Forest Ecosystem Science Co-operative Inc.

Forest Co-op "Northern Goshawk Habitat Project"

FINAL REPORT

Living Legacy Trust
(LLT Project No. 07-034)

April 16, 2004

Forest Ecosystem Science Co-operative Inc.

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Introduction

The Forest Ecosystem Science Co-operative Inc. (Forest Co-op) is an incorporated not-for-profit co-operative partnering industry, business, government, research institutes, and other organizations/institutions concerned with forest ecosystems. Our organization is committed to supporting the development and provision of scientific and technical knowledge that will contribute to the implementation of the best ecosystem management practices possible and thus ensure the environmentally sustainable development of renewable resources in the forest ecosystem.

The Forest Co-op "Northern Goshawk Habitat Project" is an excellent example of partners working towards the acquisition of important scientific data on wildlife, namely the northern goshawk, to help facilitate better resource management.

The northern goshawk (*Accipiter gentilis*) is a large, forest-dwelling raptor that is widely but sparsely distributed in the province (Weir 1987). In Ontario, the nests of all raptors are protected by law under the Fish and Wildlife Conservation Act. Goshawk nests are protected further through the application of forest management guidelines (James 1984, Szuba and Naylor 1998). These guidelines require an Area of Concern (AOC) of about 8 hectares to be defined around each active nest and no activity is permitted there while the nest is occupied.

Although goshawk nests are relatively large, their sub-canopy position in the forest interior makes them much more difficult to find than eagle or osprey nests which can be inventoried from the air. The Ontario Ministry of Natural Resources (OMNR) does not conduct regular surveys for goshawk nests, although both OMNR and the forest industry are becoming aware of these nests and more of them are being found during the course of operations. Most goshawk nests found in the Great Lakes-St. Lawrence (GLSL) forest are located before harvesting by tree-markers. However, tree marking is not utilized routinely in the boreal forest. As a result, goshawk nests in the boreal are often discovered during the course of harvesting operations. This means the AOCs may be functionally much smaller than the guidelines suggest, potential non-compliance issues may arise, the nests may be serious impediments to approved forestry operations that are underway, and an unexpected reduction in wood supply can occur. A spatial habitat supply model (HSM) that could locate areas on the landscape with the highest potential for use by nesting goshawks would be of value for forest management planning and implementation.

Also, the effectiveness of Ontario's habitat guidelines must be tested. Research from western North America suggests that goshawks are sensitive to forest management activities (Reynolds et al. 1992, Crocker-Bedford 1990) and that protection of individual nests by buffer zones alone may not mitigate impacts (Crocker-Bedford 1990).

In addition to the legal requirements for protection of its nest (above), the goshawk has significant value as an indicator of sustainable forest management. OMNR has listed the goshawk as a locally featured species on Crown land in some parts of Ontario, and has identified it as a candidate indicator of forest sustainability (McLaren 1998). Many of the key words used in conservation biology can be applied to the goshawk. For example, it is a top predator, and a healthy population of goshawks is likely to indicate a healthy population of its prey. Many environmentalists view the goshawk as a 'good' or 'the best' indicator of 'old growth forest'. Goshawks have large home ranges (570 - 3,500 ha), and may be area-sensitive and birds of the forest interior (Crocker - Bedford 1990, Squires and Reynolds 1997). The goshawk may be a keystone species because its old nests are used by other raptors including red-tailed hawks and great-horned owls, as well as red-shouldered hawks and great grey owls which are both listed as 'vulnerable' by OMNR. Finally, populations of goshawks across North America may be declining (Erdman et al. 1998, Crocker - Bedford 1990). Locating and describing nest-sites is an important first step in monitoring this species.

Research is needed to clarify goshawk habitat requirements. Little work on goshawk habitat has been conducted in eastern North America and none, prior to this study, had been conducted in Ontario (Kirk 1995). Differences in forest types and forest harvesting systems between areas where a majority of research has taken place (western North America) and Ontario make it difficult to transfer information for local management. Also, although OMNR's non-spatial habitat suitability models support the idea that goshawks prefer mature and old forest for nesting (D'Eon and Watt 1994; Bellhouse and Naylor 1997), goshawks are known to hunt primarily for hares and grouse, which are more abundant in younger forest. Possibly it is the juxtaposition of patches of old and young forest that determines habitat quality for goshawks. How much habitat is needed and what its characteristics should be are not known.

A use-availability study with spatial components would answer these questions. The work can be used to refine OMNR's non-spatial habitat suitability models (ie. D'Eon and Watt 1994, Bellhouse and Naylor 1997), and to predict either, spatially or non-spatially, the long-term supply of habitat on the landscape (ie. habitat supply analysis).

This final report summarizes the 1-year study results of the Forest Ecosystem Science Co-operative Inc. (Forest Co-op) "Northern Goshawk Habitat Project" led by Peter Bush MSc.F, PhD Candidate, The University of Western Ontario (lead researcher / project leader). In addition, it describes databases under development and explains how the data will be used to develop a spatial habitat supply model for goshawks.

Project Overview

Overall, the Forest Co-op "Northern Goshawk Habitat Project" had a very successful field season. The project team searched over 200 km^2 of forest, visited over 100 historical nesting areas, and completed over 60 km of road surveys. In total, 62 goshawk nest-sites were located and assessed over three forest regions (Boreal, GLSL and Deciduous) in Ontario (Figure 1). Detailed habitat data were collected at 38 of these nest-sites. Nest occupancy was monitored at 58 of these nest-sites. This sample size is relatively large when compared to other raptor and goshawk studies (Speiser and Bosakowski 1989 n=22; Penteriani and Faivre 1997, n=12; Daw and Destefano 2001 n= 22; Finn et al. 2002 n=30). Databases for both areas searched and occupancy are in the development stages.

The project completed the two key objectives required by March 31, 2004 in locating a large number of nesting sites, and describing the vegetation characteristics at multiple scales around nest-sites. As planned, the data will be used in statistical and spatial analysis for the review of OMNR's current non-spatial habitat suitability models, for the testing of current habitat guidelines, and for the development of a new spatial habitat suitability model for goshawks.

The project had good involvement from all the project partners in the field as well as in the design, data acquisition, and data analysis. There has been effective knowledge and technology transfer, including media interviews, provincial and international conferences, presentations, and a high level of participation by partners and volunteers in locating and monitoring goshawk nests.

Figure 1: Area of occurrence of Goshawk Nest-sites in the Boreal and GLSL forests.

Data Collection

GLSL Forest Study Region

A list of historical nesting areas was compiled from existing OMNR, industry (Domtar Inc.), and Ontario Breeding Bird databases. Historical nesting-areas were thoroughly surveyed for all goshawk nests. Distinguishing goshawk nests from nests of other species was done using Szuba and Naylor's (1998) guide to forest raptor nests. Tape-recorded goshawk calls were played in areas to attract goshawks to help locate nests (Kennedy and Stahlacker 1993; Watson et al. 1999). Surveys were conducted to find nests to verify activity in April, June, July, and August 2003. Surveys were not performed during the incubation period (May) due to the bird's lower vocal response rate (Kennedy and Stahlecker 1993; Hautala pers. comm.).

There were 40 nest-sites within the GLSL forest in the area-of-the-undertaking (AOU). An additional 8 nest-sites were located just outside the AOU (south and east) (i.e. Peterborough, Coldwater, Ottawa), but still within Rowe's (1972) definition of GLSL.

Although the initial research phase concluded March 31, 2004, the lead researcher will continue to monitor and collect information for one more field season on all of these GLSL goshawk nest-sites (i.e. 48 nests) as part of his Ph.D. research. In addition, new goshawk nest-sites will also be located in summer 2004 by searching suitable habitat with historic use by goshawks and potential sites reported by participants of the Ontario Breeding Bird Atlas, forest workers, and members of the general public. The plan is to increase the GLSL sample of nests from 48 to 60.

Boreal Forest Study Region

The project used a systematic searching technique to find nest-sites in the boreal forest region. Approximately 100 forest resource inventory (FRI) map sheets (each 100 km^2) represent the area of Spanish Forest. Random selection was done on map sheet numbers using a random numbers table. Ten map sheets were selected. Each map sheet was then divided into four-5x5 km (25 km^2) for a total of 40 study areas. The orientation of transect lines in the study-sites were either north-south or east-west and were chosen to avoid crossing large bodies of water. Transects were spaced 500 m apart. The science team broadcasted tape-recorded goshawk calls every 400 m along the transect (Watson et al. 1999). A portable megaphone (Radio Shack Powerhorn 32-2038A) and a Sony CD player with micro-headphones attached to the megaphone microphone were used as a broadcasting system. This broadcast system was the same configuration as the system tested and used successfully by Keith Hautala, Lakehead University. This system had sufficient volume for humans to hear the broadcasted calls at least 350 m away in the forest (as tested by project field staff). The project completed systematic searching of 9 of the 25-km^2 study areas from three 100 km^2 map-sheets (Figure 2). Although study areas were not completely covered, the project surveyed a tremendous amount of land, over 200 km of transects. Road surveys were also conducted in the Spanish Forest, in an attempt to increase the number of goshawks found. Road surveys used the same survey protocols as transects, stopping every 400 m and the broadcasting of tape-recorded goshawk calls after the truck engine had been turned off for 2 minutes. A total of 62 km of road surveys was completed.

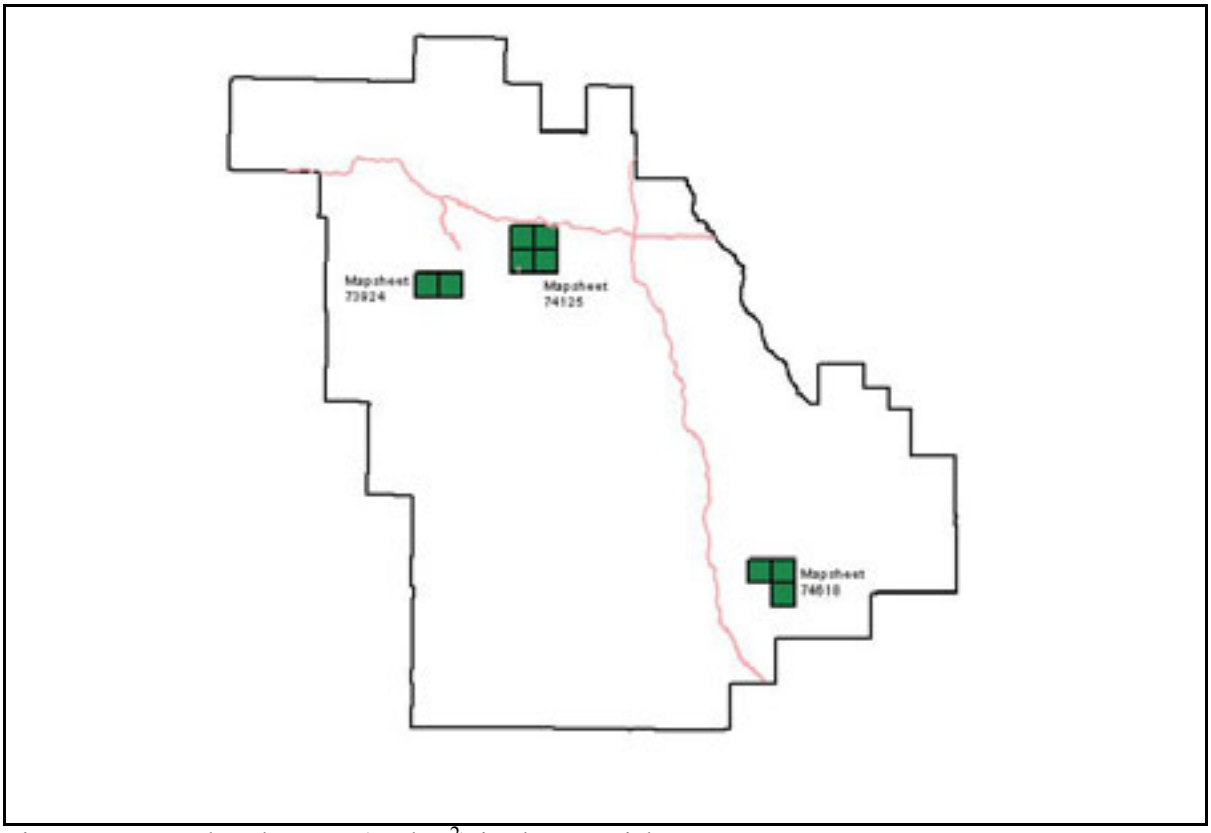

Figure 2: Completed Areas (25 km^2) in the Spanish Forest

Why the Transect Method Did Not Work

The transect method had been tested in Alberta by Keith Hautala, Lakehead University and achieved some success. Unfortunately, the project had limited success with the systematic transect surveys in the boreal forest region of Ontario. The project found one occupied goshawk nest with the systematic searching; two additional goshawk nests were located with opportunistic searching of historical nesting areas. The lead researcher attributed the low number of nests located by systematic surveys to two factors discussed below.

Problems with the survey protocol - The time required to complete transects over difficult terrain was underestimated by the project leader. A more reasonable estimate would have been 6-7 working days per 25 km^2 area. The numbers of days that broadcasting could not be completed because of rain and wind was also underestimated. The project tested the effectiveness of broadcasting goshawk calls on windy days. Adults from an active nest responded up to 450 m away on two no wind days, but did not respond to calls 150-200 m away on two windy days (25 km or greater wind speed). The project was also not able to commence surveys in April as planned due to logistic problems (road access in April, students not able to work until May, locating accommodations, etc.). Although this project employed the same transect survey protocol as Keith Hautala in Alberta, he did not randomly select his transect locations. Keith targeted older forested stands and ran transects only through these areas. Therefore, in the Forest Co-op project, the crews likely spent more time searching in younger (unsuitable) stands. In addition to younger stands being very unlikely to have goshawk nests, they are also more difficult to traverse (i.e. take longer to walk through). Due to the low success rate, the project leader, in discussion with the science team partners, decided to shift the resources being expended in the boreal forest to the GLSL forest at the end of July. As a result of all of these factors only 9 of the anticipated 40 sites were surveyed.

Low goshawk numbers - The numbers of goshawks in this area appear to be lower than expected. It is difficult from this study to know why numbers are low. The project assumed a home range size of 20-40 km^2 (based on the closest study in Pennsylvania (Kimmel and Yahner 1994). However, goshawks in the boreal may have much larger home ranges than expected. In Alaska, goshawks had summer home ranges from 63-189 km^2 for males and 108-1,114 km^2 for females. The lower than expected number of goshawks could be a function of low prey abundance during the survey year, in particular, snowshoe hares. Doyle and Smith (1994) found 40 pairs of goshawks in a 400 km^2 area in 1990 when snowshoe numbers peaked and only one pair in the same area in 1992 when the snowshoe hare population crashed. The project has not able to confirm the abundance of snowshoe hares or where they may be within their population cycle. The project is currently seeking a more definitive answer to the question of snowshoe hare abundance in Ontario's boreal forest by querying a number of biologists in the region. Although they were not able to complete as many 25 km^2 study areas as planned, the project science team feel that even with additional time and more students, the number of goshawk nests found would still be low (at most an increase from n=1 to n= 4 or 5). Therefore, future systematic searching for goshawks on random transect lines with broadcasted goshawk calls in the boreal forest is not recommended.

Deciduous Forest Study Region

Although this region was initially not included in the proposal, it was added because these nest-sites are located in areas with reduced forest coverage and increased disturbances (human development). These sites may be helpful to identify minimum forest-area requirements or minimum tolerable distances to disturbances for the development of the spatial habitat supply model for the GLSL. Analysis of the deciduous forest nest-sites will only be conducted at the landscape-scale. The project located 11 nest-sites in the deciduous forest region. Naturalists working on the Breeding Bird Survey reported all deciduous forest nest-sites.

Nest-site and Stand-scale Habitat Measures

Data on key habitat characteristics were collected during August – October 2003 at 38 of the nest-sites in the boreal and GLSL. Due to logistics and time constraints, no vegetation data were collected at the other 24 nest-sites. Habitat data were collected in the field at 3 scales: 1) the nest tree, 2) the immediate nest site, and 3) the general nesting area. Information collected on nest trees included: tree species, diameter breast height (dbh), position of nest in tree, tree height, nest height, nest width, nest depth, and tree condition. Characteristics of habitat at the nest site and nesting area were collected using fixed area plots (0.04 ha) and prism plots (BAF 2) situated at the nest tree and 50 m north, south, east and west of the nest tree. Ground cover, shrub cover, sapling, and canopy closure were measured in the fixed area plots. Densities of living and dead trees (by species and size class) were measured on the prism plots. Canopy closure was measured using a spherical densiometer. Habitat data have been compiled in a database. The project leader, in his on-going PhD research, will be making statistical comparisons between active and inactive nest-sites and between sites with high and low reproductive success. In the timeframe of this project, initial analysis was done on the vegetation data from the 38 nest-sites.

To fulfill the longer-term objectives of the work started under this project (which is beyond the timeframe of the Living Legacy Trust), and to ensure the most robust analysis possible, additional data will be collected to supplement the database that was created through the Forest Co-op "Northern Goshawk Habitat Project". Below we describe the analyses that will be performed on the enlarged database.

Macro- and Landscape-scale Habitat Measures

The project leader is in the process of conducting analysis at the macro- and landscape-scale as part of his PhD research. Initially, this project referred to the work as focusing on the landscape-scale, but the terms macro and landscape seem to better fit with other literature. The following sections describe the work that will build on the results of this project for the PhD thesis. The project leader will be conducting this work and expects it to be completed by July 2005.

Goshawk habitat at the macro-scale

In this research, macro-scale is distinguished from the landscape-scale. Habitat measurement at the macro-scale involves the collection of data within multiple circular areas around nest-sites ranging from 12-170 ha. Area represented at the macro-scale is considered the core nesting area or post-fledging area (Finn et al. 2002) for goshawks. As a continuation of this Forest Co-op project, important habitat characteristics at the macro-scale will be measured from digital forest resources inventory (FRI) maps. The FRI maps that will be used had been derived from air-photo interpretation at the scale of 1:10000 or 1:20000. The FRI database is constantly updated by the sustainable forest licenses (SFLs) and the OMNR. Thus, the SFLs will provide the latest depletion data (harvest data & natural disturbance events) to enable updating the FRI. The FRI database includes information on the land cover type, roads (separate layer), and watercourses. Forest landcover information includes dominant tree species, tree species composition by deciles, stand age, stand height, stand stocking, and site class.

Nest tree locations, recorded with a GPS in the field, will be converted to an ArcGIS point coverage (ESRI 2002). Buffer polygons around the nest point locations will be intersected with FRI database which includes the forest stand characteristics. The buffer polygons will be completed for the following radii centred on the nest-tree point: 195 m (12 ha), 276 m (24 ha), 400 m (50 ha), 618 m (120 ha), 735m (170 ha) (Daw and DeStefano 2001) (Figure 3). Area calculations of land cover types and length measures to various features will be calculated from the resulting buffer polygons. Reclassification of FRI polygons will be completed in order to allow calculations of macro-scale variables.

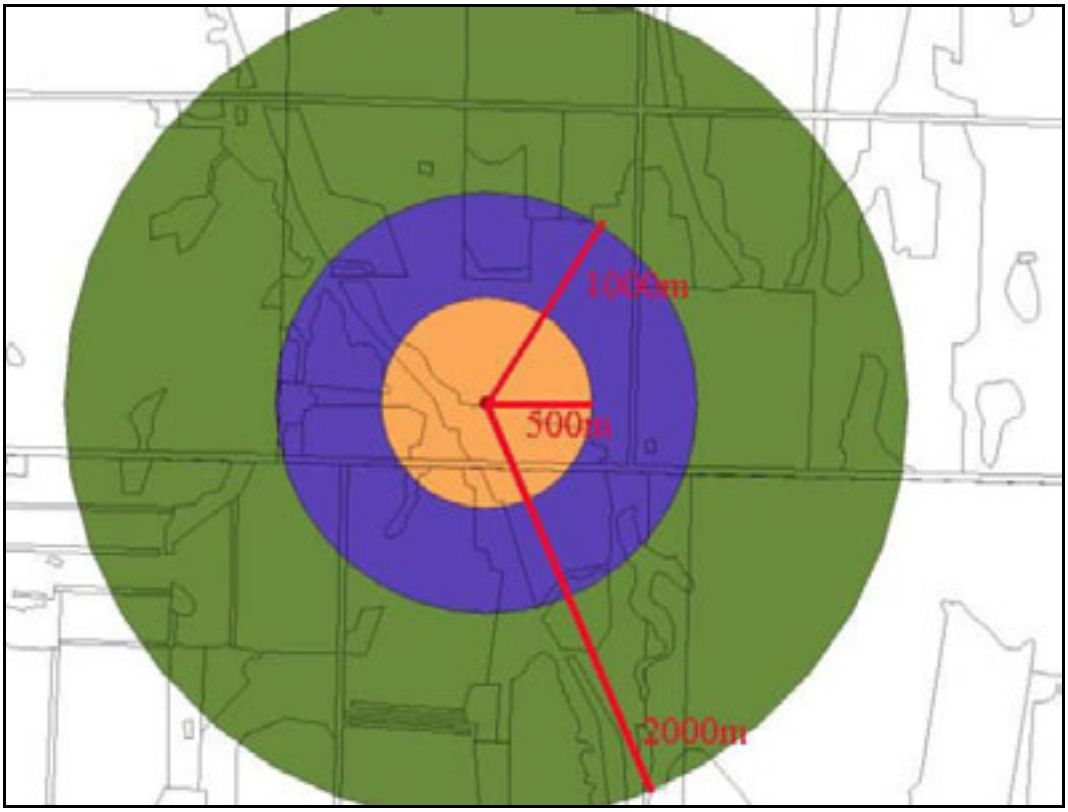

Figure 3: Example Buffer Polygons around Nest.

Goshawk habitat at the landscape-scale

Landscape-scale analysis will differ from the macro-scale analysis in that it will examine the configuration as well as the composition of lands around nests – and will look at a larger area around nests (up to 3500 ha vs. 170 ha for the macro scale). Landscape-scale analysis will also utilize the digital FRI maps used in the macro-scale analysis. In addition, the landscape-scale analysis will utilize the software program FRAGSTATS to quantify the composition and configuration habitat around nests. FRAGSTATS will provide measures of categorical map patterns, or what is otherwise referred to as landscape metrics (McGarigal and Marks 1995). Landscape metrics are algorithms that quantify specific spatial characteristics of patches, classes of patches, or entire landscape mosaics (Gustafson 1998).

Because the scale used can influence the results obtained in landscape analysis, this project will examine multiple scales in the analysis of habitat relationships: 200 ha (Daw and DeStefano 2001, Cocker-Bedford 1990); 500 and 1000 ha (possible small home range, Squires and Reynolds 1997); 2,500 and 3500ha (possible home range, Squires and Reynolds 1997, Boal et al. 2003).

Because of the importance of how patches are classified in landscape analysis, the research will incorporate a number of approaches. Typically, landscape pattern studies have focused on the general classification of patches as forest and non-forest (Trzcinski et al. 1999) or mature forest vs. immature forest (McGarigal and McComb 1995). This research will also classify FRI polygons into similarly broad forest classes. Another approach to landscape analysis involves investigating the composition and configuration of patches of preferred or suitable habitat. To accomplish this, the FRI polygons will be classified as not used or preferred according to OMNR's non-spatial habitat suitability model (Naylor et al. 1997; Bush 1999). This will reveal the pattern of habitats of different quality on the landscape. An alternative non-spatial habitat suitability model from Alberta will also be examined for comparison purposes.

Forest Co-op Project – Other species data

Another goal of the Forest Co-op "Northern Goshawk Habitat Project" was to contribute bird data that were collected to other bird monitoring programs. All bird species observed were reported to the Breeding Bird Atlas (BBA) (project partner- Canadian Wildlife Service). BBA reports were completed for 7 (10km x10km) squares, completed 12 point-counts, and reported over 60 species. ROM nest-record cards have been completed for all active raptor stick-nests found.

Habitat Suitability Models and Guideline Evaluation – Future Analyses

In the process of developing a new spatial habitat suitability model, an evaluation of OMNR's existing (literature based) non-spatial habitat model will be completed. The question will be "How does the existing non-spatial habitat model perform at predicting the locations of study sites (goshawk nest-sites) found during this project?" Based on the evaluation of the existing OMNR models and the results obtained from the nest-site and stand-scale analyses, a new non-spatial habitat model will be developed. A GIS-based spatial habitat supply model will incorporate aspects of the non-spatial model and results from the macro and landscape-scale analyses.

The effectiveness of the current guidelines will be evaluated by comparing nest occupancy and productivity at nest sites with timber harvest that was modified following the guidelines and nest sites without timber harvest (controls). Potential modifications to guidelines will be inferred from thresholds revealed by the multi-scale habitat analyses. For example, at stand scales the relationship between occupancy/ productivity and basal area will be modeled. At the macro/landscape scale the relationship between occupancy/productivity and the proximity and amount of timber harvest will be modeled.

Project Partnership and Science Team

Forest Ecosystem Science Co-operative Inc. (Forest Co-op) Partnership

The Forest Co-op partners who financially supported this project include:
Domtar Inc., Ontario Ministry of Natural Resources, Tembec Inc. and Weyerhaeuser Canada Ltd.
In addition, Forest Co-op members were also active in providing other project assistance, such as:

- Domtar, Inc., through the work of Dr. Kandyd Szuba, Dave Kean, Doug Peerla and Joanne Freeman, supported the project through the design, implementation, monitoring and locating of nest-sites in the boreal and GLSL and by providing FRI data.
- Weyerhaeuser, Inc. provided the project with one nesting site in the Chapleau area. One of their staff, Al Tremblay, joined the students in the field to learn more about the project and to assist with the technology transfer.
- OMNR supported the project through the time and travel of Dr. Brian Naylor. Dr. Naylor provided assistance on project design, data collection standards, historical nest locations and also spent a significant amount of time in the field monitoring and locating nests and assisting with the vegetation data collection.
- Ron Black and Jan McDonnell, OMNR Parry Sound District, contributed a number of active and historical sites to the project.
- Tania Baker, Pembroke District, OMNR, provided the project with a highly organized and complete set of historical nesting-sites. As a result, the project had more nest-sites in Pembroke District than any other district.

- Dianne Miller, General Manager, Forest Co-op, provided financial and administration management services to the project.

Field Staff

The Forest Co-op "Northern Goshawk Habitat Project" employed a total of 6 students over the spring and summer. The lead researcher/ project leader, Peter Bush, coordinated the field data collection. Jeremy St. Onge, a graduate of Nipissing University, served as the Boreal Study Region student supervisor. Three of the student field assistants, Joe Crowley, Robin Perron, and Oriana Prokony, were students from Nipissing University. A fourth student field assistant, Jessica Hopkins, was a student from Sir Sanford Fleming College. The hiring of these students fulfilled a project goal of hiring a majority of the students from the Area of the Undertaking. The project was also able to secure two volunteer field assistants for portions of the summer.

Other Project Partners

The University of Western Ontario has been one of the lead partners in this project through the work of Peter Bush and Dr. Micha Pazner. The University has provided financial support for Peter Bush. Dr. Pazner contributed his time as well as office space, computer, GIS software, and GPS units for Peter Bush.

Dalhousie University contributed to the project, through in-kind contributions of the time of Dr. Peter Duinker. Dr. Duinker provided advice on the project design and data collection methods. Peter also traveled to both the Spanish Forest and GLSL on July 02, 2003 to assist in the field surveys and to meet with other project partners.

The Canadian Wildlife Service (CWS), through the efforts of Mike Cadman and Nicole Kopysh and the large volunteer effort by naturalists, supported the project through the documentation of historical goshawk nesting sites. Twenty-one of the 62 nest-sites were located as a result of the efforts at CWS and their network of volunteers. In turn the project provided the Breeding Bird Atlas of Ontario with a record of all active goshawk and other raptor nests. Although it is hard to estimate their contribution in terms of time, their work was an important component of this project.

Ontario Parks also supported the project through the time of Norm Quinn and staff, in the processing of permit applications, access keys, and historical nest-sites in Algonquin Park.

Algonquin Forestry Authority provided GIS data in support of the project.

A number of SFL staff also supported the project with the donation of GIS data including: Westwind Forest Stewardship Inc. (Barry Davidson); Nipissing Forest Resource Management Inc. (Norm Cottam); Bancroft-Minden Forest Company (Mike Keenan and Peter Nitschke); and Ottawa Valley Forest (Jeff Leavey).

Knowledge and Technology Transfer

Short-term Knowledge and Technology Transfer

Despite the project's short duration (1 year), it was successful in achieving quality knowledge and technology transfer.

1) Partners from Forest Ecosystem Science Co-operative (Forest Co-op), Canadian Wildlife Service, Dalhousie University, and the University of Western Ontario were involved in project design to ensure that relevant questions were asked and relevant information and technology will be produced.
2) Partners were involved in locating and monitoring nests and facilitated the transfer of survey and monitoring expertise.
3) Overall, partners and their members' increased awareness of the research project. Over 50 people were directly involved in the project in one way or another (providing nest-site, GIS data, etc., project design, etc.)
4) Forest Co-op partners were informed of the project plan and details with a presentation at the Forest Ecosystem Science Co-operative Annual General Meeting on May 27, 2003 in Sault Ste. Marie. Preliminary findings will be presented at the Forest Ecosystem Science Co-operative Annual General Meeting on May 5, 2004 in Toronto, Ontario and suggestions for analysis and interpretation will be solicited.
5) Dr. Brian Naylor and Dr. Peter Duinker gave presentations to project staff and guests at the Canadian Ecology Centre July 2, 2003.
6) Mr. Bush attended a Birds of Prey Conference on May 30, 2003 in Haliburton, and had a poster on the project promoting volunteers to report goshawk nest sightings to the project.
7) Mr. Bush presented the project and some initial findings at one-national/international conference and one regional conference.
   Bush, P.G*., M. Pazner, and P.N. Duinker. 2004 " Forest characteristics of northern goshawk (*Accipiter gentilis*) nesting areas in Central Ontario." CONFOR'04 Dalhousie University, Halifax, NS. February 5-7.*
   Bush, P.G*. and M. Pazner. 2003. "Nesting Area Preferences of Northern Goshawks in Central Ontario". Canadian Association of Geographers –Ontario (CAGONT), Kingston, ON. Oct. 24-25.*
8) The project also received some media exposure from CBC Radio (Thunder Bay), the Thunder Bay Chronicle (newspaper), and a profile on Peter Bush and his research in the Canadian Association of Geographers Newsletter Vol.11 No.1.
9) The project has had a web site hosted at the University of Western Ontario since March 2003, advertising the project, project details, and information on goshawks.

Long-term Knowledge and Technology Transfer

Long-term tech transfer is still in progress and includes continuation of the project initial goals and objectives.

In the spring and summer of 2004, the project leader will be conducting a second field season to monitor the existing nests, find additional nests in the GLSL, and to collect additional vegetation data (including some of the sites where sampling was not completed in 2003) to supplement the database that was created through the Forest Co-op "Northern Goshawk Habitat Project". Project

partners have also applied for additional funding, to support the second field season of the Forest Co-op "Northern Goshawk Habitat Project", through the OMNR ProGrid funding competition.

The project leader will continue to conduct statistical analysis, landscape analysis, development of the habitat supply models, recommendations on OMNR guidelines, and the publication of results in a refereed journal, using the data obtained through the Forest Co-op "Northern Goshawk Habitat Project". This work will constitute a portion of the project leader's Ph.D. dissertation, with an anticipated completion in December 2005. Other project partners will be actively supporting Peter's progress with this work through continued assistance in locating and monitoring nests (e.g. Tania Baker, OMNR, has already located two new nest-sites), continued support in securing up-dated GIS FRI databases, providing feed-back on future semi-annual progress reports submitted by Peter Bush, and review of manuscripts prepared for journal publication.

Summary

The Forest Co-op is pleased to report that this multi-party partnership project, the Forest Co-op "Northern Goshawk Habitat Project", has been completed on time and on budget. The knowledge generated from this research provides important scientific data on wildlife, specifically the northern goshawk, to help facilitate better resource management.

The Forest Co-op and its many partners acknowledge, with gratitude, the outstanding work of the Forest Co-op "Northern Goshawk Habitat Project" lead researcher / project leader, Mr. Peter Bush, the significant efforts of the science team members, the partnering organizations and the many volunteers, and the support of Living Legacy Trust which, collectively, have contributed to the success of this initiative.

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