



Ecology of American Marten in an intensively managed forest in northwestern New Brunswick

Highlights

- American Marten require stands of dense cover and access to dead wood to fulfill habitat requirements. Intensively managed stands such as conifer plantations may provide adequate cover, but lack sufficient dead wood for the needs of this carnivorous mammal.
- A case study conducted in New Brunswick showed that individual marten avoided landscapes where recent clear-cuts and young (i.e. less than 20 years old) conifer plantations cover a large proportion of the surface area. Population density was higher in areas covered by plantations older than 20 years, compared to areas covered by younger plantations. Breeding success and survival of females seems to be related to the relative proportion of coniferous stands in their habitat.
- Conifer plantations can contribute to the maintenance of marten populations in intensively managed forests when they reach more than 20 years old, as long as stands containing large amount of dead wood are maintained and interspersed in the landscape.
- Marten population density will likely reach higher levels if plantations cover less than 50% and stands containing large amount of dead wood cover more than 30% of surface area in 35-50 km² landscapes.

Intensive silviculture is an important part of forest management on public and private lands in New Brunswick. Fibre productivity is increased by planting and repeated thinning. Consequently, managed stands typically lack dead wood, which is known to be an essential part of the habitat of many animal species, such as the American Marten (*Martes americana*). The species is known to be sensitive to some logging practices such as clear-cuts, but the long term influence of intensive silviculture on population dynamics and behaviour of marten is not well documented. Studying marten ecology in an intensively managed forest could thus provide insights on effective ways to integrate fibre and wildlife management.

Marten use snags as maternal dens during summer and coarse woody debris during winter to hunt small mammals and to escape both predators and cold weather. Marten populations reach their



A marten released after being captured during the study. 119 specimens were captured (81 males, 38 females) between 2001 and 2006. Photo by C. Samson.

highest density in landscapes dominated by large tracts of old coniferous forests and significant decline in populations generally occurs where early-successional stands, such as recent clear cuts, cover more than 20% of the landscape. Coniferous plantations can provide adequate canopy cover but not enough dead wood to fulfill the habitat requirements of marten. The objective of the case study was thus to determine whether the scarcity of dead wood in plantations could be a limiting factor for marten in an intensively managed landscape, and have an influence on population dynamics and behavioural ecology.

Case study

The study was conducted between 2001-2006 in four sites located in the Black Brook District (BBD) industrial private land owned by J.D. Irving, Limited located in northwestern New Brunswick (Figure 1). Each site differs according to the age (less than 20 years old vs. more than 20 years old) and proportion

of surface area (35% to 51%) covered by plantations. The sampling periods varied from 2 to 6 years.

Body mass, age structure, and population density were estimated from live trapping during fall. In 2003-2004, 26 martens (13 females and 13 males) were equipped with radio-collars to evaluate their habitat preferences. Pregnancy rate and litter size were determined by the presence of embryos in uterus of martens harvested by trappers in BBD and in the surrounding Wildlife Management Zones (WMZ).

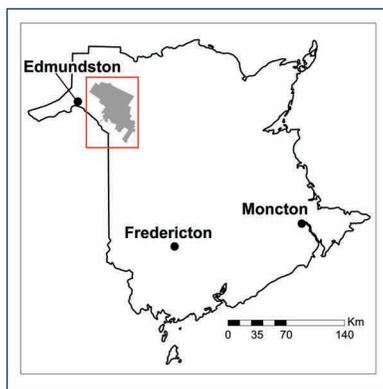
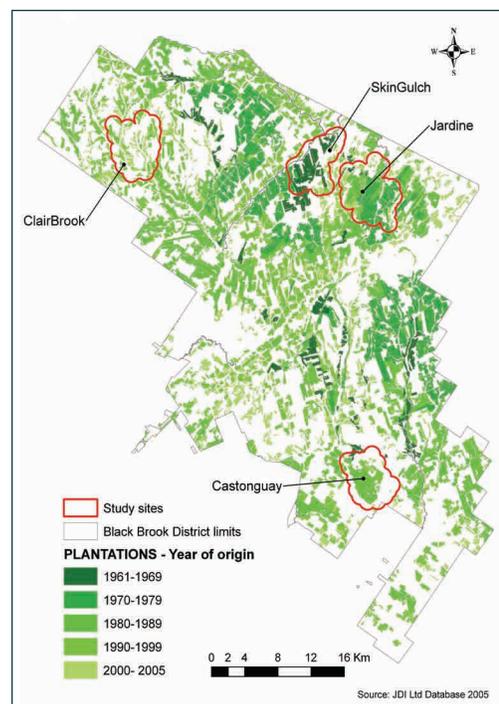


Figure 1. Location of the study area in New Brunswick.



Results

Habitat preferences

Martens generally avoided landscape where open areas, such as recent clear cuts and relatively young (less than 20 years old) plantations, and deciduous stands were more abundant. They also spent a relatively lower proportion of their time in these cover types within their home range either during summer or winter. It was also noted some preference for mature conifer stands within their home range. The avoidance of open areas and deciduous stands has been reported in various studies and has been interpreted as reluctance by marten to expose themselves to predators and to cold weather during winter. The preference for mature stands may be related to the large amount of dead wood found in this cover type. Plantations older than 20 years were neither avoided nor preferred by marten.

Marten population density in relation to age of plantation

Population density in study sites where plantations were older than 20 years was higher than density from other sites where plantations were less than 20 years old. Also, in the sites where plantations were

older than 20 years, population density was higher in the site where mature stands were more abundant. Various authors reported that population density of marten usually declines when more than 20% of the landscape is covered by early-successional stands, such as recent clear cuts and young plantations. Although comparisons with density estimates from other studies must always be made with caution due to methodological differences, the densities we measured in the various sites are within the range estimates obtained in industrial forests of Ontario and Maine. Higher population densities are usually reported in unmanaged boreal forests.

Female productivity and age structure and male body mass relative to habitat quality

Pregnancy rate of females aged at least 2 years was higher in the BBD compared to surrounding WMZ. Average litter size measured in the BBD was similar to litter size measured in the surrounding territory. Age structure of females was generally older in BBD compared to WMZ, which could indicate better survival condition related to habitat quality. However, it could also be related to a different harvest pressure by trappers. The higher productivity and apparent survival in the BBD may be related to the higher proportion of coniferous stands, mostly due to the presence of plantations, compared to WMZ (Figure 2).

In the two study sites where plantations were older than 20 years, the body mass of captured males was generally higher in the site where plantations covered a lower proportion and where mature stands were more abundant. Better physical condition is usually related to the habitat quality, indicating relatively good access to essential resources such as food and denning sites.

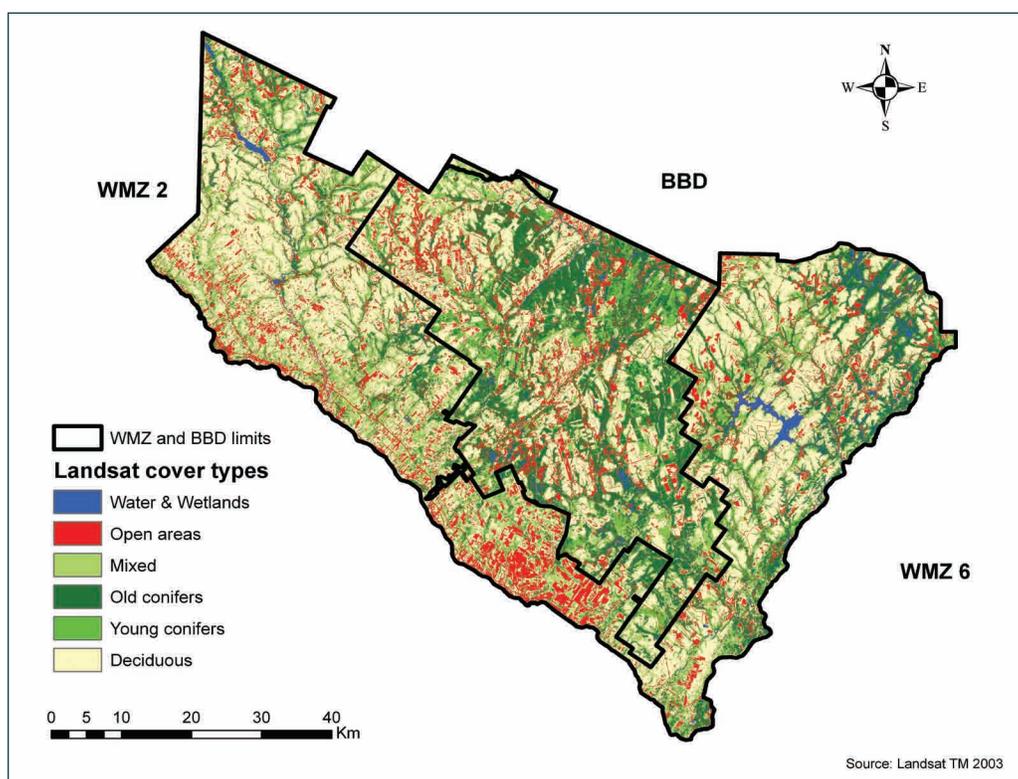


Figure 2. Cover types found in the Black Brook District compared to the surrounding Wildlife Management Zones 2 and 6.

Conclusions

The scarcity of dead wood in plantations did not seem to be a strong limiting factor for the marten population in our study area. Marten avoided open areas, which included mainly plantations aged less than 20 years old. However, this behaviour is likely more related to the absence of an adequate tree cover



rather than to the lack of dead wood. Population density of marten seem to increase when plantations reach 20 years old, and habitat condition seems to be better when old plantations are interspersed with stands that provide large amounts of dead wood. Female productivity was higher in the BBD compared to the surrounding WMZ, and this result may be a consequence of the higher prevalence of coniferous stands (mostly plantations) in the BBD.

Further reading

Andruskiw, M., J.M. Fryxell, I.D. Thompson and J.A. Baker. 2008. *Habitat-mediated variation in predation risk by the American Marten*. *Ecol.* 89, 2273–2280.

Chapin, T.G., D.J. Harrison and D.D. Katnik. 1998. *Influence of landscape pattern on habitat use by American Marten in an industrial forest*. *Cons. Bio.* 12, 1327-1337.

Harrison, D.J., A.K. Fuller and G. Proulx. 2004. *Martens and Fishers (Martes) in Human Altered Environments: An International Perspective*. Springer, New York, New York.

Payer, D.C. and D.J. Harrison. 1999. *Influences of timber harvesting and trapping on habitat selection and demographic characteristics of marten*. Final contract report for Maine Department of Inland Fisheries and Wildlife, University of Maine, Orono.

Payer, D.C. and D.J. Harrison. 2003. *Influence of forest structure on habitat use by American Marten in an industrial forest*. *For. Ecol. Manage.* 179, 145-156.

Written by: Claude Samson¹, Pascale Forget, Isabelle Laurion, Anne-Marie Pelletier and François Villeneuve
Faculté de Foresterie, Université de Moncton, Nouveau Brunswick, Canada

¹Corresponding author : Service de la conservation des écosystèmes, Agence Parcs Canada, 3 Passage du Chien d'Or, C.P. 6060, Haute-Ville, Québec (Québec) G1R 4V7; claudio.samson@pc.gc.ca

The views, conclusions and recommendations contained in this publication are those of the authors and should not be construed as endorsement by the Sustainable Forest Management Network.

For more information on the SFM Network Research Note series and other publications, visit our website at <http://sfmnetwork.ca> or contact the Sustainable Forest Management Network University of Alberta, Edmonton, AB. Tel.: 780-492-6659. Email: info@sfmnetwork.ca

Coordinating editor: C. Solano-Rivera
Graphics & Layout: K. Kopra

© SFM Network 2010

ISSN 1715-0981

Management Implications

- Plantations can contribute to the maintenance of a marten population in an intensively managed forest when trees reach more than 20 years of age, as long as a certain level of stands that contains large amounts of dead wood are maintained and interspersed in the landscape.
- Based on the results of the case study, population density will likely reach higher levels if plantations cover less than 50% and stands containing large amount of dead wood cover more than 30% of surface area in 35-50 km² landscapes. However, marten populations in other parts of Canada and North America may respond differently due to variation in landscape composition, productivity, and prey availability.