

# Endangered American Marten Special Management Practices

## Introduction

Marten (*Martes americana*) is provincially listed as an endangered species under the Nova Scotia Endangered Species Act due to their small population size and limited localized occurrence. Historically, marten were found throughout Nova Scotia but are now found, in low numbers, in only two locations. There is a re-introduced population in southwestern Nova Scotia and a small relic population on Cape Breton Island (CBI). These Special Management Practices apply to the CBI population and are based upon its recovery strategy (Nova Scotia American Marten Recovery Team. 2006) and actions of the Nova Scotia American Marten Recovery Team.

The distribution of the present population is highly fragmented with a small subpopulation on the northwest side of the highlands, largely inside the boundaries of the Cape Breton Highlands National Park, and a second sub-population in the southeastern highlands. The separation is wide enough to reduce the probability that there is significant movement of animals between the two areas. Each of these sub-populations is further fragmented by habitat patchiness. This separation has occurred within the last 30 to 35 years and is the result of habitat alteration from timber salvage operations following a massive spruce budworm infestation. Remaining marten habitat remains fragmented and under threat of harvesting.

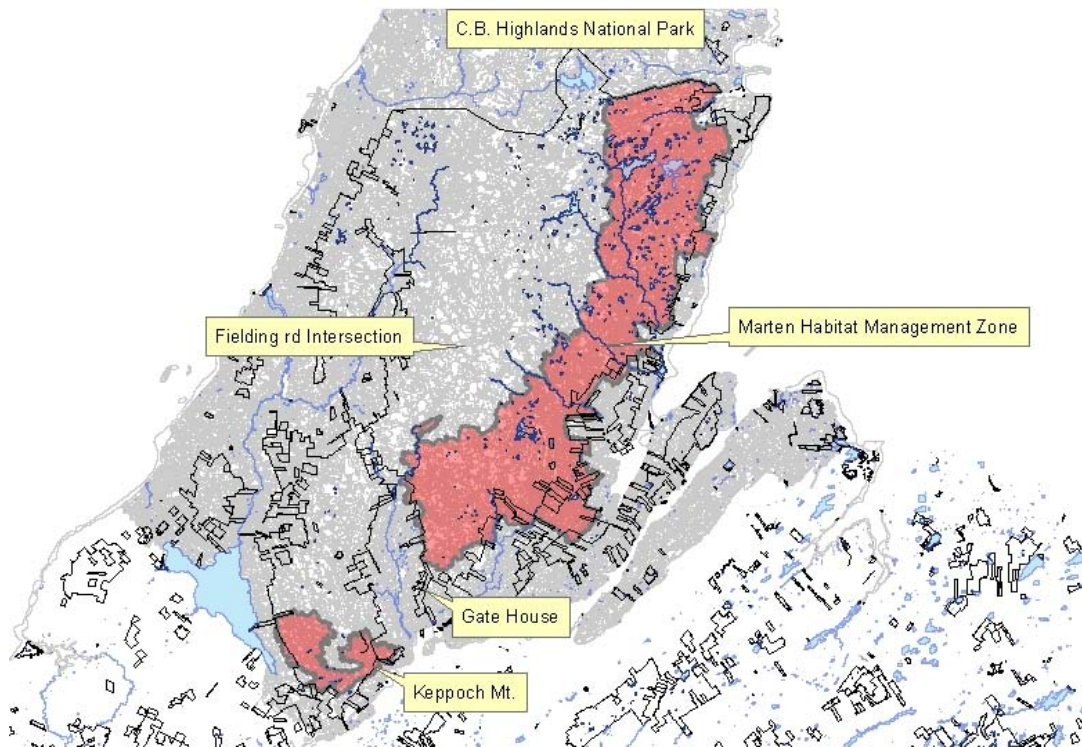
The species is generally associated with late-successional conifer-dominated forests and their optimal habitat appears to be in older forests. Although younger mixedwood and conifer-dominated habitats may also be used, horizontal and vertical stand structural complexity and landscape patterns are determining factors. Coarse woody debris (snags, downed logs, exposed root masses and stumps) plays an important role for marten in hunting and thermo-regulation.

## Special Management Practices

The Recovery Team has defined a Marten Habitat Management Zone (MHMZ –Figure 1) derived from modeling and local experience to restore a self-sustaining population of the Cape Breton marten. The recovery strategy Objectives 1&2 provided the specific targets used in the creation of the MHMZ, as well as planning for marten habitat blocks/home range patches within the area of concern. Within the MHMZ, forecasting forest development on a stand-by-stand until year 2030 produced a series of marten habitat map layers for 2004, 2009, 2014, 2019, and 2030 used to identify and plan for 55 prescribed marten home range patches by 2030 (Figure 2). While not all of the required patches were initially available within the MHMZ, particularly in the first 3 time periods, by the year 2030 the options to create quality habitat patches will increase significantly if the SMPs are adhered to (Figure 3). Patches may migrate within the MHMZ but must be a minimum 500 ha in size, circular in shape, and contain a minimum 60% marten habitat as determined using the equations in Appendix 1.

Figure 1. American Marten Habitat Management Zone

## Marten Habitat Management Zone (MHMZ)

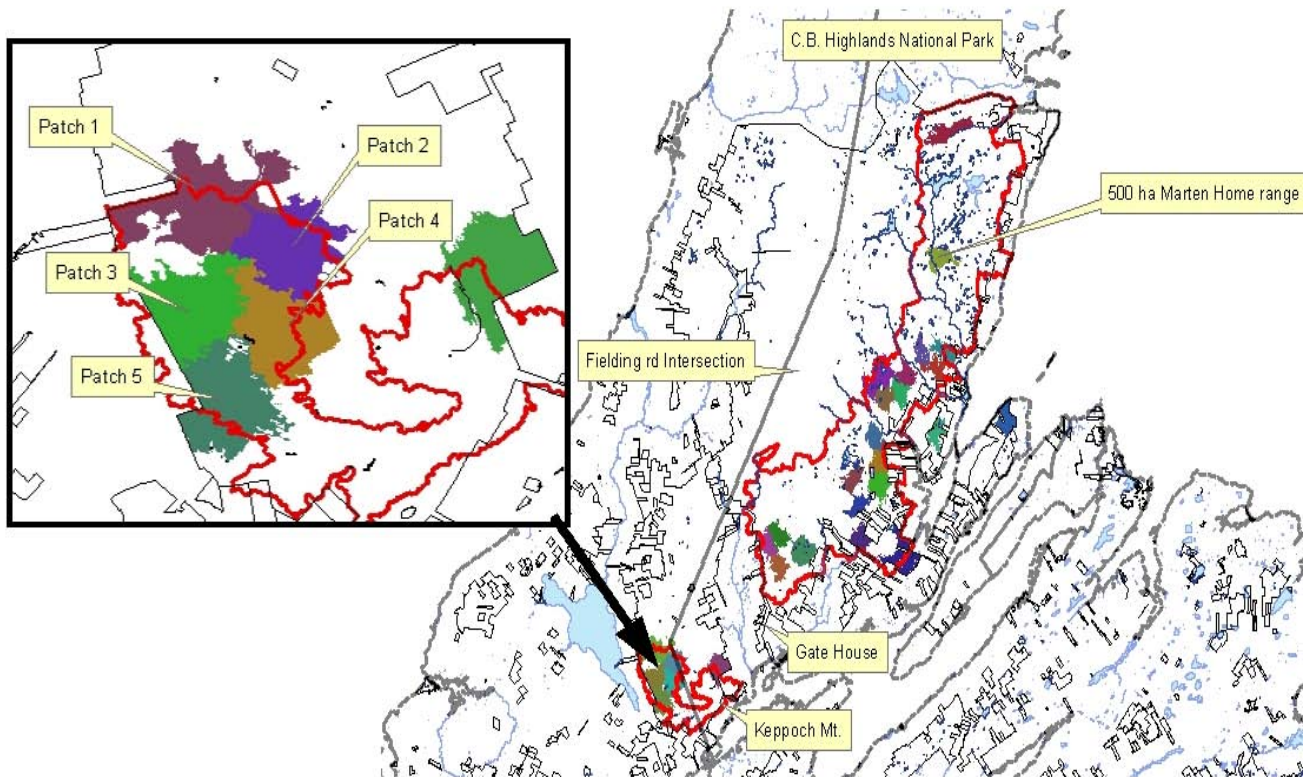


To address future habitat supply at the landscape level the following SMPs are to be applied to forest harvesting throughout the Cape Breton Highlands:

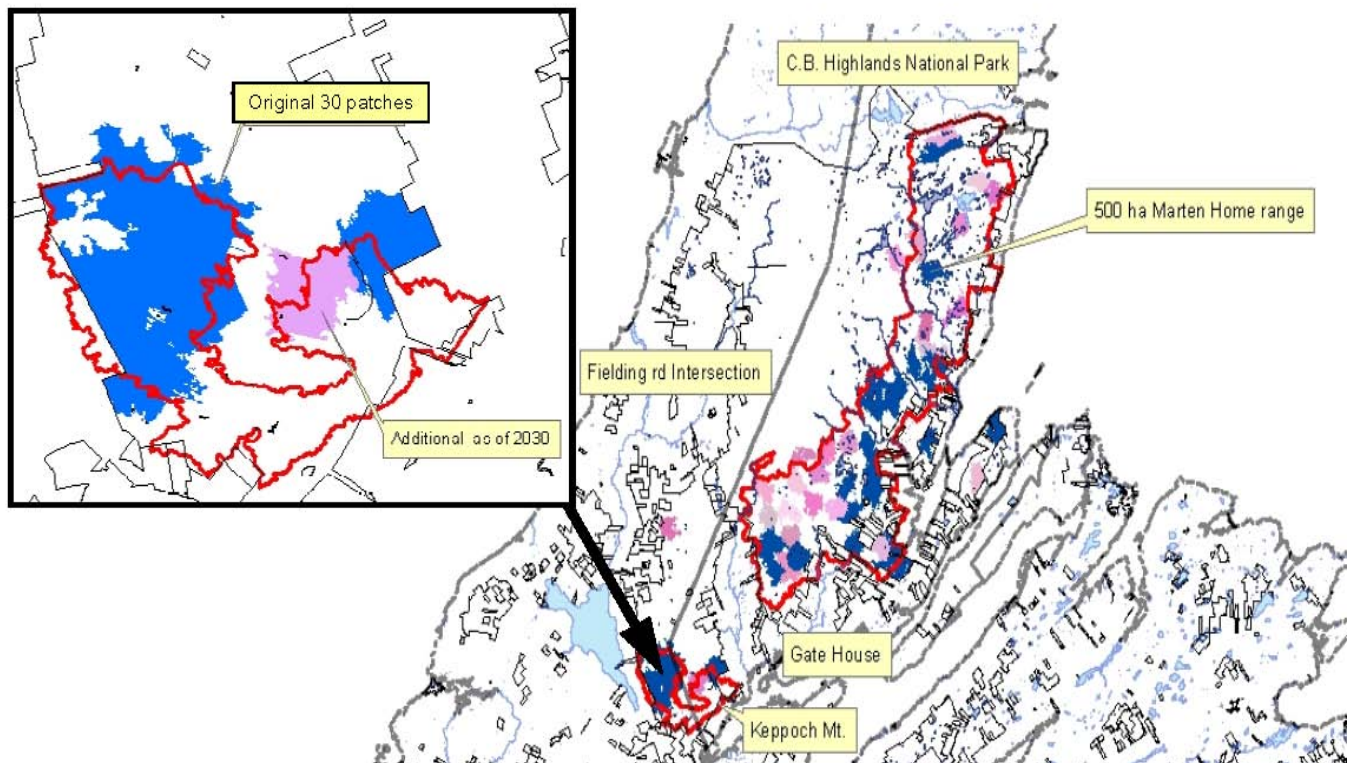
- 12-14 standing and live mature trees per ha must be left evenly spaced throughout the harvest site;
- These are in addition to all other requirements of the Wildlife Habitat and Watercourse Protection Regulations;
- Large yellow birch trees should be left standing where possible;
- Harvest sites should maintain at least 100 m<sup>3</sup> of coarse woody debris/ha and mean maximum diameter of downed logs should exceed 22 cm.

Figure 2. Increase to 55 forecasted American Marten home range patches (2030).

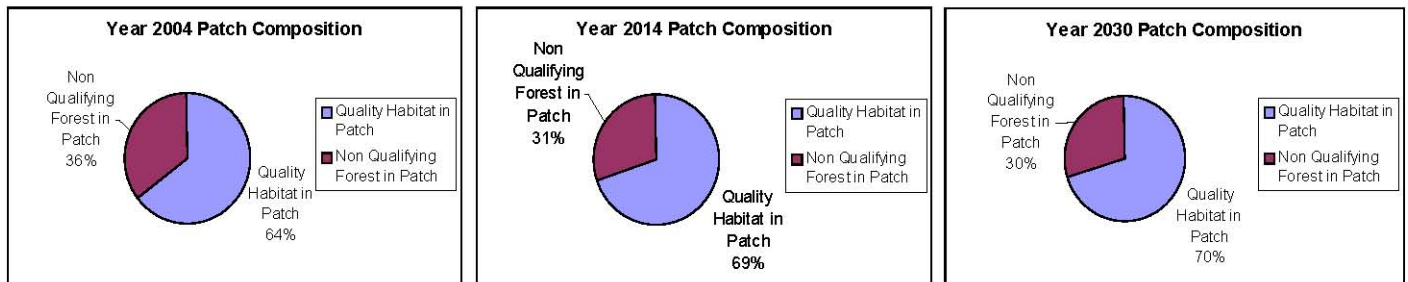
## 30 Marten Home Ranges



## Additional 25 Home Ranges in 2030



# SMP Actual - Mapped Home Range Patch Details



	Original patches				Additional Patches (25)	
	2004 (33)	2009 (32)	2014 (30)	2019 (30)	New (25)	Total Patches in 2030 (55)
Total Quality Habitat in Patch	12184	12250	12111	12456	9466	21922
Non Qualifying Forest in Patch	6822	6206	5336	4992	4480	9472
Total Patch Area	19006	18456	17447	17447	13946	31393
Area within Private	0	0	0	0	0	0
Area within Wilderness Protected Areas	6217	6217	6217	6217	2238	8455
Area within MHMZ	15106	14750	14053	14053	12081	26134

	2004 (33)	2009 (32)	2014 (30)	2019 (30)	Total Patches in 2030 (55)
Average Patch size	576	577	582	582	571

Figure 3. Changes in the amount of qualifying American Marten habitat in the Marten Habitat Management Zone.

## Reference

Nova Scotia American Marten Recovery Team. 2006. Recovery Strategy for American marten (*Martes americana*) on Cape Breton Island, Nova Scotia in Canada. Nova Scotia, Canada.

## Appendix 1: Habitat modeling calculations and assumptions.

Habitat was forecasted according to the following detailed calculations and assumptions:

### Calculating height growth rate.

Used the Department of Natural Resources (DNR) yellow book to get regression of height growth versus site class (r2 of 0.99).

Equation:

$$\text{Growth Rate} = 0.125 + 0.0365 * \text{SiteClass}$$

### Calculating Basal Area (BA) from volume and height.

Equation:

$$\text{BA} = 7.114 + \text{vol} * 0.165 + \text{ht} * -0.07$$

with an r2 of 0.912

### Calculating Height and volume for treated and unclassified stands.

Do not have height for these and, therefore, do not have the calculated volume.

Based on treatment type and treatment year the age was calculated. Then calculated the height based on the previously developed height equation.

Based on just the site class calculate the current volume. Assume 90% stocking on all softwood stands.

$$\text{softwood volume} = \text{siteclass} * \text{age} * 0.9$$

$$\text{total volume} = \text{siteclass} * \text{age} * 0.9$$

For unclassified on highlands we can assume that an average of 50% will always be softwood.

Heights have already been calculated, but the volumes are required.

Age calculated from height and site class:

$$\text{Age} = \text{int}(\text{ht} / (0.125 + 0.0365 * \text{Site Class}))$$

Volume calculated from site class and crown closure

$$\text{Totalvol} = \text{site} * \text{age} * \text{cc} / 100$$

$$\text{swvol} = \text{site} * \text{age} * \text{cc} / 100 * 0.5$$

### Calculating Height at 0,5,10,15 and 26 years.

Assume the existing height (ht) in the file is from 1998, therefore need to forecast up to today.

Example:

$$\text{Height 2004} = \text{ht} + (5 * (0.125 + 0.0365 * \text{site}))$$

A 14 m maximum height is assumed, except for those stands that have already passed this threshold, In this case these stands do not gain any height.

This assumes that if it is over 14 metres it is a slope stand at maturity and not going to get any taller than what it is. Other stands will grow at their current rate until they reach 14 metres.

Code:

```
If([Forest][HEIGHT]>14,[Forest][HEIGHT],If(Int([Forest][HEIGHT]+(5*(0.125+0.0365*[Forest][SESITE])))>14,14,Int([Forest][HEIGHT]+(5*(0.125+0.0365*[Forest][SESITE])))))
```

### Calculating Softwood percent.

Softwood percent calculated from softwood volume and total volume - assumes that the percent softwood will not change over the next 20 years. This is a problem potentially for the softwood under hardwood situation. However, on average for a particular stand this should be ok given that we do not know where a stand is in the softwood cycle at any particular point in time. This same problem would exist with using our yield curves.

### Calculating volumes at 2004, 2009, 2014, 2019, 2030

Volume 2004 = totalvol + 5 \* sesite \* cc/100

A growth limiter is placed on it where if the height has not changed in the previous period, the volume is assumed to stay the same.

Code:

```
If([Forest]![HT2004]>[Forest]![HEIGHT],[Forest]![TOTALVOLUM]+(5*[Forest]![SESITE]*[Forest]![CRNCL]/100),[Forest]![TOTALVOLUM])
```

### Calculating Basal Area's (BA)

Use BA equation in each period, based on height and volume.

$BA = 7.114 + vol * 0.165 + ht * -0.07$

### Calculating whether each stand is habitat

Where

BA >= 18

Softwood percent >= 30

Height >= 6

Calc Hab2004 = 1

### Determining "best of best" habitat

Used site class and softwood percent to determine the range of habitat quality.

Where: Higher Site class = better habitat

Greater softwood % = better habitat.