

**Enhanced Forest Productivity Science Program - Round 2  
Full Project Proposal (Revised to reflect deferral of funding to 2007/08)**

**Characterizing marten natal den sites in managed forests**

Background and Relevance to Program Themes

The Class Environmental assessment for Timber Management on Crown Lands in Ontario (1994) identified marten as a provincially featured species and required the development and implementation of management guidelines for the species. The *Forest Management Guidelines for the Provision of Marten Habitat* (Watt et al. 1996) were developed and implemented in 1996 and require the retention of significant areas of mature and over-mature conifer-dominated forests within each forest management unit.

Martens preferentially use older forest stands with significant conifer composition, large trees and complex structural conditions near the ground (Bowman and Robitaille 1997; Payer and Harrison 2003; 2004) - current habitat models (including Holloway et al. (2004)) used in Ontario assume that required structural conditions are not present in previously harvested stands until those forest stands have experienced sufficient mortality to accumulate coarse woody debris. These models are reasonably good at classifying forest stands based on suitability for marten by using age and stand composition as surrogates for structural elements like coarse woody debris (Bowman and Robitaille 2005).

Marten habitat, and habitat for other wildlife species is located in the same forest stands that contribute to the industrial wood supply. Concerns with wood supply are driving forest companies to look for ways to maintain the flow of fibre to the mill. If future forest management practices promote harvesting while maintaining old growth structural characteristics, managed stands may provide important marten habitat and contribute to core areas, which relates directly to the Enhanced Forest Productivity, Theme 1. Silviculture and Harvesting – enhanced utilization. The retention of stand components that are critical to denning success (beyond actual den sites/structures) will ensure forest management is not detrimental to marten reproduction.

This will address the effectiveness of the current guidelines (Watt et al. 1996) and their applicability should forest management techniques change (e.g. the implementation of partial harvest techniques in the boreal forest of northeastern Ontario). Applicability (or need for changes) of the current guidelines will provide valuable insight into marten habitat requirements in the development of Landscape, Stand, and Site Guides. Forest companies are interested in knowing if stands that are managed using partial harvesting techniques will contribute to marten habitat requirements. Site-specific requirements can be incorporated into the development of the Stand and Site Guides, addressing definition (d) of Enhanced Forest Productivity

– clarify the nature and amount of forest cover required to protect non-timber forest values associated with harvesting.

Various studies have evaluated the structures that are used for den sites and general characteristics of the stands within which these dens are found. Studies have also assessed specific characteristics of stands in areas used by marten (Bowman and Robitaille 1997; Payer and Harrison 2003; 2004) but have not focused specifically on den sites. Although we know that marten may require older forest with complex structure (Bowman and Robitaille 1997; Buskirk and Powell 1994; Payer and Harrison 2004), we do not know the range of stand structure, composition, stocking, and canopy closure within which marten will still reproduce in the boreal forest. Minimum stand-level habitat requirements have been estimated for the northeastern United States (Payer and Harrison 2003; 2004) but these assumptions have not been assessed in the boreal forest.

Alternative harvesting strategies could be developed and employed to retain physical structures in managed stands and enhanced inventory procedures could be developed to detect physical structures in existing managed stands if critical habitat conditions were defined. Fuller and Harrison (2005) studied habitat selection by martens in partially harvested stands in Maine but did not investigate areas in the vicinity of natal or maternal dens. Harvesting while maintaining habitat for marten may help mitigate wood supply constraints which is directly relevant to Theme 4. Economic and Social Implications. The project compliments existing radio telemetry studies and leverages the existing investment in marten habitat studies by using existing radio-collared martens.

### Project Design and Methodologies

We will test the hypothesis that there are more suitable marten den sites in older forests or forests that have the structural characteristics of older forests, than in forest stands without these characteristics. The following methods will be used in an attempt to either accept or reject the null hypothesis, that there is no difference in the abundance of suitable marten den sites in old forests, stands with the characteristics of old forests, or stands without these characteristics.

Approximately 10-12 radio-collared adult female martens are present in the study area being used by Thompson (NRCan-CFS) and Fryxell (University of Guelph) in the Gordon Cosens Forest near Kapuskasing, Ontario.

Existing home range information will be used to focus telemetry activities during the pre-denning period (approximately 01 April to 15 April) to investigate where movements of females within their home ranges are concentrated. Movements of females with home ranges with abundant old forest, or structurally old forest, may be more frequent as they investigate potential den sites. On the other hand, movements of females with home ranges that lack older forest or structurally old forest, may be infrequent and concentrated

in those areas where older forest is present, if more suitable den sites are available in older forest or forest stands with the structural characteristics of older forest.

Natal den site locations will then be identified by radio-tracking adult females. Up to 10 natal dens and 20 maternal dens will be identified. Total number of sites will depend on productivity of female martens in spring 2007. Successfully testing our hypothesis may not be possible if too few (or none) of the radio-collared, adult female martens in the study area, attempt to give birth (and thus use natal/maternal dens) in the spring of 2007.

Sites will be marked in the field with flagging tape and steel pins if the site permits. A brief description of the den site (including specific den structure, e.g. snag, hollow Ce log, etc.) and a precise GPS location (NAD 83) and way points to the nearest year-round access will be also be recorded.

Identified den sites will be revisited later in the summer of 2007 and characteristics of each site/structure and its immediate surroundings (i.e. BAF 2 prism sweep) will be measured and recorded. All trees greater than 10 cm, dbh will be tallied by species and dbh (Grosenbaugh 1952). Height of the dominant canopy and any secondary canopy (e.g. layering) will be determined, as will the average age of a representative sample of the trees counted in the prism sweep. Canopy closure will be estimated and volume of coarse woody debris will be determined by field crews. Standard mensurational techniques and methodology previously applied by Fryxell and Thompson, and OMNR Growth and Yield crews will be used whenever possible.

Similar measurements will be taken at a series of random plots located within the same stands as den sites were located as well as plots located in forest stands with similar age and species composition, known to be in home ranges of the marten whose den sites were identified. These sites will be spread between each of three treatments in the Kapuskasing study area:

- (a) 30-40 year old harvest areas with no post-harvest silviculture;
- (b) 30-40 year old harvest areas with post-harvest silviculture (some site preparation, planting, some tending);
- (c) old-growth (i.e. unharvested) stands.

Sample size of these control sites will be 20-30 plots per treatment area.

A comparison of the characteristics of known den sites and the random sites will show any significant features that are causing martens to select for particular sites. If our hypothesis is correct, a comparison of den sites versus randomly selected sites will show greater similarity in home ranges with older forest, than will the same comparison of den sites versus randomly selected sites in home ranges that are located in second-growth stands, or in stands without the structural characteristics of older forests.

### Incremental Value of Research

This project complements ongoing marten research in the boreal forest of northern Ontario. Dr. John Fryxell (University of Guelph) and Dr. Ian Thompson (Great Lakes Forestry Centre, Canadian Forest Service) have been studying martens at locations near Ear Falls since 2000 and near Kapuskasing since 2003.

Work in these areas has focused on many aspects of marten ecology at the landscape and stand scales, including predator-prey relationships, genetics, behaviour, home range characteristics, dispersal, and habitat use, among others. They have investigated habitat use at the scales identified above, but have not focused on denning, den sites, or the adjacent habitat.

Our research will look at an interesting component of marten ecology and habitat use and will add value to the larger marten research project while taking advantage of the knowledge of the researchers on this larger project, their data, infrastructure, and equipment.

### Project Team

**Mr. Stephen Mills, Forest Wildlife Habitat Specialist, Northeast Science and Information Section, Ontario Ministry of Natural Resources – Project Leader.** Mr. Mills is currently involved in research and extension work related to wildlife habitat associations and the effects of forest management in the boreal forest of northeastern Ontario. He is currently co-leading a project on “The importance of marten cores to trapper harvests”, investigating the relationship between habitat supply and harvest by trappers. He has worked on various wildlife and forestry surveys, including residual tree retention surveys, and has extensive experience working with forest management practitioners as both an area biologist with OMNR and as a planning biologist with Tembec.

**Project Biologist and Field Technician (To be determined), Northeast Science and Information Section, Ontario Ministry of Natural Resources.** The project team will be supplemented with a project biologist and field technician, to be determined upon approval of this proposal.

### Product Advisors and Partners

**Dr. Ian Thompson, Research Scientist, Great Lakes Forestry Centre, Canadian Forest Service – Project Advisor/Partner.** Dr. Thompson has been involved in much of the marten research that has occurred in Ontario. His Ph.D. from Queen’s University was entitled “Diet choice, hunting behavior, activity patterns, and ecological energetics of marten in natural and logged areas”. That research project produced 10 publications. He has worked in the boreal forest near Manitouwadge, Ear Falls, and most recently,

Kapuskasing while investigating various aspects of marten ecology. In conjunction with Dr. John Fryxell (University of Guelph), Dr. Thompson provides extensive background information and data on the study area in this proposal.

**Mr. Al Stinson, Forest Research Operations Manager, Forestry Research Partnership – Project Partner.** Mr. Stinson is currently the Forest Research Operations Co-ordinator for Tembec's forestry R&D program. His background includes: extensive operational experience preparing and implementing silvicultural prescriptions; participation on numerous forest management planning teams; preparation of silvicultural training programs such as the provincial tree marking certification course; participation on research project teams providing operational input, and project coordination and guidance; and participation on teams preparing provincial level guides.

**Dr. Jim Baker, Science Business Co-ordinator, Ontario Ministry of Natural Resources – Project Advisor.** Dr. Baker is currently a partner in most of the current research on martens in Ontario. He is a co-author of the Ontario marten habitat guidelines.

**Mr. Robert Watt, Science Co-ordinator, Northeast Science and Information Section, Ontario Ministry of Natural Resources – Project Advisor.** Mr. Watt has done habitat-modeling work with martens in New Brunswick and Ontario. He has co-ordinated co-operative research projects on martens, forest birds, small mammals, and landscape ecology in northeastern Ontario. He is the senior author of the Ontario marten habitat guidelines.

#### Technology and Knowledge Transfer

A NESI Technical Report documenting the project will be prepared and posted as a PDF on the NESI Section website. Any required reports or presentations to the Forestry Futures Committee will be based on the NESI Technical Report.

A presentation will be developed and delivered to appropriate audiences including the forest industry, regional planning groups, guideline development teams and other resource management practitioners.

A NESI Technical Note will be developed and distributed, highlighting the key findings of the study and how they might be incorporated into management prescriptions.

If appropriate, an article will be prepared for submission to a peer-reviewed journal.

## Leverage and Partnerships

The Canadian Forest Service (NRCan-CFS) and the University of Guelph have been conducting marten research in both northwestern and northeastern Ontario for several years. Work in the Kapuskasing study area has been ongoing since 2003. Key contributions to this proposal include access to previous home range and radio-tracking data and radio frequencies of collared martens in the study area. Field work mentioned in this proposal would not be possible without the knowledge of staff and researchers working on the larger marten project as well as access to the equipment and accommodations at the field station in the Gordon Cosens Forest. Because of the integration of research dollars, expertise, and support of both the University of Guelph and the Canadian Forest Service, only the CFS is shown as a contributing partner in this proposal. We would like to acknowledge that contributions by both organizations and their researchers are critical to the success of this project and will be fully recognized in project reports and presentations.

Details of in-kind contributions as associated dollar values are shown in Table 1.

Table 1. Details regarding in-kind contributions of project partners, including a description of each contribution and associated dollar value.

| <b>Expenditure</b> | <b>Forest Co-op Partner</b> | <b>In-kind (\$ 000's)</b> | <b>Details of Contribution</b>   |
|--------------------|-----------------------------|---------------------------|--|
| <b>YEAR 1</b>      |                             |                           |  |
| Salaries           | NRCan – CFS                 | 4.0                       | Field support (intermittent, as required) for duration of field component; advice on analysis and interpretation |
|                    | OMNR                        | 6.0                       | 2-4 weeks field work; field co-ordination; project analysis and reporting  |
|                    | FRP/Tembec                  | 2.0                       | 2 weeks FRI and map prep; harvest history  |
| Equipment          | NRCan – CFS                 | 2.0                       | Use of ATV/snowmobile, trailer, various field equipment  |
|                    | OMNR                        | 2.0                       | Use of ATV/snowmobile, various field equipment   |
| Supplies           | NRCan – CFS                 | 5.0                       | 10-12 radio-collared marten, maps, telemetry locations   |
|                    | OMNR                        | 1.0                       | Disk/server space, paper   |
|                    | FRP/Tembec                  | 3.5                       | Disk/server space, paper   |
| Tech. Transfer     | OMNR                        | 1.0                       | Website updates, report preparation/materials  |
|                    | FRP/Tembec                  | 0.5                       |  |
| Travel             | NRCan – CFS                 | 4.0                       | CFS vehicle, fuel, expenses, field accommodations  |
|                    | OMNR                        | 2.0                       | OMNR vehicle, fuel, expenses   |
| <b>TOTAL</b>       |                             | <b>38.0</b>               |  |

Although the financial contributions of forest industry partners in this proposal are not great, their in-kind support and leverage from the larger marten research projects that are ongoing at this location are of great benefit. Funding for this comprehensive marten research has come from many sources, including provincial and federal government agencies, university partners, and the forest industry. Funds in excess of \$500,000 have been granted to the comprehensive, ongoing research, which has produced numerous graduate theses and research papers (published and in press).

## Project Management and Financial Plan

Stephen Mills will be both the principal investigator and project manager for this proposed research. Contact information is as follows:

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Other project team members and advisors will be involved in this project in various capacities, with roles outlined in Table 2.

Table 2. Roles and contributions of team members and advisors, including affiliations.

| <b>Affiliation</b>   | <b>Contribution</b>   | <b>Contact(s)</b>   |
|----------------------|---|---|
| OMNR – NESI          | -project coordination and facilitation of field work<br>-field equipment and supplies<br>-data management and statistical analysis<br>-lead reporting and technology transfer                 | Stephen Mills<br><br>Project Biologist (To be determined) |
| OMNR – NESI and ARDB | -provide advice on design and analysis  | Robert Watt , Jim Baker                                   |
| NRCan – CFS          | -provide advice on design and analysis<br>-provide data on collared marten, including location data, den sites<br>-contribute to field work, provide field support, equipment, accommodations | Ian Thompson<br><br>Phil Wiebe                            |
| FRP/Tembec           | -liaise with local company officials to facilitate road maintenance and access to study area; obtain harvest data and maps<br>-assist with technology transfer                                | Al Stinson  |

### *Schedule/Timelines*

The anticipated duration of this project is one year, from 01 April 2007 to 31 March 2008. The project will be comprised of three separate components as described below:

**Telemetry field component** will occur from 01 April 2007 to 30 June 2007 or until adult female marten and young of the year are no longer reliant on maternal den sites

**Mensuration field component** will occur between 15 July 2007 and 31 August 2007; duration of this component will be dependent on total number of den sites located during the telemetry phase

**Data analysis and development of the technical report** and other knowledge transfer products will occur between 01 September 2007 and 31 March 2008. Submission and acceptance of a manuscript to an appropriate peer-reviewed journal may occur after this date, and will depend on the denning success of female martens and the timelines of the journal.

The total budget for this one-year project is \$ 61,000. Funding requested from EFPSP is \$ 25,000 for the project. For financial details see Appendix C for financial Template “A” – Multiyear and Partner Funding and Template “B” – Total Project Costs and Partner Contributions.

### Other Funding

Funding has not been requested from any other program or organization beyond those identified earlier in this proposal, namely the Canadian Forest Service, Ontario Ministry of Natural Resources, Forestry Research Partnership/Tembec and the EFPSP.

### Potential External Reviewers

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