Could marten become the spotted owl of eastern Canada?

by Ian D. Thompson

Abstract

Conservation of spotted owl habitat in western North America illustrates the difficult decisions that must be taken and the conflicts that can arise in land-use planning. In eastern North America, spotted owls are absent but marten, an animal species which prefers old-growth forest, has become rare in some areas as a result of habitat loss. The marten is a threatened species in Newfoundland, exists in small numbers in Nova Scotia, and has been extirpated in Prince Edward Island. Lack of long-term integrated forest resource planning, short rotations, and silvicultural practices that produce sub-optimal habitat may eliminate the species in Atlantic Canada. Two cases are discussed from Newfoundland and New Brunswick where unbalanced forest age structures suggest a bleak future for the marten. Other larger jurisdictions in Canada should closely examine their forest land management plans in view of the Atlantic experience.

Résumé

La préservation de l'habitat de la chouette tachetée dans l'ouest de l'Amérique du Nord est un exemple des difficiles décisions qui doivent être prises et des conflits qui peuvent surgir dans la planification de l'utilisation du territoire. La chouette tachetée ne se retrouve pas dans l'est de l'Amérique du Nord, mais la martre, un autre animal qui préfère les forêts surannées, est devenue rare dans certaines régions par suite de la destruction de son habitat. La martre est une espèce menacée à Terre-Neuve, dont on retrouve quelques individus en Nouvelle-Ecosse, et qui a été chassée de l'Ile du Prince Edouard. La manque de planification à long terme intégrée des ressources forestières, les courtes rotations et les pratiques sylvicoles qui produisent des habitats sous-optimaux pourraient éliminer la martre des Maritimes. Deux exemples sont tirés de Terre-Neuve et du Nouveau-Brunswick où les classes d'âge irrégulières des forêts laissent entrevoir un avenir sombre pour la martre. Les autres juridictions plus importantes au Canada devraient étudier attentivement leurs plans de gestion des terres forestières à la lumière de l'expérience des Maritimes.

Introduction

As resource managers begin to improve management of the land base for the protection of forest resources other than fiber, various problems emerge. Some problems relate directly to individual wildlife species which require certain forest structures or broad expanses of particular forest types. Marten (*Martes americana*) and spotted owl (*Strix occidentalis*) are two species of animals which prefer old coniferous forests. As a result of declining amounts of old forest, marten and spotted owls have become increasingly important in forest management planning in some areas of North America (e.g., Thomas et al. 1990).

Spotted Owl and Logging

The spotted owl is the focus of considerable attention and controversy particularly in the northwestern United States, because it inhabits old-growth Douglas fir (*Pseudotsuga menziesii*) forests that are highly valued for saw timber. Populations of the owl have been affected by logging its habitat (Wilcove 1986). Dawson et al. (1986) reported that logging has undoubtedly reduced populations of the owls in southern British Columbia, where the species is at the northern extent of its range. In the United States, large areas of old-growth forest are the subject of litigation between logging interests and public groups seeking to preserve the forests for spotted owls and other resource values. The US National Forest Act requires that all species be maintained in viable populations on Federal lands and the Forest Service and Bureau of Land Management are developing integrated resource plans designed to guide the protection of wildlife populations. Other bird species may also depend primarily on components of western old-growth forests for breeding, including Vaux's swift (*Chaetura vauxi*) and marbled murrelet (*Brachyramphus marmoratus*). However, the spotted owl has been the focus of attention because the species has been listed as threatened under the US Endangered Species Act, as a result of a dramatic decline in population size (Simberloff 1986).

Eastern Canada has no spotted owls and controversy about logging the forests has been sporadic and more often related to native land claims rather than concerns for forest resources other than timber. Low human populations in boreal forest areas have contributed to an ignorance among the Canadian public of how wildlife populations change as a result of logging. Such lack of interest is translated through the political system to few dollars for research, inventory, or management of wildlife species, beyond those few animals of economic importance (Thompson 1987).

A major difference between the eastern and western situations is the value, age, and structure of the forest types. Western old-growth forests, especially those dominated by Douglas fir are long-lived (250-750 years), exceptionally valuable (approx. $CDN 12,000/ha) (Crain 1985), and highly diverse as a result primarily of a warmer climate than in eastern Canada. Old-growth forest of eastern Canada is relatively short-lived (180-250 years for white spruce (*Picea glauca*) dominated communities in Ontario, and less than 150 years for balsam fir (*Abies balsamea*) communities in the Atlantic Provinces), substantially less valuable than western forests (e.g. $CDN 3,000/ha for good pulpwood stands) (P. Trelawny, pers. comm.), and botanically less diverse.

However, certain similarities between these widely separated areas are apparent. First, wood supply shortages are being predicted near the turn of the century both locally and over broad areas. Increasing public concern for wildlife, forest-based recreation, and maintenance of old-growth communities is causing the planning process to be questioned in public debate, resulting in some difficult situations for

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governments and industry. Government agencies are beginning to re-assess forest management goals in terms of integrated resource management. Finally, some wildlife species are becoming (or have become) rare as a result of logging: among these is the marten in some areas of eastern Canada.

History of Marten Populations

Marten were once one of the most common mammalian carnivores in boreal and temperate coniferous and mixed forests in eastern North America, and they still are in many areas. However, over most of the southern portions of their historical range, logging and land-clearing, coupled with excessive trapping, has reduced or eliminated the species. There are few data available to enable partitioning of the causes of decline. However, it appears that marten exist in low numbers in successional forest habitats (de Vos 1952, Koehler and Hornocker 1977, Thompson et al. 1989), and that trapping can eliminate marten from areas where they occur in small populations (de Vos 1952, Quick 1956). Marten are extirpated in Prince Edward Island, mainland Nova Scotia, and nine northern States, and are reduced to remnant populations in Newfoundland, Cape Breton Island, and six States (Bergerud 1969, Dodds and Martell 1971, Strickland et al. 1982, Davis 1983, Hamilton and Fox 1987, Melchior et al. 1987). Reintroductions have been undertaken in Newfoundland, Nova Scotia, Michigan, Wisconsin, Maine, New Brunswick, and Ontario.

Marten Habitat Requirements

Marten occur in highest densities in mature and over-mature conifer and mixed forests (Marshall 1951, Soutiere 1979, Taylor and Aubrey 1982, Thompson et al. 1989). Extensive reduction of preferred habitat through clearcutting or fire reduces marten populations (Yeager 1950, de Vos 1952, Koehler and Hornocker 1977, Soutiere 1979). In Ontario for example, I found that marten densities were 67-90% lower up to 40 years after clearcutting (the oldest second growth in the area) compared to densities in uncut over-mature mixed stands (Thompson et al. 1989, Thompson in prep.). Soutiere (1979) working in Maine, showed that density of marten in stands up to 15 years post-logging was one third that of mature stands. He also suggested that selective timber extraction (40 cm spruce and 15 cm balsam fir diameter limit) did not alter marten populations. There are several possible hypotheses as to why marten prefer old forest: 1) habitat choice may reflect predator avoidance behaviour. Conifer-dominated forest with a closed canopy may provide greater protection from avian predators than do open stands or deciduous-dominated forest in winter. 2) Preferred food species may not occur in young forest stands. Differences in canopy and diversity (horizontal, vertical, and plant species composition) between natural old forest and post-logging successional types are substantial and therefore so are the small mammal communities associated with each (Martell 1983, Thompson 1986). Small mammals are important as food to marten. 4) Access to the subnivean zone where small mammals dwell in winter is more available in old forest compared to that in young forest stands (Steventon and Major 1982). 4) Young forests probably lack natal den sites provided by large diameter trees found in old forests.

Use of logged habitats in boreal forest by marten is influenced primarily by the amount of softwood remaining after harvesting (Soutiere 1979). Islands of uncut timber within a logged site can be used for hunting by marten particularly if the uncut stands are large. For example, Snyder and Bissonette (1987) observed in western Newfoundland that stands larger than 15 ha were used by marten while smaller stands were avoided. Home ranges of marten in clearcut areas of boreal Ontario were two to four times as large as those in uncut forest (Thompson and Colgan 1987). Further, only two of 10 logged sites that I censused during that study consistently contained marten before the commercial trapping season, whereas marten always occurred in our uncut stands.

Forest Management and Marten

Thompson (1988) speculated on the effects of intensive silviculture on marten populations. The basic assumption was that a forest managed for timber production would be less dense, and less diverse structurally and botanically than a stand of natural origin. Therefore the managed forest should provide poorer habitat for prey species and support relatively fewer carnivores, including marten, than might be expected in natural stands, particularly those of fire origin. For example in Newfoundland, balsam fir/black spruce (*Picea mariana*) stands generally regenerate after logging to balsam fir with little spruce or other species, because balsam fir occurs in the understory (Damman 1964). Dense stands of balsam fir are eventually thinned mechanically and perhaps treated with herbicides if alder (*Alnus* spp.) and white birch (*Betual papyrifera*) are viewed as competing species. The result is often a balsam fir monoculture of even-aged, even-sized trees at approximately 2000 stems/ha with no snags or downed wood and a ground cover dominated by litter. That situation may be contrasted to uncut mature stands of natural origin with 2-3000 stems/ha of balsam fir, black spruce, and perhaps 10% or more white birch, which may contain numerous snags and fallen timber and a moss dominated forest floor (W. Meades, pers. comm.). Habitat conditions for marten are also poor in much of boreal northern Canada where clearcut mixed stands have regenerated to aspen (*Populus tremuloides*), or aspen/birch/balsam fir forest.

Case 1. Newfoundland

Marten occurred throughout central and western portions of Newfoundland (Bergerud 1969). They are now restricted to small numbers in a few isolated areas of the province, for example in both national parks, and are recognized nationally as a threatened subspecies (COSEWIC 1986). The only remaining large marten population occurs near Little Grand Lake in the western part of the province (Snyder and Hancock 1982), where the animals are partially legally protected in the "Pine Marten Study Area". Although the Pine Marten Study Area is closed to trapping, the forests are not entirely protected from logging. The most recent population estimate for the area is 150 marten (Bissonette et al. 1988) in an area of about 790 km^2. I calculated that a minimum viable population (MVP) for Newfoundland marten is 247 animals, using Lemkuhl's (1984) model, data from Bissonette et al. (1988), Thompson and Colgan (1987), and assuming a genetically effective population of 50. The Little Grand Lake population is below minimum MVP, and could be drastically affected as a result of stochastic population events or by loss of genetic variability (e.g., Soule and Simberloff 1986).

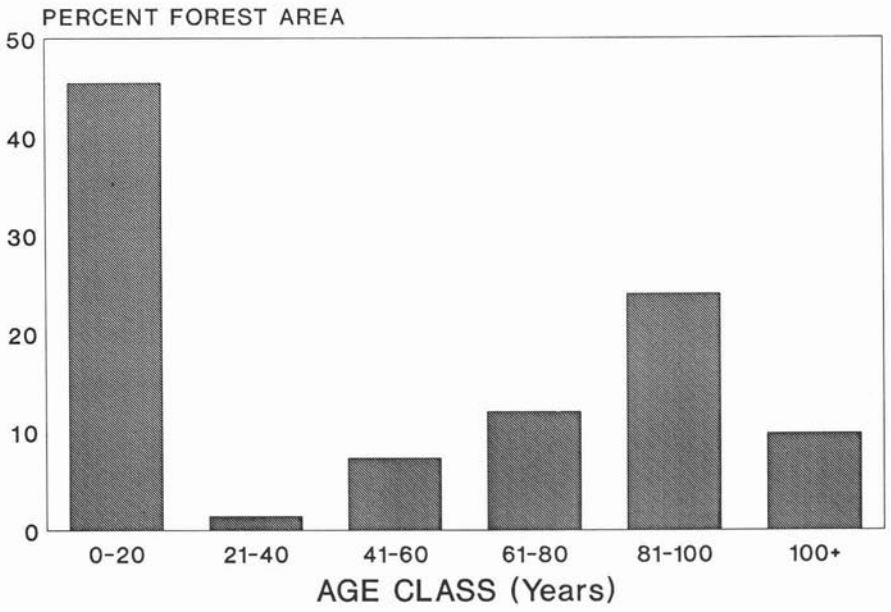

Figure 1. Percent of forested area in each 20-year age class at the Pine Marten Study Area, near Little Grand Lake, Newfoundland. (Data from: Newfoundland Department of Forestry and Agriculture).

Marten in the Little Grand Lake area inhabit mature and over-mature balsam fir/black spruce forests (age-classes 80+) which account for 40% of the area (Fig. 1). Two percent of the old forest has been killed or severely damaged by hemlock looper (*Lambdina fiscellaria*). Old trees in Newfoundland start to decay and fall at about 100 years (if they are not killed by insects) and there are few balsam fir stands in Newfoundland older than 120 years. If I use the mean of each age class and make the following generalizations: 1) the current oldest age class will convert to young stands in 10 years, 2) the average age of forest death is 110±20 years, 3) dead trees remain standing for a further 15 years thereby providing some overhead cover; then most of the present marten habitat at Little Grand Lake (age classes 81+) will last another 30-40 years. This is an optimistic view because Dobesberger (1989) indicated that within 20 years there will be another infestation of hemlock looper in the area further hastening forest decline. On the Pine Marten Study Area, mature habitat which may develop (current age classes 41-80) over the next 30 years will occur on about 173 square kilometres, and the habitat in the oldest class (currently 61-80) would already have begun to decline (Fig. 1). At a density of 0.26 marten/km^2 (Bissonette et al. 1988) there will only be enough habitat for 45 adult marten during a period of 30-40 years, beginning in the year 2020.

Over most of the province except in the regulated Pine Marten Study Area, snaring for snowshoe hare (*Lepus americanus*) is an extremely intensive fall through winter activity for a large number of people. For example, it is common for individuals to operate several hundred snares over a two or three week period. Hares are sold in the various communities for $3 each. Significantly, most of the marten reported dead have been captured in snares set for hare, including 6 percent of the animals marked in a recent study within the Pine Marten Study Area by Bissonette et al. (1988). Similarly, at Terra Nova National Park on the east coast of Newfoundland, three of eight marten released in the Park were caught in snares outside of the area (Parks Canada, pers. comm.). The data suggest that the Little Grand Lake area could act as a reservoir from which marten would disperse to other suitable habitat, but dispersers cannot survive the incidental trapping pressure. Furthermore, little other marten habitat exists elsewhere along the west coast that is not used for hare snaring.

The lack of an endangered species act impedes management efforts for the marten in Newfoundland. Although the species is listed as nationally threatened, the province is responsible for its own wildlife resources and has no legislation requiring conservation of marten habitat.

Concern over the status of the species led, in 1990, to the establishment of a RENEWS committee (Recovery of Nationally Endangered Wildlife Species) to develop a plan to aid in conservation of marten in Newfoundland. However, based on the shortage of protected suitable habitat available to marten in Newfoundland in the next 50 years, I believe that there is a high probability that the species will become extinct sometime during that period.

Case 2. New Brunswick

Marten presently occur in substantial numbers in New Brunswick primarily in the northern part of the province where they are commercially trapped. In 1988-89, 1559 pelts were sold in New Brunswick (D. Cartwright, pers. comm.). Habitat is provided primarily in even-aged mature and over-mature black spruce and balsam fir forest. A few marten also exist in central and southern parts of the province, including a small introduced population in Fundy National Park.

New Brunswick forests have an unbalanced age structure in the north and central areas of the province, with most trees in the 41-80 year classes (Fig. 2). It is projected that within 25-40 years virtually all of the available commercial older-aged stands will have been logged (New Bruns. DNR 1990). These projections also suggest that a substantially shorter rotation age, probably 50 years, will be used for spruces and balsam fir to meet wood supply targets. Shorter growing time and increased silviculture will result in litte future mature

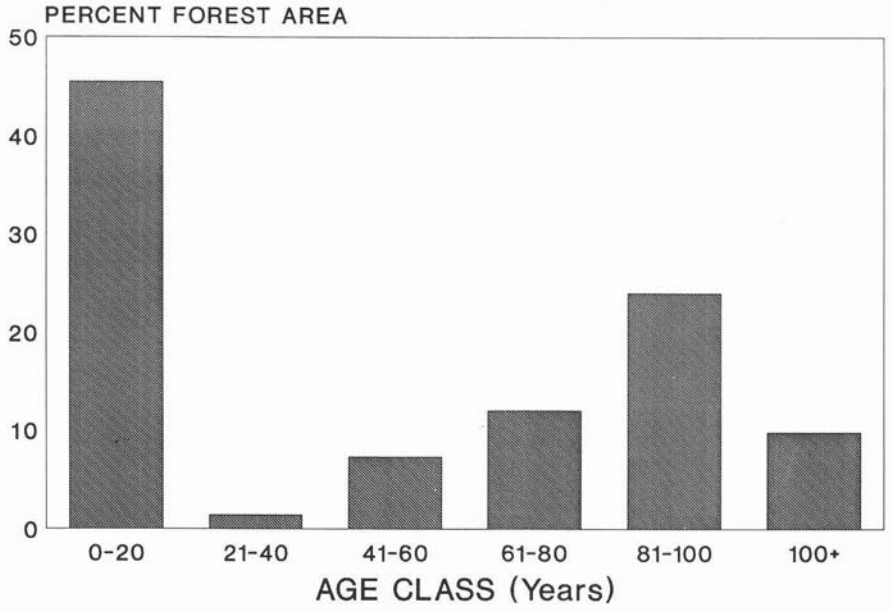

Figure 2. Percent in each 20-year age class of 2800 km^2 of typical northern New Brunswick forest. (Data from: New Brunswick Department of Natural Resources.)

or over-mature natural forest in the province. Thus, although it would appear that there will be considerable forest of the required age for marten available in 50 years (Fig. 2, age class 41-60), much of it will be harvested before it attains old age. Some stands of older timber will remain in areas protected from harvesting in riparian zones, parks, and deer wintering areas resulting in a patchwork of highly scattered preferred marten habitat. Work from Newfoundland has indicated that marten will use scattered residual stands if they are large (Snyder and Bissonette 1987). However, the stands studied in Newfoundland were in close proximity to uncut habitat, and such will not be the case in New Brunswick.

As in Newfoundland, considerable second-growth forest in New Brunswick is pre-commercially thinned or planted and treated with herbicide in an effort to balance the long-term age structure of the forest. Even if such forests were permitted to grow to over-mature, their simple structure and low stem density would likely support fewer marten than would a natural old-growth forest. Lack of habitat will present a major impediment to the maintenance of a viable marten population in the province. The predicted situation is for fragmented habitat surrounded by vast suboptimal areas. Unlike the Newfoundland situation, marten mortality from trapping is not so affected by heavy traditional hare snaring and some colonization of suitable habitat patches can be expected. However, there is little doubt that if present forestry practices continue (including the move to a short rotation) that marten populations will be extremely low within 50 years. The scattered remaining population will be subject to genetic deterioration, and stochastic mortality which could possibly eliminate the species from the province. The Province is attempting to develop a plan to alleviate the habitat shortage, but there exists a direct conflict between goals for marten and timber supply.

Will Marten Become the Spotted Owl of the East?

The answer to the question of marten survival in Atlantic Canada has probably been predestined by lack of an integrated approach to forest management. Marten will become and remain an endangered or extirpated species as a consequence of forest and wildlife management practices of the past four decades. Immediate steps taken in an attempt to solve the problem may not be fully able to counteract the irrevocable process that has been set in motion. In Newfoundland particularly, I believe that maintaining the species is problematic.

It is rather easy in hindsight to dissect the causes of the problem: habitat supply for marten was not calculated, no clear policies (or laws) were in place to deal with declining species, population or habitat goals for marten were not set, research money to determine habitat requirements was not available early enough, and industry was allowed to cut at a rate that exceeded habitat replenishment. Most importantly however, there was and continues to be a failure by government agencies and industry to recognize that the forest produces products other than fiber, and to step into a modern concept of management of the forests which uses a holistic approach. Such an approach necessarily considers habitat supply in a long-term context, i.e., 100-300 years.

Elsewhere in Eastern Canada, in Ontario and Quebec, marten habitat may also become a contentious issue. However, those provinces are large and time remains to assess habitat supply. The opportunity exists to enable integrated management to work to the benefit of species, such as marten, which achieve highest densities in mature and over-mature forest. However, for corrective action to be effective there will inevitably be tradeoffs and costs associated with protection and maintenance of marten habitat. Further, the spatial and temporal scales of planning must be appropriate to the problem. For example, 20 year timber management harvesting plans are not suitable at either scale. Consideration will also have to be given to strict trapping regulations in regenerating habitats where marten exist in low numbers and are particularly vulnerable to trapping (Thompson, in prep.).

The analogy between marten and spotted owls is valid to the extent that they are both species which do best in old forest stands. In situations where the species are imperiled, forest management planning must have as its major objective

the protection and development of habitat to maintain the species. Public pressure on governments in the United States has succeeded in making spotted owl habitat a paramount consideration within the forest planning process. As yet in the east, no such symbol exists despite data to suggest that concern is clearly warranted.

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