration and extreme weather events. Acquired data can then be applied in iterative habitat models that aim to ensure thresholds for American Marten habitat retention are met in the province.

6.3.1 Habitat Protection, Management and Stewardship

Landscape-level planning should consider current and future habitat requirements of American Marten. Such an approach should encompass all foreseeable (real or potential) projects, undertakings, or developments at relevant spatial and temporal scales. Landscape-level planning should ensure suitable American Marten habitat in terms of size and connectivity, using both coarse filter and fine filter approaches including modifications, where needed, to silvicultural management regimes. Consideration should also be given to the influence of road networks, which may result in an increase in recreational activities including access for hunting and trapping and facilitate the distribution of predators and competitors for American Marten.

Landscape-level planning should be carried out at the population scale for both Mainland Nova Scotia and Cape Breton Island to consider current and future human developments on both populations.

Habitat management should ensure that the landscape meets current and future habitat needs for American Marten by accounting for both direct and indirect causes of habitat loss and fragmentation. The potential impacts of logging and wood harvesting – including the development and maintenance of road networks - should be considered alongside ecosystem-level threats or limitations, such as pollution and fire risk in conjunction with landscape-level planning initiatives.

6.3.2 Surveys and Monitoring

Ongoing population monitoring studies may fill in knowledge gaps on American Marten population trends, distribution, and life-history traits. Population monitoring may also inform the relative impacts of threats to American Marten in Nova Scotia and thereby aid development of mitigation strategies. For example, population monitoring may be used to help understand the potential positive and negative impacts of climate change on American Marten. The species may then be adaptively managed to reflect potentially different circumstances in Cape Breton and Mainland Nova Scotia.

6.3.3 Communication, Outreach and Education

Reducing direct mortality of American Marten may involve varied approaches including land-use planning, hunter and trapper education and reporting, and managing populations of predatory or competitor species. Land-use planning may assist in identifying key roads to decommission to limit access to core American Marten habitat areas. Education efforts and monitoring of catch data from hunters and trappers will be important when considering strategies to reduce incidental catches.

6.3.4 Research to Address Knowledge Gaps

Long-term monitoring of American Marten may be used to determine the impacts of threats such as climate change, and to determine the effectiveness of habitat management initiatives that may experience a lag time after being implemented. Habitat disturbance should be managed with land-use planning that has accounted for the current and future habitat needs for American Marten. Additionally, successful habitat management will require collaboration and cooperation among stakeholders.

7. RECOMMENDED COURSE OF ACTION(S) FOR RECOVERY

Table 4. Recovery actions and implementation schedule of activities in support of recovery.

Broad Strategy: Habitat Protection, Management and Stewardship		Implementation Schedule
Approach 1.1: Consider American Marten habitat requirements and land-use planning for forest plantations.		
Action 1.1.1	Incorporate biodiversity values when planning forest plantations.	2025
Action 1.1.2	Consider the number and location of plantations on the landscape.	2025
Action 1.1.3	Consider potential cumulative impacts of silvicultural practices on amount and quality of American Marten habitat available.	2024
Action 1.1.4	Ensure disturbance from fire is incorporated into the planning for American Marten habitat management.	2025
Approach 1.2: Consider American Marten habitat requirements to minimize habitat fragmentation.		
Action 1.2.1	Decommission roads and limit access to forested areas especially during times of high risk of fire.	2025
Action 1.2.2	Limit access to Highlands areas by coyotes through decommissioning roads.	2026
Action 1.2.3	Incorporate American Marten habitat values through forest management planning.	2024

Approach 1.3: Manage and reduce access to tracts of land that are suitable American Marten habitat		
Action 1.3.1	Provide input into environmental assessment processes to manage creation of new roads and other access corridors.	2024
Action 1.3.2	Develop deep snow mapping. Prioritize habitat conservation and restoration efforts in localized areas of deep snow.	2026
Broad Strategy: Surveys and Monitoring		
Approach 2.1: Monitoring of species-specific habitat requirements		
Action 2.1.1	Continue to review literature and changes to recommendations for habitat for American Marten and incorporate them into practices in Nova Scotia.	2025
Action 2.1.2	Perform similar surveys for Mainland American Marten as was done for the Cape Breton populations using same protocols (E.g., winter track surveys, deploy wildlife cameras, etc.)	2025
Approach 2.2: Monitor impacts of climate change to American Marten and their habitat		
Action 2.2.1	Monitor changing climate and habitat conditions, and extreme weather events.	2024
Action 2.2.2	Include monitoring and indicators in future forest and species management.	2025
Approach 2.3: Manage habitat and reduce the risk of fire.		
Action 2.3.1	Continue fire index monitoring and suppression efforts by the Department.	Ongoing
Approach 2.4: Monitor impacts of problematic species on American Marten populations		
Action 2.4.1	Monitor fisher population growth and limit the growth of the fisher population in Cape Breton.	2026
Action 2.4.2	Evaluate the elevations for the Mainland and Cape Breton and how it relates to competition between American Marten, coyotes, and fisher.	2026
Broad Strategy: Communication, Outreach and Education		
Approach 3.1: Manage and reduce access to tracts of suitable American Marten habitat		
Action 3.1.1	Provide input into environmental assessment processes to manage creation of new roads and other access corridors.	2024
Action 3.1.2	Limit potential for recreational use in key areas.	2027
Action 3.1.3	Consider cumulative impacts of road networks and other access corridors on the landscape as related to habitat fragmentation.	2025
Approach 3.2: Reduce the risk of incidental take		
Action 3.2.1	Continue trapper education workshops and incorporate how to lower chances of incidental take of American Marten.	2025
Action 3.2.2	Encourage reporting of incidental catch.	Ongoing
Action 3.2.3	Continue to trap test to increase selectivity of traps for target species	Ongoing
Approach 3.3	Manage habitat and reduce the risk of fire.	Ongoing

Action 3.3.1	Continue public education during times of higher fire risk.	Ongoing
Approach 3.4	Continue working with woodlot owners and other members of the forest industry to ensure proper protection is provided to American Marten and their habitat.	Ongoing
Broad Strategy: Law, Policy and Enforcement		
Approach 4.1 Ensure landscape habitat requirements practices are enforced and managed.		
Action 4.1.1	Audit proportion of Crown land leased by the province to ensure compliance with the NS Endangered Species Act	Ongoing
Action 4.2.1	Continue to design, implement, assess, and improve special management practices designed for American Marten habitat.	Ongoing
Action 4.2.3	Develop messaging to discourage feeding and handling of American Marten which includes language from the NS Endangered Species Act and other Provincial Legislation.	Ongoing
Broad Strategy: Research to Address Knowledge Gaps		
Action 5.1.1	Continue modelling habitat to determine the threshold for habitat retention needed to meet American Marten recovery objectives.	Ongoing
Action 5.1.2	Continue to design and implement surveys to address knowledge gaps in American Marten population size, trends and distribution	Ongoing

8. IDENTIFICATION OF CORE HABITAT

8.1 Core Habitat Definition and Attributes

Under section 16 and 18 of the Endangered Species Act, core habitat is defined as the specific areas of habitat essential for the long-term survival and recovery of endangered or threatened species.

It should be noted that the most suitable tracts of habitat for the American Marten will change over time: forests are successional, meaning that suitable habitat for denizens of mature coniferous forest will change over time with maturity and disturbance. Some areas that may be considered for inclusion as core habitat may not be capable of supporting American Marten for 20+ years but are important to ensure that suitable habitat persists in the future. It is important to preserve core habitat areas that are required for both the recovery of the species in the province, and later for maintenance of those populations. Such an approach will help prevent extirpation in localized pockets of habitat within the range, supporting long-term objectives for the population.

An American Marten population must have at least 100 individuals to maintain its long-term genetic diversity (Hillman 2014). One hundred American Marten would require between 225 and 440 km² of high-quality habitat. This range is based on the size of the average American Marten home range in an area (Pelletier 2005; Berlo 2006; Godbout

and Ouellet et al. 2008; Fuller et al. 2010; Sirén et al. 2015). The lower end of this estimate (i.e., 225 km²) is based on American Marten home range estimates from New Hampshire (Sirén et al. 2015), and the relatively mild southwestern Nova Scotia (Berlo 2006) and the upper value (i.e., 440 km²) is derived from home ranges reported in Maine (Fuller et al. 2010), New Brunswick (Pelletier 2005), and Quebec (Godbout and Ouellet 2008). However, American Marten in Cape Breton experienced an estimated 80% decline after the last spruce budworm outbreak due to extensive salvage logging (Scott 2001). Based on this we would need at least 500 individuals to withstand another similar decline. So based on this we would need between 1125 and 2200 km² of high-quality habitat for each American Marten population. In Nova Scotia, an assessment of forest cover attributes identified 6521 km² of area (Cape Breton: 2258 km², Mainland: 4263 km²) that meets the minimum habitat requirements of American Marten. Further, American Marten have been observed over more than 1070 km² of Cape Breton and 1300 km² of the western Mainland (Figure 4)

8.2 Identification of the Species' Core Habitat

Geographical Location

- Core habitat occurs at the intersection of Digby and Yarmouth counties on the Mainland and Inverness and Victoria Counties in Cape Breton (Figure 4).

Biophysical Attributes

- Core habitat is defined by the following attributes, which are requirements for survival and recovery (Payer and Harrison, 2000; Fuller and Harrison 2005; Jeppesen 2008; Thompson et al., 2012):
 - American Marten can be found in any type of mature forest.
 - Forests with a basal area over 18 m² /ha and trees over 6 m tall, but prefer trees between 9-12 m tall
 - Contiguous forest patch of at least 5 km² but are in Nova Scotia are found in areas with forest patches of over 100 km².
 - Abundant coarse woody debris, with the more the better
 - Coarse woody debris generated after clearcutting is less beneficial than coarse woody debris generated from natural disturbance or high retention forestry these systems produce thicker debris and that produces more complex horizontal structure (Farnell et al. 2020)
 - Abundant small mammal populations which are their main food source
- While core habitat is exclusive to mature forest, marten often have non-mature forest within their home range.

- Additionally, American Marten avoid large forest openings. If an area has more than 25-30% open habitat, the chance of American Marten using that area decline exponentially (Fuller and Harrison 2005).
- Roughly 6521 km² of Nova Scotia (Cape Breton: 2258 km², Mainland: 4263 km²) meets the minimum American Marten habitat requirements, while American Marten are found in roughly 40% of this area (Figure 3)

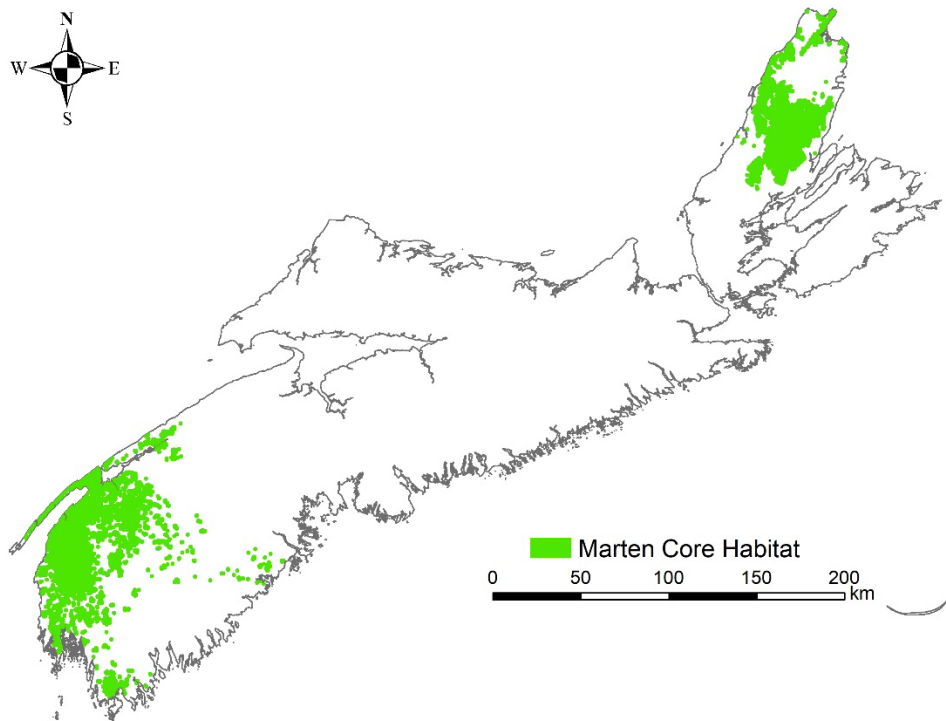


Figure 4. American Marten core habitat area in Nova Scotia (Mainland = 4428, Cape Breton = 2109 km²).

8.3 Activities Likely to Result in the Destruction of Core Habitat

Destruction of core habitat occurs when part of the identified core habitat is degraded (temporarily or permanently) to such an extent that it can no longer serve the species. Destruction may occur because of a single event, as a consequence of longer-term repercussions of a single activity, or from cumulative impacts of multiple activities over time. It is important to note that destruction of core habitat occurs on a landscape scale, involving various forest types and age classes over time; it is not an automatic consequence result of stand-specific destruction.

Table 5. Activities Likely to Result in Destruction of Core Habitat. Activities are based on the threats identified in Table 1 that result in a change of use for a forested area on the landscape.

Description of Activity	Rationale
Mature forests cut and converted to plantations.	Prevents natural forest succession and reduces availability of mature forest on the landscape, which may limit carrying capacity, prey availability, and dispersal, in turn restricting gene flow. Increases likelihood of road networks and associated threats to the species.
Utility corridors or roads, (such as those created during forestry operations) can increase access by humans, predators, and competitors.	Increases risk of incidental catch or other direct causes of human mortality. Increases access by predators and/or competitors, especially in areas of deep snow. Increases fragmentation, which may limit dispersal and restrict gene flow.
Direct loss of forest, (including from large outbreaks of forest pest such as Spruce Budworm and associated (control or salvage operations) forest fragmentation, reduced quality of remaining forest.	Decreases availability of mature forests on the landscape, and thus limits carrying capacity. Decreases coarse woody debris and understory depending on silvicultural regime, resulting in fewer den and rest sites, and reduced prey habitat. Increases likelihood of road networks work and associated threats to the species. A large-scale outbreak of forest pests (and control or salvage operations) could have a significant impact on marten.
Loss of habitat due to fire.	Decreases the amount of forested area on the landscape, reducing carrying capacity, increasing fragmentation, and limiting dispersal.
Alteration of forest.	Climate change may result in reduced snow depth, decreasing competitive advantage.

8.4 Schedule of Studies Related to Core Habitat

Table 6. Schedule of Studies to Further Identify Core Habitat.

Description of Activity	Rationale	Timeline
Assess previous habitat goals to determine whether habitat patches were attained and whether they may be occupied.	Provides the basis for developing management regimes for designated core habitat required for population recovery.	Completed for Cape Breton
Analyze Biodiversity Investigation Report data to determine where American Marten are found; combine with other map layers of relevant data.	Further refine core habitat required for population recovery.	Ongoing
Analyze TANS block presence data to determine where American Marten are found. Combine with other map layers of relevant data.	Further refines core habitat required for population recovery.	Completed 2007-2011 on Mainland NS
Determine which types of habitat should be prioritized for active management to ensure the survival and recovery of American Marten, based on a comparison of habitat modelling in Nova Scotia with studies from other areas.	Refines parameters for consideration of tracts of forest as core habitat.	2018-2020 Completed in CB
Consider including snowfall data in modeling and mapping exercises.	Establishes baseline snow depth information for monitoring potential effects of climate change on habitat quality.	Completed in 2022
Consider management of core habitat at different levels of ecological land classification schemes such as ecodistricts and ecosections.	Provides insight on appropriate spatial scales for core habitat management.	2020-2025
Conduct a review and analysis on the practical and theoretical implications of managing designated core habitat.	Informs wildlife and land managers for implementation of regulations and policies associated with identification of core habitat.	2021-2026
Explore the feasibility of different methods (camera traps, hair snagging for genetic analysis, presence-absence modelling with sighting records) that	Further refines core habitat and may provide information on relative abundance across the species' range as it relates	Ongoing

could be used to detect American Marten on the landscape to further understand and monitor the area of occupancy	to habitat quality and suitability.	
Develop and implement a robust detection and monitoring program to gather data for habitat-based occupancy modelling for American Marten in Nova Scotia.	Further refines core habitat for population maintenance.	Ongoing
Further refine modeling techniques that make use of the Forest Resource Inventory (FRI) data to model current habitat supply and to forecast habitat availability over time.	Estimates current habitat availability and to ensure recovery habitat is available in the future.	Ongoing
Develop messaging to support public education and outreach with regards to the American Marten, including discouraging feeding of and the importance of reporting sightings	Enhances public engagement and reporting, which may provide data useful for defining core habitat. AS well it will that advocates of the American Marten are supporting them in the right way.	Ongoing

9. MEASURING PROGRESS

9.1 Performance Indicators

Performance indicators provide a way to define and measure progress toward achieving the population and distribution objectives for American Marten. The success of implementing of the Recovery Strategy and Action Plan for the species will be measured against the following performance indicators:

- Populations of American Marten persist in both Mainland Nova Scotia and in Cape Breton.
- Increasing or stable population trends are evident for both populations.
- The minimum viable population (MVP) of American Marten in Cape Breton is sustained.
- A MVP size has been calculated for American Marten in Mainland Nova Scotia.
- MVP estimates for both populations are reassessed and refined as new data and information become available.

- MVP analyses and habitat models have been used to determine the threshold for habitat retention needed to meet American Marten recovery objectives for Mainland Nova Scotia.
- Forest roads (and other roads) management for Crown lands is improved through policy implementation.
- Unused roads into areas of key habitat have been decommissioned.
- The fisher population on Cape Breton Island has been monitored continuously and management of the population has been considered where necessary.
- An appropriate long-term detection and population monitoring strategy (e. g. using hair snags and/or camera traps) is developed and implemented for both Cape Breton and the Mainland to and monitor and document Recovery.
- Trapper education initiatives have minimized incidental take of American Marten.
- Reporting rates (including carcass submission) of incidental take of American Marten have are believed to be close to 100%.
- Effective programs are developed, and monitoring data have been incorporated into habitat and population modeling initiatives.
- Data analysis, modeling, and mapping has been completed to further refine core habitat.
- Core habitat for American Marten in Nova Scotia has been formally identified and Designated under the NS ESA.
- Core habitat is managed appropriately to achieve conservation goals.
- Progress towards increasing habitat quality and quantity in Cape Breton has been assessed.
- Available habitat has not dropped below 2020 levels in Cape Breton.
- Indicators of habitat alteration resulting from climate change have been identified.
- In the short term, biodiversity values related to the maintenance and continued recovery of the American Marten has been meaningfully incorporated into efforts of ecological forestry as defined by Lahey. Mammals Recovery Team and other species at risk experts are engaged in the provision of advice.
- In the long term, actions and benchmarks for recovery and maintenance of American Marten and American Marten habitat are an integral component of Nova Scotia's forest management planning system for Crown lands.

9.2 Review of Past Recovery Objectives

Objective 1. Supplement the Cape Breton Island American Marten population.

- The Cape Breton Island American Marten population was supplemented with a total of 128 animals from New Brunswick from 2007-2009 and four captive-bred animals from Shubenacadie Wildlife Park.

- The goal of maintaining a population of 100+ American Marten by 2030 (75 in the Highlands and 25 on other holdings) was likely met, although the current population abundance is currently unknown.

Objective 2. Improve knowledge important for American Marten recovery efforts.

- An assessment of threats to Cape Breton American Marten to determine the relative contributions of various threats to the population was carried out.
- Genetic analyses to describe the evolutionary history of Nova Scotia American Marten populations, characterize the extent and patterns of genetic variation, and to estimate the level of gene flow between populations were conducted (results not published).
- Snow track survey transects from 2005-2018 to improve knowledge on the distribution and abundance of the Cape Breton Island population were carried out.
- Detailed plans to identify and protect 30 American Marten home range patches by 2019 and an additional 25 home range patches by 2030 were made.

Objective 3. Secure habitat for the Cape Breton Island American Marten population from 2007-2012.

- Special management practices for American Marten based on a defined American Marten Habitat Management Zone were published.
- Guidelines for commercial thinning of immature stands within the American Marten Habitat Management Zone were developed in consultation Port Hawkesbury Paper to address concerns raised by the Government of Nova Scotia.
- The feasibility of habitat manipulation of mature pre-commercially thinned forest habitat was tested.

Objective 4. Minimize, to the extent possible, accidental mortality from trapping and snaring by 2010.

- To the extent possible, mortality from accidental trapping and snaring of American Marten was minimized.

Objective 5. Raise public awareness of the concern for American Marten on Cape Breton Island and involve relevant stakeholders in stewardship activities.

- Continue to raise public awareness of the concern for American Marten on Cape Breton Island and involving relevant stakeholders in stewardship activities.

9.3 Monitoring

The American Marten monitoring plan is aimed at providing consistent data over time to assess population dynamics, habitat parameters and threats in Nova Scotia for both populations. American Marten populations will be monitored annually through various surveys (e.g., cameras, fur snags, tracks, etc), disease monitoring and prey populations. Success of this monitoring plan will be reviewed and adjusted as needed and as management actions change.

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