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Scientific And First Nation Perspectives Of Non-Timber Forest Products: A Case Study From The Shoal Lake Watershed, Northwestern Ontario

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Scientific And First Nation Perspectives Of Non-Timber Forest Products: A Case Study From The Shoal Lake Watershed, Northwestern Ontario

NCE-SFMN Project
Combining Scientific and First Nations' Knowledge for the Management and Harvest of Traditional and Commercial Non-Timber Forest Products

By

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ABSTRACT

This report provides a summary of initial findings from the project: Combining Scientific and First Nations' Knowledge for the Management and Harvest of Traditional and Commercial Non-Timber Forest Products (NTFPs). This report is divided into five sections. The first section provides an overview of the research project. Section 2 presents an overview of traditional ecological knowledge research undertaken on NTFPs. Section 3 turns to an examination of a scientific approach to inventorying NTFPs. Management applications and conclusions are addressed in sections 4 and 5 respectively.

Following Davidson-Hunt, Duchesne and Zasada (2001) the term non-timber forest products (NTFPs) is defined as those biological organisms, excluding timber, valued by humans for both consumptive and non-consumptive purposes found in various forms of forested landscapes. NTFPs moves the focus on forest management away from large industrial interests in forested landscapes and toward a consideration of the interests, values and activities of people who have largely been excluded from forestry research, planning and management.

The purpose of the research project between the Natural Resources Institute, University of Manitoba and Iskatewizaagegan #39 Independent First Nation was to develop a model for cooperative research between First Nation harvesters and scientific researchers. The research project included an interest in theory building regarding social-ecological systems and resilience. A practical consideration of the project was to discover how research partnerships could be established between scientific institutions and First Nation communities to increase the well-being of rural communities. The objectives of the research project were: (1) To develop a model of cooperative research between rural/First Nation communities and scientific researchers which builds upon the contributions of both science and local/indigenous knowledge towards multi-functional and biologically diverse landscapes; (2) Document the traditional ecological knowledge of botanical NTFPs and the perception of the forest in terms of disturbance, succession and forest patches; and, (3) Develop a rapid inventory methodology based upon the Ontario Ecological Classification which assesses NTFP distribution, abundance and quality.

The management implications of the research presented in this report suggest: (1) The importance of establishing protocols and agreements for the sharing of knowledge among First Nation peoples, managers and researchers; (2) the need to establish a common lexicon for the sharing of knowledge; (3) a requirement for more specification of First Nation values; and, (4) the development of community-based tools for assessing and communicating values such as rapid NTFP inventories. In conclusion, the research suggests a need to move away from incorporating or integrating knowledge systems toward working with First Nations to develop tools for communicating and implementing their visions for the land.

ACKNOWLEDGEMENTS

This work could not have been completed with the assistance of the Shoal Lake Resource Institute of Iskatewizaagegan #39 Independent First Nation (IIFN) and its members: Edward Mandamin; Phyllis Jack and Brennan Wapioke. Brennan Wapioke also worked on the project as community researcher and was integral to the completion of fieldwork and for translation during interviews and processing of interview transcripts. Many of the ideas in this paper emerged from conversations held with a number of elders of the community: the late Dan Green; Ella Dawn Greene; Robin Greene; Jimmy Redsky and Watler Redsky. The Chief and Council of IIFN also supported the project. Their participation was integral to the preparation of a research protocol and agreement and the review of research results during the course of the project. This included: Chief John Wapioke and Councilors Susan Adams, Dennis Hunter, Laverna Greene and Randy Paishk.

Colin Bowling and Bob White of the Kenora office of the Northwest Science and Technology Unit, Ontario Ministry of Natural Resource, Peter Uhlig of the Ontario Forest Research Institute, Luc Duchesne of the Canadian Forest Service, John Zasada of the United State Forest Service and Andrew Chapeskie of The Taiga Institute for Land, Culture and Economy all provided input into the design of the research. Peter Uhlig also provided access to data from the Ontario Ecological Land Classification. Colin Bowling and Bob White also provided support and training for field methods of the Ontario Ecological Land Classification. Peter Schaffer, Gerry Simmons and Ian Pyke of the OMNR Kenora District Office provided access to digital data of the Ontario Forest Resource Inventory, Northwest Ontario fire history data and air photos.

While we gratefully acknowledge the support of the aforementioned people we alone are responsible for any shortcomings found in this research document.

INTRODUCTION

This report provides a summary of initial findings from the project: Combining Scientific and First Nations' Knowledge for the Management and Harvest of Traditional and Commercial Non-Timber Forest Products (NTFPs). Further detail can be found on the results from year 1 of the research project in technical reports. The results from year 1 of Traditional Ecological Knowledge research can be found in the technical report written by Davidson-Hunt (2001). The results of a scientific inventory for NTFPs can be found in Ruta (2001). Data from the field season can be found in Davidson-Hunt and Ruta (2001). Final results from the research project will be available in the fall of 2002 in theses by Tracy Ruta and Iain Davidson-Hunt and future publications.

This report is divided into five sections. This section provides an overview of the research project. Section 2 presents an overview of traditional ecological knowledge research undertaken on NTFPs. Section 3 turns to an examination of a scientific approach to inventorying NTFPs. Management applications and conclusions are addressed in sections 4 and 5 respectively.

Following Davidson-Hunt, Duchesne and Zasada (2001) the term non-timber forest products (NTFPs) is defined as those biological organisms, excluding timber, valued by humans for both consumptive and non-consumptive purposes found in various forms of forested landscapes. NTFPs moves the focus on forest management away from large industrial interests in forested landscapes and toward a consideration of the interests, values and activities of people who have largely been excluded from forestry research, planning and management.

The Purpose of the Research Project

The purpose of the research project between the Natural Resources Institute, University of Manitoba and Iskatewizaagegan #39 Independent First Nation was to develop a model for cooperative research between First Nation harvesters and scientific researchers. The research project included an interest in theory building regarding social-ecological systems and resilience. A practical consideration of the project was to discover how research partnerships could be established between scientific institutions and First Nation communities to increase the well-being of rural communities. This would provide a concrete example of how the Federal and Provincial governments of Canada could move toward meeting their obligations under Article 8(j) of the Convention on Biodiversity. The Convention on Biodiversity, signed by Canada in 1992, required the signatories to incorporate the knowledge of indigenous and local communities in the sustainable use of biodiversity, equitable benefit sharing which results from such knowledge, and the promotion of customary uses of resources by indigenous and local communities (Higgins 1998).

Brief Background for the Research Project

One of the customary means of managing ecosystems by the Aboriginal people of North America was through the use of fire and other technologies (Blackburn and Anderson 1993; Boyd 1999; Cronon 1983; Lewis and Fergusen 1988; Pyne 1982). Through the use of such technologies Aboriginal peoples used their resources to meet their material and spiritual needs. The suppression of aboriginal technologies and practices, such as burning (Lewis and Fergusen 1988), by forest management agencies diminished the traditional and commercial potential of non-timber products of the boreal forests. However, in recent years, some ecosystem management practices, such as burning, have re-entered the toolbox of forest management agencies like the United States Forest Service (Berkes and Davidson-Hunt 2001; Christensen et al. 1996; Grumbine 1994).

One of the findings of ecosystem-based forest management is that fire, and other technologies, should be utilized as management tools to emulate natural disturbances. This reflects a broader conclusion of the international and inter-disciplinary research network, the Resilience Network, which suggests that disturbance and adaptive learning are integral components necessary for managing natural resources (Berkes and Folke 1998; 2001; Gunderson, Holling and Light 1995; Perrings, Mäler, Folke, Holling and Jansson 1995; Pinkerton 1998). The ecological knowledge of North America's Aboriginal peoples and the scientific community appear to be converging in suggesting that multi-functional and biologically diverse landscapes are linked to the incorporation of disturbance events into flexible and adaptive resource management systems (Berkes 1999; Trosper 1998).

The role of multi-functional and biologically diverse landscapes in creating flexible and adaptive rural livelihoods is receiving international attention (EFI 1998; FAO 1995; USDA 1997) but has been under-represented in the Canadian research on ecosystem-based forest management (Duchesne, Zasada and Davidson-Hunt 2000). A conference organized by the Canadian Forest Service, the United States Forest Service, the Manitoba Model Forest, the National Aboriginal Forestry Association, the Saskatchewan Department of Agriculture and the Taiga Institute was held in October, 1999 in an effort to increase our basic knowledge of the role played by non-timber forest products in rural livelihoods. It was found that many Aboriginal and other rural communities still draw upon a diversity of forest species for domestic and commercial purposes. It was suggested that such knowledge and products could provide a base upon which First Nations might build customary livelihood opportunities and contribute to rural development.

Due to the lack of knowledge about the local uses of diverse ecosystem products on the part of forest management agencies, non-timber forest products have yet to be incorporated into ecosystem-based forest management planning. At the same time there is an accelerating loss of knowledge about the traditional uses of forest diversity. While an ecological value is often imputed for natural disturbance and succession stages of forest dynamics there is no recognition of the linkage between these processes and the livelihoods of forest communities. This proposal has emerged from the discussion among scientific researchers and First Nation peoples in Canada and the United States to develop applied research proposals on non-timber forest products which builds upon both local and scientific knowledge in order to strengthen sustainable rural livelihoods.

Objectives of the Research Project

The objectives of the research project were:

1. To develop a model of cooperative research between rural/First Nation communities and scientific researchers which builds upon the contributions of both science and local/indigenous knowledge towards multi-functional and biologically diverse landscapes.

2. Document the traditional ecological knowledge of botanical NTFPs and the perception of the forest in terms of disturbance, succession and forest patches.

3. Develop a rapid inventory methodology based upon the Ontario Ecological Classification which assesses NTFP distribution, abundance and quality.

Ecological Resilience and Biodiversity

Biodiversity, the variety of earth's genes, species and landscapes, plays an important role in Holling's ecosystem resilience theory (Holling et al. 1995). Genetic and species diversity play both a role in the structure (physical architecture) and function (nutrient, carbon and energy cycles) of ecosystems. Biodiversity is not so important from a straight consideration of numbers, i.e. more is better, but due to the overlapping roles played by different genes and species within an ecosystem. This is similar to the diverse portfolio strategy of investors. However, ecosystems are not static but change over time. This idea has been captured by utilizing a model of an adaptive-renewal cycle which represents succession as a four phase cycle during which ecological time flows unevenly.

As summarized by Holling et al (1995), the progression in the ecosystem proceeds from the exploitation phase; slowly to conservation; very rapidly to release; rapidly to reorganization; and, to complete the cycle rapidly back to exploitation. During the slow sequence from exploitation to conservation, connectedness and stability increase and ecological capital such as nutrients and biomass slowly accumulate. The diversity of species thus changes not only across space but over time as different species emerge into an ecosystem during different stages of the adaptive-renewal cycle. Disturbance and change are attributes of an ecological system and not exceptions to a dominant state of stability and equilibrium. This understanding of ecosystems, biological diversity and the adaptive-renewal cycle have important implication for human's as they construct livelihoods based on ecosystem products and services.

Non-Timber Forest Products and Rural Livelihoods

Non-timber forest products (NTFPs) are those components of a forest ecosystem which have not been captured by equilibrium based forest inventories and economic models. This has begun to change with recent movements toward ecosystem-based forest management in Canada. This has led Marla Emery of the United States Forest Service (1998) to characterize NTFP harvesting activities as "invisible livelihoods" in her ground-breaking study of the non-timber forest products of Michigan's upper peninsula. This study focused on specifying the role of different categories of forest in terms of human livelihoods. This was done in two different ways:

(1) There are still people within rural/First Nation communities who remember, or practice, the harvesting of plant and animal species from the boreal forest. This research examined an example of the ways by which First Nation people categorized and utilized plants and forest habitats. An example of early successional communities was examined to address the importance of disturbance events in providing NTFP harvest areas. See Section 2.

(2) Non-timber forest products offer the potential of commercial use and have been increasing in importance in numerous regions of North America and the World. One of the reasons that non-timber forest products are seen as increasingly important is that they provide supplemental income, products and spiritual value for people in rural communities. In order to assess the opportunities and threats related to NTFP harvesting in First Nation territory it was necessary to create a rapid methodology to provide an estimation of NTFP distribution, abundance and quality. This methodology would allow First Nations to protect the customary use of NTFPs from outside commercial harvesting as well as assess commercial opportunities. See Section 3.

By undertaking research which examined NTFPs from an indigenous knowledge point of view, the research provided a means to reveal the relationship between rural/First Nation livelihoods and NTFPs. It revealed that First Nation knowledge of NTFPs and a rapid inventory methodology could allow for the inclusion of First Nation goals in forest management planning.

The Partners

The research is based on a partnership between the Natural Resources Institute at the University of Manitoba and Iskatewizaagegan #39 Independent First Nation. The Natural Resources Institute is an interdisciplinary research and graduate unit based at the University of Manitoba in Winnipeg, Manitoba. It undertakes interdisciplinary research to increase society's understanding of natural resources and their management and to train future resource managers in an interdisciplinary approach to resource management. Iskatewizaagegan #39 Independent First Nation (IIFN) is an Aniishinaabe community located on Shoal Lake which crosses the border of Ontario and Manitoba as shown in Figure 1. The shoal lake watershed is the source of drinking water for the City of Winnipeg. The First Nation considers that the emphasis on water quality by the OMNR has constrained their economic opportunities. IIFN has participated in a process to manage the Shoal Lake watershed. There has also been an interest to explore the linkages between natural resource management, conservation and economic development. IIFN consider themselves as a "traditional" community and place a strong emphasis on including elders in questions of resource management and economic development. The partnership was established to explore the potential of scientists and elders working together to ask and answer questions related to the sustainable use of the Shoal Lake watershed.

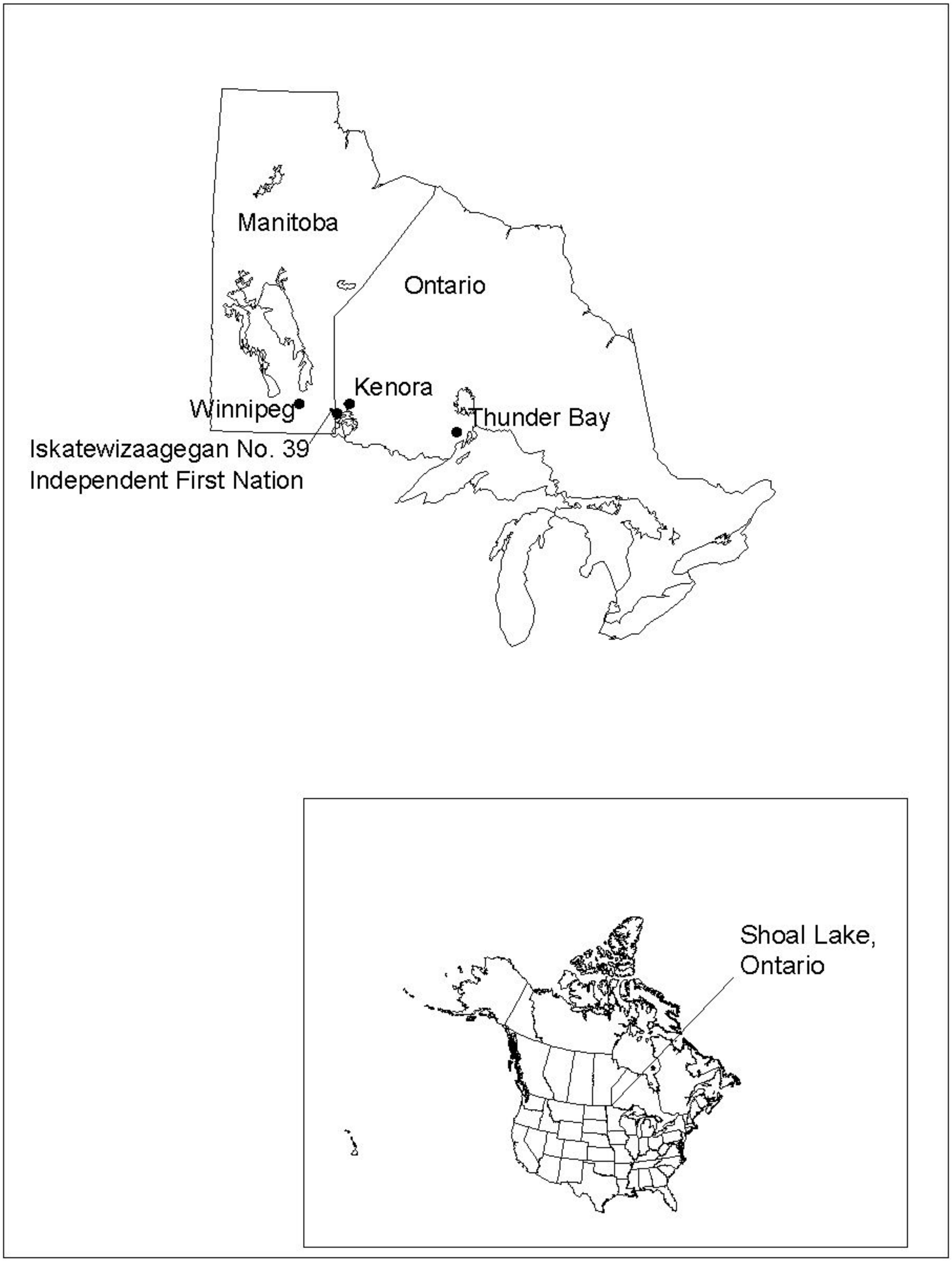


Figure 1. Location of Research

TRADITIONAL ECOLOGICAL KNOWLEDGE RESEARCH AND METHODOLOGY

> *A formidable barrier to research is the scientists' lack of credence in folk specialists. This manifests itself in a reluctance to allow the informant to lead the researcher along unfamiliar lines of logic and into areas of research that the native chooses. Scientists resist the loss of control of the questioning paradigm and fear leaving the base line of the "reality" that control signifies. Concerns about research time also inhibit emic analysis, since restraints on field stays often mean that researchers are reluctant to trade assured results from their project design for possible "finds" from informants.* (Posey 1998)

Purpose and Objectives

The purpose of the traditional ecological knowledge research was to examine processes of social-ecological resilience in the context of NTFPs. The research on social-ecological resilience focused on the use, knowledge, institutions and ecology of non-timber forest products for the Shoal Lake Watershed. The specific objectives of the research were to: (1) Develop a research project protocol; (2) Collect historic information on the plants utilized by Aniishinaabe people of Northwestern Ontario; (3) Document the Aniishinaabe names and uses of plants; (4) Record Elders' knowledge and perception of NTFP ecology with respect to forest patches and disturbance cycles; (5) Document a narrative of NTFP harvesting which emphasizes the process of social-ecological resilience. In this report results related to objectives 1, 3 and 4 are presented. Further results will be available in the Ph.D. dissertation by Davidson-Hunt.

Methods

The methodology utilized in the research was a combination of non-structured, qualitative interviews based upon thematic conversations, excursions to harvesting locations with elders to identify plants and plant associations with Aniishinaabe terms, and, archival research. The specific activities undertaken included:

1. Research team and First Nation jointly developed a cooperative research model and protocol.

2. Archival Research - Ethnographic, governmental, and archival documents were identified related to the historical use and management of NTFP by Aniishinaabe people in the region. Scientific reports and publications were also collected related to plant distribution, associations and commercial uses.

3. Research Team/Community workshops - A workshop was held with the First Nation prior to the beginning of year 1 field research. During the workshop the purpose and objectives of the research were presented and time was allowed for discussion, comment and suggestions for objectives to be included in the research. A research team was identified with members from Chief and council, the Shoal Lake Resource Institute, the NRI and community elders.

4. Selection of "apprentice" researcher and translator. A youth was selected by the research team to work with university researchers in the ecological and ethnobotanical field work. A community researcher was utilized in the research so that a youth from the community would be able to gain field work skills and learn about plants from community elders.

5. NTFP excursions - Elders took researchers to the field to find specific plants about which they wanted the researchers to learn in terms of Aniishinaabe names and uses. Specimens of the plants identified by elders were collected or photographs taken if the plant was commonly known. Conversations were also held with elders at this time about topics such as: whether the habitat in which the plant was found had an Aniishinaabe name; the specific ways in which certain plants should be harvested and the historic and contemporary harvesting of such plants.

6. Thematic conversations - Unstructured, qualitative interviews were also held in the elders' complex about the Aniishinaabe way of becoming "skilled" plant harvesters.

7. Disturbance site excursions – Sites were identified which were considered to be important blueberry (*Vaccinium* sp.) habitat. A plant list was created for each site and the occurance of *Vaccinium* sp. was noted. Elders accompanied the researchers to the site and conversations were held regarding the dynamics of blueberry harvesting sites. Topics such as fire, logging, soil types, history and harvest cycles were discussed.

8. Transcription and Translation of Interviews - All interviews and excursions were recorded on digital video or audio media. After the field season the community researcher and the university researcher went through the tapes to transcribe the names given for specific plant specimens or photographs. Transcriptions of English interviews were prepared as well as translations from Aniishinaabe to English for key texts. An index of materials collected during the field season was prepared.

9. Verification workshops. Workshops were held with elders and the steering committee at the end of field seasons in 2001 and 2002 to discuss the results of the research. The release and presentation of results were also discussed during these workshops.

Developing the Research Partnership Model

Theoretical Considerations

The model that we explored for cooperative research projects draws from the practical experiences of rapid and participatory rural appraisal and theoretical approaches to knowledge studies. A partnership model for cooperative research does not attempt to indicate specific forms or structures of the process. Rather, it provides a conceptual approach to think about the ontology and epistemology of the knowledge production processes. The specific partners and institutional models may vary from location to location. The specifics of the model will vary from place to place and time to time. However, the model reflects our position on knowledge as a dynamic, socially and culturally embedded process.

The intent of the model was to push our thinking toward a consideration of place-based knowledge production embedded in specific social, cultural and ecological systems. The objective of this approach, as shown in Figure 2 was to link experiential and Cartesian knowledge traditions in an adaptive learning process. This responds to the request by First Nations for increased transparency and accountability from research partners. The model does result in an increase in the transaction costs of research. However, it is only through such attempts that we may find a bridge across the chasm between place-based and universalistic knowledge traditions. A substantive result of our research project was the negotiation of a research protocol for the project.

Research Partners and Partnerships

An obvious, but often overlooked or ignored, prerequisite for successful partnerships is an interest on the part of both communities (scientific and local) in forming a research partnership. Ideally, this interest should transcend a specific interest in the resource and knowledge flows of the research project. However, researchers should pay attention to issues of equity regarding the immediate benefits of the partnership. The form of local interest can be quite variable and informal. At the same time, there is a need for a formal organization which can enter into a partnership for the purposes of signing agreements, archiving the products of the process, administering the research project and etc. Individuals committed to the process as “keepers” of the knowledge artefacts (reports, maps, lists, videos, audio tapes and etc.) and adaptive learners cannot be underestimated. Finally, a minimum level of trust must be in place before experiential knowledge holders and scientific researchers can work together on a research project. The history of the relationship between rural communities and research centres make it difficult to establish research partnerships without pre-existing social networks.

We were fortunate to work with a First Nation who had already participated in research projects with the Natural Resources Institute. In addition, three individuals from Iskatewizaagegan had a long history in undertaking research related to the Shoal Lake watershed. As the First Nation was engaged in a watershed management process this research project was considered as one component of that larger process.

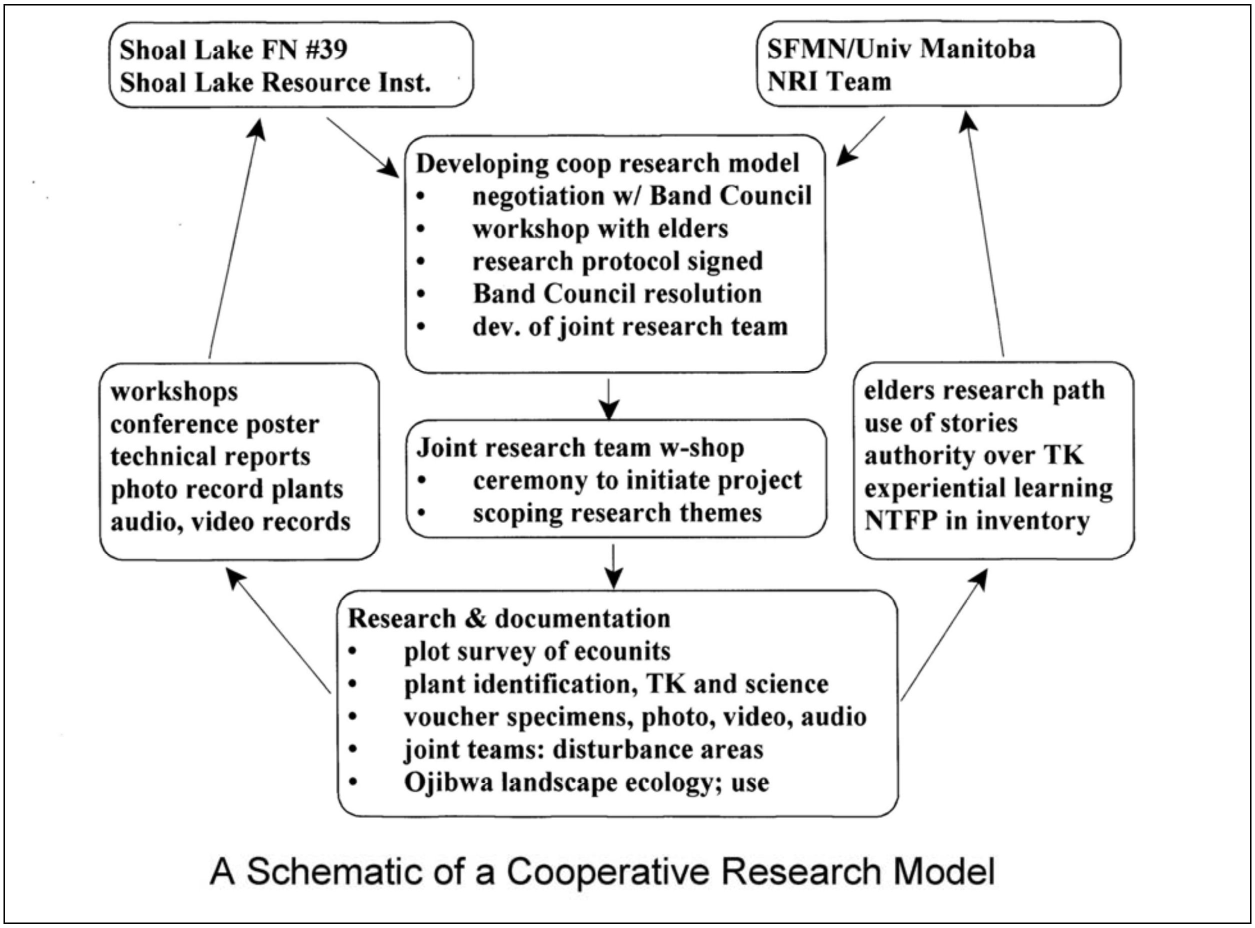


Figure 2. Research Model.

Negotiating the Research Protocol

The first step of formalizing the research partnership and negotiating the research protocol occurred through informal discussions with two members of the Shoal Lake Research Institute regarding non-timber forest products. Ed Mandamin, Phyllis Jack and Iain Davidson-Hunt had been involved in organizing a conference on non-timber forest products in Kenora in the fall of 1999. One outcome of this conference was the recognition that more research was required to understand the non-timber values of First Nations. However, it was also recognized that a methodology was needed which would allow those values to be related to categories of ecological land classifications as well as specific harvesting locations. Due to Ed and Phyllis's participation in land use mapping projects with elders, and forest management based on scientific forestry, they were interested in looking at these questions from both perspectives. These informal discussions took place over a three month period during the fall of 1999.

Once the goals, objectives and methodology of the research had been discussed the researchers from the Natural Resources Institute prepared a discussion paper describing the proposed research project in clear language. At this time, a letter was also submitted to the First Nation summarizing the interest of the Natural Resources Institute in undertaking the research project. This was presented to the First Nation council along with opportunity for questions and discussion. At this meeting a Band Council resolution and workshop agenda were approved which stated that the Natural Resources Institute and the First Nation would solicit funding. Shortly thereafter a workshop was held to discuss the content of the research protocol and the proposed theme of the research project. Elders were selected by the First Nation to participate in the research based on their knowledge about the forest and/or their ability to provide spiritual guidance for the project. The general items agreed upon for inclusion in the research protocol and agreement have been extracted and summarized for this document.

Duration of the Project

This item allows the two partners to negotiate a degree of comfort and security over the minimum and maximum time of the commitment. It is important from a researcher point of view as they have the commitment of the First Nation that they will be given permission to finish their research. From a First Nation point of view it provides the community with the ability to end the research process after a certain time period. It allows provides both parties an idea of each other's time commitment to the research process.

Preamble

The preamble puts down on paper why the research partnership is being negotiated. The preamble should articulate why both sides are interested in undertaking the research partnership.

Summary of the Research Project

A summary of the research project provides the boundaries on the topics that will be researched along with a description of the methodologies to be utilized.

Project Partners

It is important that both sides indicate who will be involved in the project as partners so that the community knows who may be active on the First Nation territory as well as present at meetings.

Research Team

A research team is identified who will undertake the research activities of the project.

Accountability

This section lays out a number of mechanisms by which the members of the research team will be accountable to their respective communities. The First Nation participants were accountable to the community through a band council. Researchers were accountable to the academic community through traditional academic mechanisms such as graduate committee and ethical statements.

Advisory Committee

An advisory committee was set up an in order to monitor the activities of the research team and the knowledge generated by the research project. The members of the advisory committee were, in our case, a representative of the First Nation council; elders; members of the Shoal Lake Resource Institute; and, members from the university. Members from the First Nation can also be asked to sit on student research committees and/or invited to meetings where the students present their research results. Specific problems arose which were not resolved by the research team. Special meetings of the advisory council were called to resolve such problems through consensus.

Review of Research Results

There were a number of mechanisms set up to provide for a review of the research project and its results. Research proposals were orally presented to the advisory committee. A written copy was also submitted to the members of the advisory committee so that consensus was reached on the specific content of the proposals. In addition, a number of workshops were structured into the research project in order to provide oral presentation of the research results to the advisory committee. Written results of the research project were also submitted to the advisory committee for review. These included student dissertations; reports; academic and popular publications and any other written material that released into the public domain. A consensus based approach was utilized to resolve disputes over interpretation of results before they are released into the public domain. It may be decided by the advisory committee that some results are too sensitive to be released. When interpretations over data differed, alternative interpretations and objections to the conclusions drawn were included in written documents released to the public. A two month review period is utilized for such objections to be raised and included in the written documentation.

The advisory committee ensured that due recognition was given to the participants in the written documentation of the project. When it was decided that people's names should not be utilized in the written documentation alias were utilized to protect research participants privacy. However, at times it was more appropriate to give due recognition to the information provided by research participants through the use of their names. The advisory committee also ensured that participants in the research were given a chance to review written documentation. This was especially important for documentation in which they provided information or in which they were identified as having provided specific information. Individuals were also provided with copies of photos in which they appear.

<u>Archiving of Knowledge Artefacts</u>

A copy of all written documentation (transcriptions of interviews; reports; publications), audio, video and photographic materials generated by the research project was provided to the community to be archived within the appropriate organization. It was also decided that it might be appropriate to safeguard copies of documentation at institutions with appropriate storage facilities. Although this was not undertaken it would have required negotiated agreements with such institutions.

<u>Sharing of Research Results</u>

The research results were made available to the First Nation community for other purposes. The research team also shared the results of their work for use in school curriculum and other forms of teaching about the topics of the research.

<u>Communication</u>

The research results were presented to the community in a manner which facilitated understanding the results during workshops and in written materials.

<u>Community Researcher</u>

Researchers worked with community researchers in a manner which provided the community researcher with an opportunity to learn field methods of research. The use of a community researcher during interviews allowed for the transmission of knowledge between elders and future generations.

Compensation

The advisory committee set a fair and equitable level of compensation for the community researcher and other participants in the research project through a process of consensus.

Informed Consent

Participants in the research process were made aware of the purposes of the research and how the information provided by the participant was to be used by research team. Any participant was free to withdraw from the research at any time with no penalty. Written consent was sought from elders although they consider verbal consent through participation in workshops to be more appropriate. Elders who chose to be involved in the research agreed to participate in interviews and on the advisory committee. Those who were not interested did not participate in the research. It became clear that the use of written informed consent was not applicable to the type of research being undertaken.

Sources of Funding

It was important to clarify who was providing financial support for the project as this influenced whether people chose to be involved in the research project. Attempts were also made to make First Nation participants aware of other funders and provide the ability for the First Nation to directly obtain their own sources of funding.

Summary

We discovered that the process of developing a research protocol through workshops, review of written documents and oral presentations became the negotiating arena out of which a final written document resulted. Trust, respect and partnerships were negotiated orally through the process. The signing of the final agreement signified that these conditions had already been established orally through the process. The protocol document was not so much a legal or ethical document but a symbol of the degree of trust established through the negotiation process. The process forced us to engage in a detailed process of communication in order to reach a common understanding of the research project and the use of the results.

Formally, the signing of a band council resolution signified the band administration's agreement with the research project. Informally, elders involved in the project indicated their agreement by attending a pipe ceremony and feast held to start the field component of the research. Further agreement by the elders was demonstrated by their willingness to show up for interviews. Those that chose not to become involved in the project chose not to attend interview sessions or trips to the bush.

The process of writing a research protocol may seem officious. The importance was found not in the written document, but the intercultural (Aboriginal / Euro - Canadian; Scientist / Practicioner; Botanist / Ethnoecologist; etc.) communication necessary to find themes of common interest the research project could address. If common themes and methods had not been found and which were mutually acceptable, the result would have led one of the parties to walk away from the negotiating process before a final protocol was established.

Plants

Table 1 presents the results of the research with elders to document plant names. Elders were reluctant to place too much emphasis on plant names as a sign of authoritative knowledge about plants. Elders insisted that authoritative knowledge holders were those who had learned plants in the Aniishinaabe way. The Aniishinaabe way included: (1) Development - accompanying parents, or other knowledgeable relatives, in the bush as a child, youth and young adult; (2) Calling - experiencing a calling through a vision or dreams regarding plants; (3) Mentorship – a person might work with a person with extensive knowledge of plants to learn over a period of time; and, (4) Ethics – show respect to knowledgeable people who would then show a person a specific plant for healing or other uses, taking only what you need and etc. The plants names are useful to establish a common lexicon for sharing knowledge. However, names are only authoritative in the context of the Aniishinaabe way of knowing. More detail regarding these results can be found in the technical report by Davidson-Hunt (2001) and forthcoming thesis.

TABLE 1. Iskatewizaagegan (Aniishinaabe) Generics Including Alternate Nomenclature and Folk Varieties

Iskatewizaagegan Generic **Alternate Nomenclature** **Folk varieties**	**Other Ojibway Generics**	**English Name**	**Latin Binomial**
Aajitaamowaano	Ajidamoowaanow	Foxtail Barley	*Hordeum jubatum* L.
Aajitaamowaano		Rusty Woodsia	*Woodsia ilvensis* (L.) R. Br.
Aasaakamig		'Moss'	Sphagnaceae + Dicranaceae + Hylocomiaceae + Hypnaceae + Brachytheciaceae
Agiimaatig	Aagimaak; Wiisagaak	Black Ash	*Fraxinus nigra* Marsh.
Agiimak			
Agwisiimaan		Pumpkin + Squash +Watermelon	*Cucurbita pepo* L. + *Citrullus colocynthis* (L.) Schrad.
Amikominaatig		Black Gooseberry / Bristly Black Currant	*Ribes lacustre* (Pers.) Poiret.
Aniib	Aniib	American Elm	*Ulmus americana* L.
Aniibiminaatig	Aniibimin	Highbush Cranberry	*Viburnum trilobum* Marsh.
Aniibimin			
Aniimoziitens		Little Prickly Pear Cactus	*Opuntia fragilis* (Nutt.) Haw.
Azaati	Azaadi (i)	Trembling Aspen	*Populus tremuloides* Michx.
Baabiigobag	Animikiibag	Poison Ivy	Rhus radicans L.
Gaagagiwaandag	Giizhigaandagizi / Ogaawalinzh	Common Juniper	*Juniperus comunis* L.
Gaagagiwaandagminan			
Gaagigebag	Gaagigebag	Pince's-pine ; Pipsissewa	*Chimaphila umbellata* (L.) Bart.
Gaatecaasiing	Aandegobagoons; Namepin; Namewashkoon	Canada Mint	*Mentha arvensis* L.
Giizhig	Giizhik; Gizhikens; Giizhikaandag	Eastern White Cedar	*Thuja occidentalis* L.
Giizhigaandag			

Ginebigowazhin		'Fern'	*Matteuccia* sp. + *Polypodium* sp. + other fern species.
Gitcheaniibiish		Ostrich Fern	*Matteuccia struthiopteris* (L.) Todaro.
Gitchegaamewashcon	Anaakan; Anaakanashk; (Gi)chigamiiwashk	Great Bulrush	*Schoenoplectus acutus* (Muhl. ex Bigelow) A. + D. L`ve
Gaazhoosh Kwenigwegozid Shingwaak	Apakwanagemag, Bapakwanagemag; Zhingobiins; Zhingwaak	Red Pine; Norway Pine	*Pinus resinosa* Ait.
Maananoos	Maananoons	Ironwood; Hop-Hornbeam	*Ostrya virginiana* (Mill.) K. Koch
Maandamin		Corn	*Zea mays* L.
Maanizati	Man'asa'di	Black Poplar	*Populus balsamifera* L.
Maanomin	Manoomin	Wild Rice	*Zizania aquatica* L. and *Z. palustris* L.
Maanominaatig			
Waabemaanomin		White Rice	
Mishtetimomaanomin		Oats	
Manitoominaatig		Red Baneberry and Blue-bead Lily	*Actaea rubra* (Ait.) Willd. and *Clintonia borealis* (Ait.)Raf.
Manitoomin			
Maanitoo o caatag	Wandkons' Abagwasĩ'gans	Water Hemlock	*Cicuta maculata* L.
Makominaatig		Wild Black Currant	*Ribes americanum* Miller
Makomin			
Makwaminaatig	Adjimag	Showy Mountain Ash	*Sorbus decora* (Sarg.) C.K. Schneid
Makwamin			
Mashkiigobag	Mashkiigobag; Mashkiikaang niibiish; Waabashkikiibag	Labrador Tea	*Ledum groenlandicum* Oeder
Mashkiigokamig		Sphagnum Moss	*Sphagnaceae* sp.
Mashkiigomin	Mashkiigiminagaawanzh; Mashkiigimin (-an)	Bog Cranberry	*Vaccinium oxycoccos* L.

Mashkiigwaatig	Mashkiigwaatig	Tamarack; Larch	*Larix laricina* (Du Roi) K. Koch
Mashkiigwandag			
Mazaanishk	Mazaan; Mazaanaatig	Stinging Nettle	*Urtica dioica* L.
Maazhii Miitigomizh		Poison Oak	?
Miin		Blueberry	
Miin		Low-bush Blueberry; Narrow-leaved Blueberry	*Vaccinium angustifolium* Ait.
Miinaatig			
Makatemiin		Black Blueberry	
Shaabwaatemiin		Transparent Blueberry	
Pingomiinaatig		Velvetleaf Blueberry; High-bush Blueberry	*Vaccinium myrtilloides* Michx.
Miishichiiminaatig	Waaboozojiibik; Micidji'minaga'wf	Skunk Currant	*Ribes glandulosum* Graver
Miishichiimin			
Miitigomish	Mitigomizh	Bur Oak	*Quercus macrocarpa* Michx.
Minaeg	Gaawaandag; Gaawaandagwaatig; Mina'ig; Wadab; Zesegaandag	White Spruce; Highland Spruce	*Picea glauca* (Moench) Voss
Minesiwaatig	Agin, (-iig); Mine'saga'wfnj	Scarlet Hawthorn	*Crataegus coccinea* L.
Miskominaatig	Miskominagaawanzh; Miskomin	Wild Red Raspberry	*Rubus idaeus* L. var. *strigosus* (Michx.) Maxim.
Miskomin			
Miskwabimag		Red Osier Dogwood	*Cornus sericea* L. syn. *C. stolonifera* Michx.
Mushkosii Wiingushk		Sweet Grass	*Hierochloe odorata* (L.) Beauv.
Nabaagshkoon		Water Sedge	*Carex aquatilis* Wahl.
Namepin	Namepin	Wild Ginger	*Asarum canadense* L.
Nayngaaminaatig	Sewa'komin	Sandcherry	*Prunus pumila* L.
Nayngaamin			
Niibaayaandag	Ne'bagandag	Canada Yew; Ground Hemlock	*Taxus canadensis* Marsh.

Obiiweshkgaanag	Apakway; Apakweshk; Apakweshkway; Nabagashk	Cattail	*Typha latifolia* L.
Obweminaatig	Bawa'iminaan; Gozigwaakomin	Pincherry	*Prunus pensylvanica* L.f.
Paweminaatig			
Oginii		Tomato	*Lycopersicon esculentum* Miller
Oginiiwaabigwunaatig		Prickly Rose	*Rosa acicularis* Lindley.
Oginiiwaabigwun			
Ogishkiibwaak	A'skibwan'	Jerusalem artichoke	*Helianthus tuberosus* L.
Okigaandag	Okikaandag	Jack Pine	*Pinus banksiana* Lamb.
Okigaandagoosag			
Okiitebagoon	Nbiish-waawaasgone; Oga'damfn; Odite'abfg	Small yellow pond-lily and White waterlily	*Nuphar variegatum* Engelm. and *Nymphaea tetragona* Georgi.
Opin		Potato	*Solanum tuberosum* L.
Oshkiizhigobag	Skiñgu-min	Dewberry	*Rubus pubescens* Raf.
Oshkiizhigomin			
Osisewayminaatig	asa/isaweminagaawanzh	Chokecherry	*Prunus virginiana* L. var. *virginiana*
Osisewaymin			
Oteiminabag	Ode'iminidjiibik; Ode'imin (-an);	Woodland Strawberry and Wild Strawberry	*Fragaria vesca* L. and *F. virginiana* Duchesne.
Oteimin			
Oteiminabik			
Ozhaabominaatig	Zhaaboomin (-ag); Zhaaboominagaawanzh	Northern Gooseberry; Bristly Wild Gooseberry	*Ribes oxyacanthoides* L.
Ozhaabomin			
Ozigwaakominaatig	Gozigwaakominagaawanzh; gozigwaakomin (-an); Ozagadigom	Saskatoon Berry	*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roemer. And *Amelanchier* sp.
Ozigwaakomin			
Ozhuskweto		Fungus	?

Paagesanaatig Paagesan	Bagesaanaatig (-oog)	Canada Plum Tree	*Prunus nigra* Ait.
Pagaaniimizh Pagaan	Bagaanimizh	Beaked-hazelnut	*Corylus cornuta* Marsh.
Pigewaatig Pigewandag	Aninaandag (-oog); Iniwaandag (-oog); Bigiwaandag (-oog); Zhingob (-iig); Zhingobaandag (-oog); Zhingob Bigiwaandag	Balsam Fir	*Abies balsamea* (L.) P. Mill.
Shiiwiigiibik	Ozagadigom	Long-styled Sweet Cicely	*Osmorhiza longistylis* (Torr.) DC.
Sagataagan		Tinder Fungus	*Inonotus obliquus* (Ach. ex Pers.) Pil.
Sesegaanaatig Sesegaandag	Gaagaagiwanzh; Zesegaandag; Zhingob; Zhingob gaawaandag	Black Spruce	*Picea mariana* (Mill.) BSP
Shaashaagomin	Ode'iminijiibik; Zhakaagomin; Zhaashaagomin	Bunchberry	*Cornus canadensis* L.
Shiigaagomizh	Bagwaji-zhi/agaagawinzh (-iig); Mashkode-zhi/agaagawanzh (-iig)	Pink-flowered Onion	*Allium stellatum* Fraser
Shingwaak	Zhingwaak	White Pine	*Pinus strobus* L.
Siizibaakwetaatig		Manitoba Maple; Box Elder	*Acer negundo* L.
Waabozogiibik Paagemo	Bebaamaabiig; Okaadaak; Waaboozojiibik	Wild Sarsaparilla	*Aralia nudicaulis* L.
Wiigwasaatig	Wiigwaas (-an) (-ag); Wiigwaasaatig; Wiigwaasi-mitig; Wiigwaasimizh	Paper Birch	*Betula papyrifera* Marsh.

Wiigwas			
Wiigob	Oziisigobimizh	Bebb Willow + Willows	*Salix bebbiana* Sarg. + *Salix* sp.
Wiike	Wiikenh; Nabagashk; Mashkosii-zhaabozigan	Sweet Flag	*Acoris* americanus (Raf.) Raf.
Wiimbushk	Ozaawashkojiibik	Spotted Touch-me-not	*Impatiens capensis* Meerb.
Wiingushk	Bizhikii-wiingashk; Bizhikii-wiingwashk	Sage	*Artemisia frigida* Willd. + *Artemisia sp.*
Wiingwushk			
Wiinsibag (-oons)	Wiinisiibag; Wiinisiibagoons; Wiinisiibagad	Wintergreen; Teaberry	*Gaultheria procumbens* L.

Places and Landscapes

Table 2 presents the results of the research with elders to document habitat names. The research demonstrated that rich technical descriptions of the biophysical environment existed in the Aniishinaabe language. However, initial finding suggest that these descriptions are not the same as replicable categories generated out of a statistical approach to landscape ecology. Iskatewizaagegan perception of the land generates out of a person's material and spiritual experiences with the beings of a place. These experiences create an ecological environment which is emergent from social, cultural and biophysical forms and processes. Biophysical descriptions, institutions (rules, rituals, ceremonies, norms, beliefs and values), personal and collective histories, kinship and etc. all play a role in an Iskatewizaagegan person's perceptions of their environment.

Figures 3 and 4 attempt to illustrate this difference in how the environment is perceived. In Figure 3, the Iskatewizaagegan perception of the land is restricted to biophysical characteristics. These characteristics could be utilized to generate an equivalent of statistically generated ecounits. Figure 4 includes social and cultural processes included in the Iskatewizaagegan perception of the land. The inclusion of such characteristics suggests that no two places on the land could ever by equivalent. These results suggest that Iskatewizaagegan perception of the landscape is based on the paths and places of personal and collective memory. While the technical descriptions are important, the elders emphasized that the institutions of learning the land are more important. Discussion regarding the implication of this perspective for social-ecological resilience will be found in the forthcoming thesis by Davidson-Hunt.

Table 2. Aniishinaabe Ethnoecology: A Sample of Landscape Terminology. Biophysical and Cultural Terms with English Gloss.

Landform / Habitat Terms	**English Gloss**
Atiinaag	Hill
Babiikwaakwaa	Patch of trees in open prairie
Babiikwaakwaag	Place of patch of trees in open prairie
Biboonishiiwinan	Winter camping
Biinjiboonaagan	Fish trap
Binesiiwassiswun	Thunderbird nest
Daawaapakinigay	Channel
Giinaywemitigomiizhikaag	Oak Point
Giinaywewigwasikaag	Birch Point
Giinaywe - point ikaag - place	
Giinaywe - any tree - ikaag	Any tree point
Giishkaapiikaang	Cracks in rock wall -sage location
Kaang - Rocky Place Piikaang - Rocky Area Giishkaa - Rock cracks	
Gaagiidazhigiishkaakweyaag	'Clearcut' Place where it was cut.
Gitigaan	Gardening
Gitigaan Minis	Gardening Island
Iskite	Burning
Iskaate	Burnt
Iskaate Minis	Burnt Island
Ishkwaakite	Burnt Trees -recently burnt where trees still standing
Kaaobiigiishkensikaag	Narrows -narrows between two points with cedar
Kaaobii - narrows Giishkens - small cedars	
Kaaobiikwaang (Kiiobwakwaag???)	Narrows with trees on points
Kaazhimaanominikaag	Maanomin field
Koochichiing	River inlet
Kwaa	Grove of trees -used within word construction to refer to a bunch of clump of trees
Maazinaapakinigun	Pictograph
Mamawiitaawin	Multiple family dwelling place / Village
Manitoo Minis	Spirit island
Manitoo Minis	Spirit falls / rapids
Mataabiiyaakwaa	Shrubby area at edge of water

Mataabiiyaakwaag	Place of …
Mitaawang	Sand
Mitaawangotina	Sand Ridge
Mashkiig	Muskeg
Mataabiiyaapkaang	Rocky slope going down to lake
Memengwayshiiwug	Little rock people place
Miikana	Trail
Miiniikaa	Blueberry Patch
Oteiminaniikaa	Strawberry Patch
	Any berry patch
Berry '-minaniikaa'	
Minis	Island
Minisinaakwaa	Island of trees -refers to a clump of trees found within a swamp
Minisinaakwaang	Place of island of trees
Mitig(-oog)	Tree(-s)
Mookichiiwanibiik	Spring
Neyaa	Point
Neyaakwaa	Point with trees
Neyaakwaang	Place of point with trees
Neyaapkaang	Rocky Point
Nibiniishiiwinan	Summer camping
Niisapkaang	Rocky Slope
Nimishoomisaabik	Grandfather rock
Ningkwaa'ikan	Burial place
Nipaywinan	Camping place
Nopoming	Forest / Bush
Okwokizowaag	Patch / Grove of trees
Okwokizowaag Wigwasaatigoog	Birch Grove
Okwokizowaag Geezhigoog	Cedar Grove
Okwokizowaag Agimakoog	Black Ash Grove
Okwokizowaag 'tree name')-oog)	Use to refer to any grove of tree by its plural name conjugation
Onigum	Portage
Oshkwaakite	Burnt tree place -2,3,4 years where new vegetation started to come in. Blueberry location
Paakita'waywikamikoon	Fishing station
Paasitinang	Ravine -in boreal - ravine often black spruce with associated vegetation - therefore both landform and assumed habitat

Paawitig	Rapids
Pikwatinaa	Hill
Saagiing	River mouth
Saaigan	Lake
Shiibaakobang	Willow Spit
Shiibeshkoteyaang	Prairie / Open Grassy Meadow Clear area that you can see across
Shiibeyaa	Seeing through under Used to refer to -Parkland areas -fern covered areas where blueberries grow underneath
Sigwanishiiwinan	Spring camping
Taashkaapkaang	Cliff -sage location
Taawin	Family dwelling place
Takwaakishiiwinan	Summer Camping
Totogan	Floating Bog
Waabigan	Clay
Waabiganikaa	Place of clay
Waachiew	Big hill / mountain
Waakaa’igan	Cabin
Wiikwechiishkiiwagaang	Shallow, muddy Bay -wild rice location
Wiikweshkosewaagaang	Grassy Bay
Wiikweyaang	Bay
Zhiibaaminis	Narrows between two islands
Zhiibaaminisiing	Narrows between a group of island -often found in front of a bay
Kaazhiibaaminisiwong	Kaa = Go -wong - place where Go to the place where there are narrows between the islands
Ziibi	River

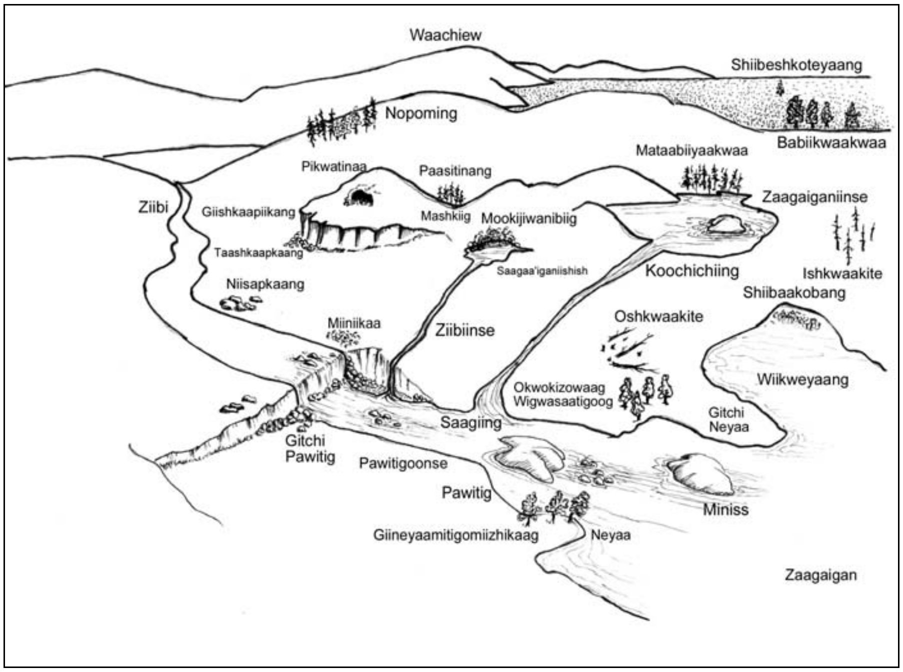


Figure 3. An Idealized Aniishinaabe Biophysical Landscape

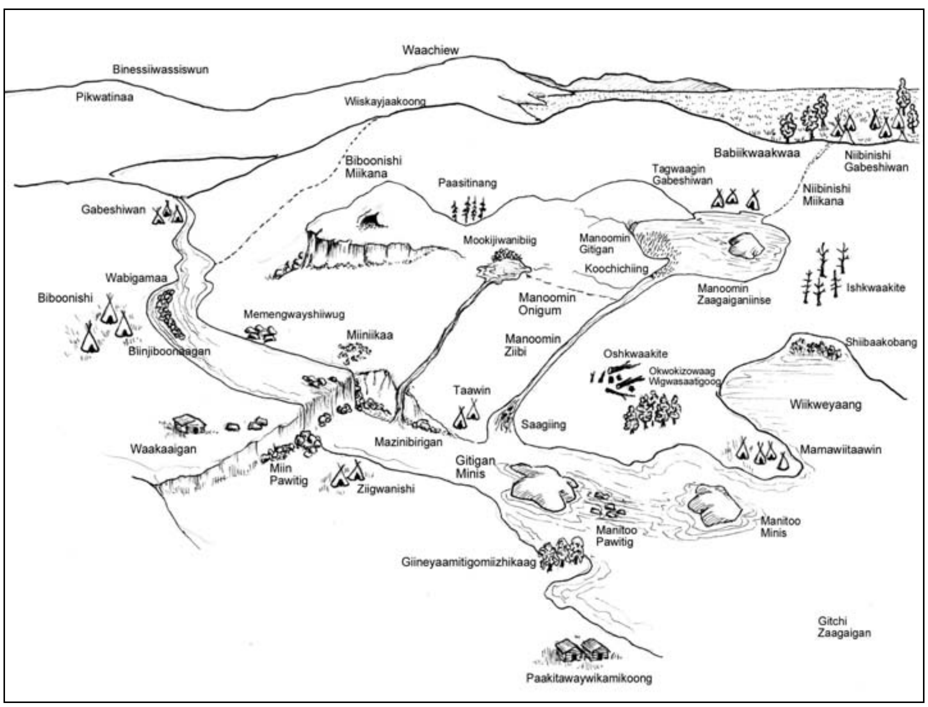


Figure 4. An Idealized Aniishinaabe Cultural Landscape.

FOREST PATCHES AND NON-TIMBER FOREST PRODUCTS

Introduction

In Canada's forestry industry there is a need for the maintenance of ecologically healthy landscapes that can provide not only timber, but other valued forest products as well (Freedman et. al. 1994). Non-timber forest products (NTFPs), are defined as those biological organisms, excluding timber, valued by humans for both consumptive and non-consumptive purposes found in various forms of forested landscapes (Davidson-Hunt et. al. 2001).

Many aboriginal and other rural communities continue to make use of a diverse array of NTFPs from forests. However, in Canada NTFP inventories have not yet been included in ecosystem-based forest management planning (Duchesne et. al. 2000). Ecological land classification (ELC) systems were developed to identify, name, and describe different types of ecosystems for the purposes of forest management planning (Harris et. al. 1999). It may be possible to use these ELC systems, already in use by forest managers to plan for timber harvesting, to locate and describe other forest values that would vary with ecological conditions across the forested landscape, such as non-timber forest products.

Birch (*Betula papyrifera*) forest patches were the focus of this study because there is a lack of baseline information on birch (Wang et. al. 1998). Birch trees and associated flora are a potential source of valuable NTFPs. Also, because birch is a tree of high cultural significance to many Native groups in Canada (Gottesfeld 1992; Marles et. al. 2000), specifically in this case, to the First Nation people at Shoal Lake (Greene, personal communication).

Purpose and Objectives

The purpose of this research was to explore the feasibility of utilizing the Ontario ecological land classification system to examine the composition and abundance of plant species, and potential non-timber forest products, in birch (*Betula papyrifera*) forest patches.

The objectives were as follows:

1. To describe the flora of the culturally important birch forest patches found in the Shoal Lake watershed, particularly flora selected based on importance to the First Nation people of the Shoal Lake watershed, and to compare the floral composition and abundance across ecosites.

2. To assess birch growth and bark quality across ecosites in the Shoal Lake watershed.

3. To investigate whether ecosites are useful units for incorporating non-timber forest product information into forest management planning.

Methods

Site Information and Selection

Fieldwork took place within the Shoal Lake watershed in Northwestern Ontario during the summers of 2000 and 2001. Four different forested ecosite types were chosen for comparison of plant species composition and abundance, as well as birch growth and bark quality. Ecosites are site types defined by abiotic factors (soil depth and texture, nutrient regime, moisture regime, and hydrology) as well as biotic factors (plant community structure and composition). Ecosites are used in Ontario's Forest Ecosystem Classification System to describe the forest land base and to achieve an ecosystem-based approach to forest management planning (Racey et. al. 1996). The Ontario Ministry of Natural Resources (OMNR) uses ecosites as mapable landscape units, usually 10-100 hectares in size, at a 1:10,000 to 1:20,000 map scale. As described below, ecosites 11, 12, 19, and 29 were chosen on the basis that each ecosite had a different nutrient and moisture regime and/or dominant tree species than the other three ecosites according to Terrestrial and Wetland Ecosites of Northwestern Ontario NWST Field Guide FG-02 (Racey et. al. 1996).

Ecosite 11:Red Pine – White Pine – Jack Pine: Very Shallow Soil.

This ecosite is described as being dominated by red, white or jack pine. Aspen, white birch or white spruce also occur and white cedar can be locally abundant. It is generally shrub and herb-poor. Shallow soils (< 20 cm) and bedrock outcrops are characteristic.

Ecosite 12: Black Spruce – Jack Pine: Very Shallow Soil.

This ecosite is described as dominated by black spruce, jack pine, and balsam fir as well as patches of trembling aspen. It is generally shrub and herb-poor on shallow soils (< 20 cm). Bedrock may be exposed or only covered by a shallow litter layer.

Ecosite 19: Hardwood – Fir – Spruce Mixedwood: Fresh, Sandy-Coarse Loamy Soil.

This ecosite is described as being dominated by trembling aspen, white birch, and balsam fir, with some occurrences of black and white spruce. Deciduous trees make up > 50 % of the canopy. This ecosite is generally shrub and herb-rich. The soils are fresh, well drained, coarse loamy to fine sandy.

Ecosite 29: Hardwood – Fir – Spruce Mixedwood: Fresh, Fine Loamy-Clayey Soil.

This ecosite is described as being dominated by trembling aspen or sometimes white birch, with a mix of conifers consisting of balsam fir, white spruce, black spruce and sometimes jack pine. Deciduous trees make up > 50 % of the canopy. This ecosite is shrub and herb-rich. The soils are fresh, moderately well to well drained, fine loamy-clayey.

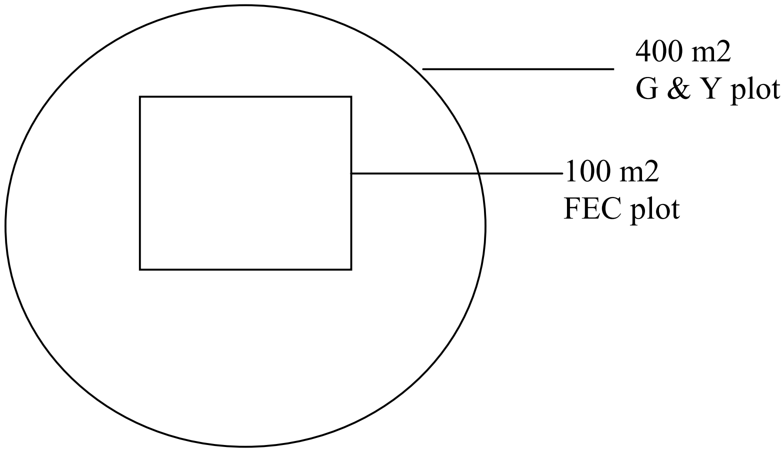
Summary

The forest stands studied, three per each of the four ecosite types, twelve in total, were chosen from the OMNR's 1999 Forest Resource Inventory (FRI) data for the Shoal Lake Watershed of the Kenora Crown Unit. Selection of forest stands was based on the following criteria: a) *Presence of birch (Betula papyrifera)*: defined by stands classed as Birch Working Group according to OMNR's 1999 FRI data. Working Group is defined by the OMNR as stands that have the same dominant species and are managed under the same broad silvicultural system; b) *Stand maturity*: mature stands that were 50-80 years according to OMNR's 1999 FRI data were chosen. The OMNR defines stands over 50 years of age as mature (Sims et. al. 1997); c) *Stand origin*: all stands originating from natural disturbance (i.e. fire).

Sampling Design

Sampling of trees and associated flora was done using a combination of the Ontario Forest Ecosystem Classification (FEC) plot design (Harris et. al. 1999) and the Ontario Forest Growth and Yield (G & Y) plot design (Hayden et. al. 1995). At the center of each of the circular G & Y plots, a 10 x 10 m square FEC plot was placed (Figure 5). The designs were combined in order to capture greater stand-level information with the larger 400 m^2 (11.2 m radius) circular G & Y plot as well as more detailed data on tree regeneration, shrubs and herbs provided by the 100 m^2 square FEC plot. The G & Y plots were placed at random distances along a randomly placed transect line in each forest stand. Vegetation in 36 forest patches, 9 patches (i.e.sites) per each of the 4 ecosite types, was sampled.

Within each 10 x 10 m FEC plot, information about tree saplings, tree seedlings, shrubs, dwarf shrubs, and herbaceous plant species was recorded according to Describing Ontario's



<u>Circular Growth and Yield Plot (400 m2)</u>
Measure **Trees (> 10 m)**

- Size of trees (dbh)
- Size of snags (dbh)
- % Cover
- Birch bark sample
- Age and size of bark sample tree

<u>Square Forest Ecosystem Classification Plot (100 m2)</u>
Measure **Saplings, Seedlings, Shrubs, Herbs as well as Soil and Other Environmental Variables**

- Species
- % Cover
- Soil sample (Soil type and moisture)
- Environment: slope, canopy cover, bare ground, fire evidence, human activity

Figure 5. Ecosite sampling design: Growth and Yield plot and Forest Ecosystem Classification plot combination.

Ecosystems: Data Collection Standards for Ecological Land Classification (Harris et. al. 1999). Cover is a standard measure of abundance that is a visual estimate of what percentage of the study plot area is covered by a plant species. In this study each plant taxon was recorded to genus or species and their percent cover was recorded.

A soil sample in the form of a soil core was taken near the center of each FEC plot using a soil auger. The soil sample was then keyed to a Soil Type and a Moisture Regime using the Field Guide to the Forest Ecosystem Classification for Northwestern Ontario NWST Field Guide FG-03 (Sims et. al. 1997). Soil Types were based on depth and mineral soil texture. Moisture Regimes were dry, fresh, moist, or wet. The environmental characteristics of slope position (level, lower, mid, upper, or crest), bare ground (percent cover), overall tree canopy (percent cover), fire evidence (charcoal pieces in the soil, present or not), and evidence of human activity (present or not) were recorded at each FEC plot as well.

Within the larger G & Y plot (including the smaller FEC plot area) information about trees (> 10 m) was recorded according to the Ontario Forest Growth and Yield Program Field Manual (Hayden et. al. 1995). The number, percent cover, and diameter at breast height (DBH) (in cm measured at 1.3 m above ground level) of birch trees and snags were used as measures of birch growth.

Birch bark was sampled as it is a raw material for use in non-timber forest products (Marles et. al. 2000; Turner 1998), particularly birch bark baskets in regards to use by the Shoal Lake First Nation people. A 15 x 15 cm sample of birch bark was cut from a sample tree (i.e. the closest mature tree to plot center) at each plot. Bark thickness, lenticel (the horizontal pores in the bark) length, and number of lenticels were used as measures of bark quality. The basis of these measures lies in birch bark characteristics required for basket-making and were developed in the field, as to my knowledge no other comparative study has been done on birch bark quality across different site types for non-timber forest product use. Age of the sample tree was measured using an increment borer to retrieve a core and counting the number of growth rings. Height in meters of the sample tree was also taken using a clinometer. DBH of the sample tree was recorded as part of the G & Y plot data.

Analysis of Statistical Data

When analyzing data, particular attention was paid to 12 plant species selected because they are utilized or otherwise recognized as important by the people of Shoal Lake First Nation. The species selected were four tree species: paper birch (*Betula papyrifera*), black spruce (*Picea mariana*), white pine (*Pinus strobus*), and eastern white cedar (*Thuja occidentalis*); four shrub species: Labrador tea (*Ledum groenlandicum*), sand cherry (*Prunus pumila*), Canada yew (*Taxus canadensis*) and velvet-leaved blueberry (*Vaccinium myrtilloides*); and four herbaceous species:

wild ginger (*Asarum canadense*), woodland strawberry (*Fragaria vesca*), sweet cicely (*Osmorhiza longistylis*), and dewberry or dwarf raspberry (*Rubus pubescens*).

The percent cover for each plant taxon, and birch data including tree and snag percent cover, DBH, and bark quality measures, were averaged across sites to give mean values per ecosite type. Mean values were calculated and histograms created using a spreadsheet program (Microsoft Excel) to compare presence/absence and abundance across ecosites. One-way analysis of variance (ANOVA) (SAS Institute Inc. 1996) was used to determine if means were significantly different across ecosite types. Significance was determined by a p-value with an alpha level set at 0.01 ($\alpha = 0.01$).

Data was also analyzed with Canonical Correspondence Analysis (CCA) using the statistical package Canoco (Ter Braak 1990). CCA is an ordination technique that uses the environmental data to "constrain" the plant species data along axes (Ter Braak 1987). In this study CCA was used to examine plant species composition and abundance of birch forest patches in relationship to the ecosite types.

Data Analysis

Environment

Environmental conditions proved to be quite variable within the ecosite types sampled. Particularly ecosite type 12, which contained both rocky upland areas with shallow dry soils and open canopy conditions, as well as lowland areas with deeper fresh or wet soils and more closed canopy conditions (Table 3). Ecosite type 11 was similar to ecosite type 12 in that it generally had open conditions with dry, shallow soils over bedrock, although some deeper soils occurred. Topography, however, was less variable in ecosite type 11 and the majority of sites had a level slope position (Table 3). Ecosite types 19 and 29 were the least variable in environmental conditions within, and were very similar to each other, both generally having deep, fresh to moist soils, a level or lower slope position, and closed canopy conditions (Table 3). It was notable that in the field it was difficult to key out ecosite types 19 and 29 using the Terrestrial and Wetland Ecosites of Northwestern Ontario Field Guide 9. For example, several forest stands that were designated as ecosite type 19, keyed out to ecosite type 29 based on soil and vegetation characteristics. It may be that some of the forest stands studied were mistyped. When ecosite types for northwestern Ontario were being developed the majority of vegetation and soil data was collected east of Lake of the Woods where acidic soils from the Canadian Shield are encountered. However, ecosite types developed from this data may not apply properly to the Shoal Lake watershed, where basic prairie soils from the west would influence the vegetation communities found there. This highlights the need for field sampling such as conducted in this study to gain accurate information about the environmental variables associated with plant NTFPs.

Table 3. A summary of the environmental variables of soil type, moisture regime, slope position, and canopy cover found in the birch forest patches in ecosite types 11, 12, 19, and 29.

Ecosite	**11**	**12**	**19**	**29**
Soil Type	Extremely-Very shallow soil on bedrock (7)*, Shallow-mod deep, silty-fine loamy clayey (2)	Extremely-Very shallow soil on bedrock (5), Shallow-mod deep, sandy (2) Shallow-mod deep coarse loamy (1), Deep, Organic (1) (*Sphagnum* moss)	**Deep, Fine loamy-clayey (5),** Deep, Clayey (2), Shallow-mod deep, sandy (1), Very shallow soil on bedrock (1)	Shallow- mod deep coarse loamy (5), Deep, Fine loamy clayey (3), Deep, Coarse loamy (1)
Moisture Regime	Dry (7), Fresh (2)	Dry (5), Fresh (3), Wet (1)	Fresh (4), Moist (3), Dry (2)	Fresh (8), Moist (1)
Slope Position	Level (5), Lower (1), Upper (2), Crest (1)	Crest (3), Mid (3), Lower (2), Level (1)	Level (6), Lower (2), Mid (1)	Level (8), Lower (1)
Canopy Cover	0-50 % (7) 51-100 % (2) Avg. 43.3 %	0-50 % (8) 51-100 % (1) Avg. 37.7 %	0-50 % (6) 51-100 % (3) Avg. 56 %	0-50 % (2) 51-100 % (7) Avg. 62.2 %

* Numbers in brackets are the number of sites (of 9 sites in each ecosite type) where that particular environmental characteristic was found.

Plant Composition and Abundance across Ecosite Types

In this study there were 139 different plant taxa identified in the birch forest patches altogether. There were 10 tree species encountered, including birch, and 129 understory shrubs, dwarf shrubs, and herbaceous plant species (Ruta 2002). The plant species composition and abundance of the birch forest patches was examined across the different ecosite types to determine if the ecosite types contained distinguishable plant communities.

The canonical correspondence analysis (CCA) in Figure 6 displays ecosite centroids that are representative of the plant species composition/abundance (i.e. average percent cover values for each plant taxa) found in the birch forest patches in the different ecosite types. Figure 6 also

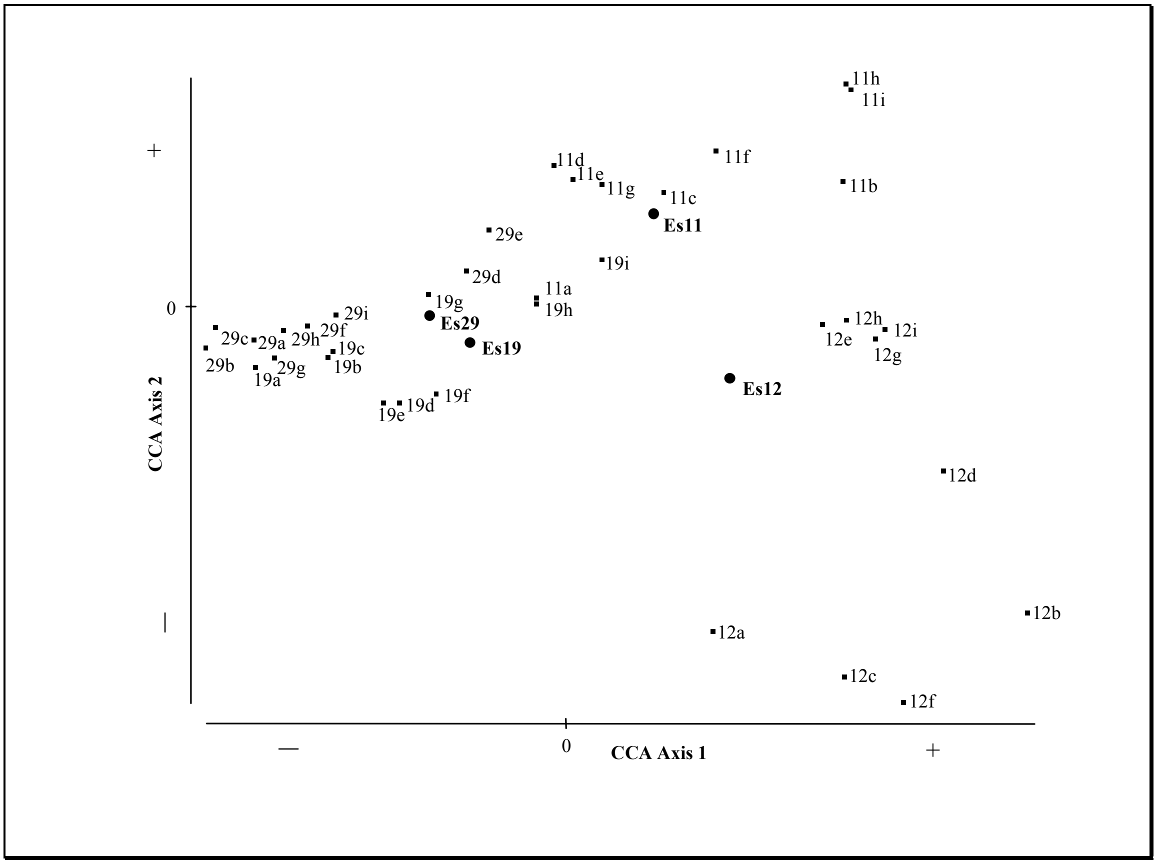


Figure 6. Results of Canonical Correspondence Analysis (CCA) of N = 36 sites, constrained by ecosite types 11, 12, 19, and 29, showing the centroid for each ecosite (black circle) for axes 1 and 2.

displays the composition/abundance of the 36 birch forest patches that were sampled in relation to the ecosite centroids. The CCA analysis showed that ecosite types were not equally distinct from each other in plant species composition and abundance. However, three general groupings resulted, ecosite type 11, ecosite type 12, and a combination of ecosite types 19 and 29 (Fig. 6).

Differences in composition and abundance were likely reflective of differences in environmental variables, particularly between groups of ecosite types 11 and 12 which had generally drier, shallower less nutrient-rich soils in contrast to ecosite types 19 and 29 which had generally moister, deeper more nutrient-rich soils (Table 3). Ecosite type 19 and 29 sites did not separate out in CCA analysis likely because environmental variables and overstory composition were very similar and because some forest stands were potentially mistyped as mentioned. Although ecosite types 11 and 12 were generally similar in environmental conditions, they separated out from each other in the CCA analysis, possibly due to different tree canopy composition. Generally white pine and/or eastern white cedar was in the canopy with birch in ecosite type 11, and trembling aspen and/or jack pine was in the canopy with birch in ecosite type 12. Also, within ecosite types 11 and 12, sites were quite spread apart from each other, due to the variability in environmental conditions found within these ecosite types. For example, the composition and abundance of plant species in site 12f, which was a wet, organic soil site at a lower slope position was very different from that of site 12g which was a dry, shallow sandy soil site on a rock crest (Fig. 2).

The CCA in Figure 7 shows some of the understory plant species associated with the different ecosites. Many plant species were not associated with any one ecosite, but found frequently (> 40 % of the sample plots) across ecosites, for example, wild sarsaparilla (*Arailia nudicaulis*) (Fig 7). However, the NTFP inventory data also showed that birch forest patches in the different ecosite types could be distinguished by some frequently occurring species. For example, in the understory, the dwarf shrub poison ivy (*Rhus radicans*) and the herb woodland strawberry (*Fragaria vesca*) distinguished ecosite type 11 from other ecosites. Ecosite type 12 was distinguished by the frequently occurring dwarf shrub low sweet blueberry (*Vaccinium angustifolium*), the herb blue-bead lily (*Clintonia boreale*) (Fig 7). Ecosite types 19 and 29, were defined by different frequently occurring species such as the herbs mitrewort (*Mitella nuda*) and starflower (*Trientalis borealis*) (Fig 7).

Other plant species were found to be unique to birch forest patches of one ecosite type. For example, the evergreen shrub Canada yew (*Taxus canadensis*), and the herbs wild ginger (*Asarum canadense*) and sweet cicely (*Osmorhiza longistylis*) were unique to ecosite type 29 (Fig. 7). The majority of these unique plants, however, did not occur frequently within an ecosite type. This may mean that these species are not unique to an ecosite type overall, but rather to

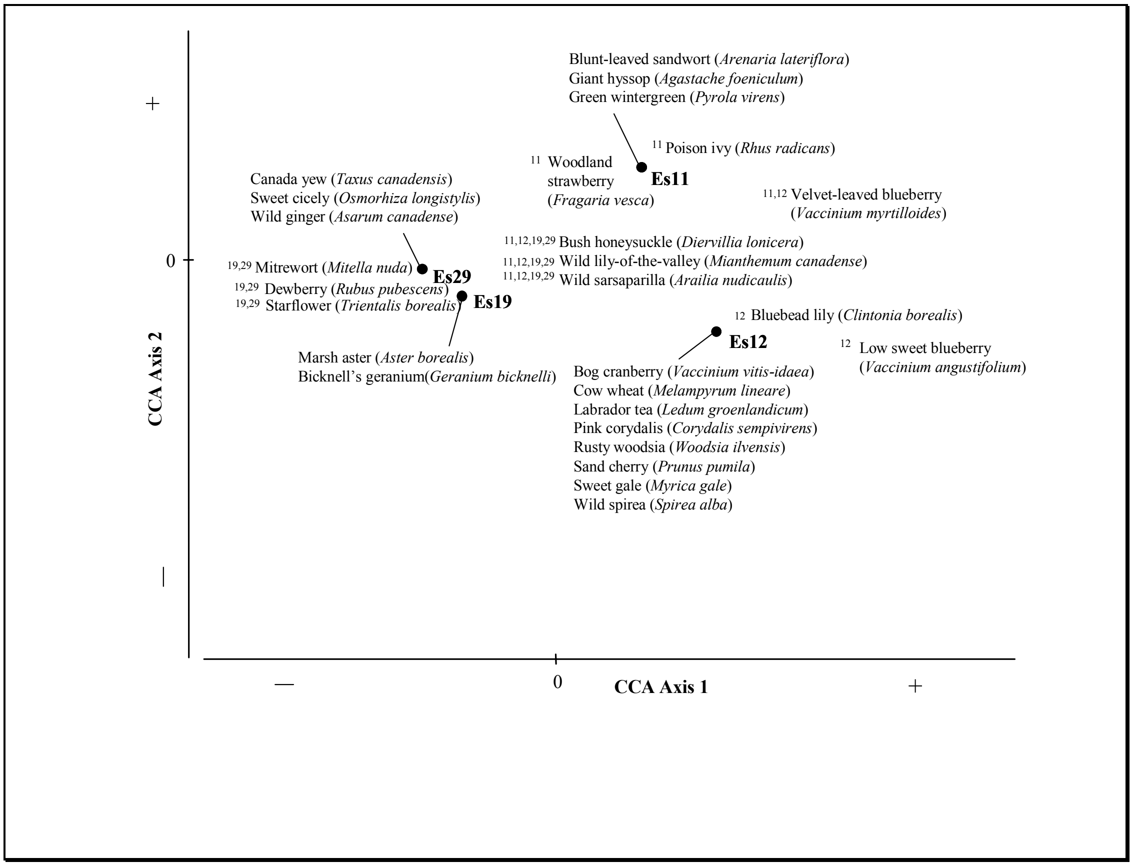


Figure 7. Results of Canonical Correspondence Analysis (CCA) of N = 125 understory plant species (herbaceous plants, dwarf shrubs, and tree seedlings) constrained by ecosite types 11, 12, 19, and 29. Selected plant species are displayed in relation to the centroid for each ecosite (black circle) for axes 1 and 2. Plant species designated by a line an ecosite type are exclusive to that ecosite type. The number in front of plant species indicates the ecosite type(s) in which that plant occurred frequently (> 40 % of the sample plots).

particular site conditions on a smaller scale. For example, within ecosite type 12, the dwarf shrub sand cherry (*Prunus pumila*) was found growing at mid or crest slope position on shallow soil over bedrock, in open high light conditions. Labrador tea (*Ledum groenlandicum*), however, was found growing at a lower slope position on deeper, fresh or wet soil associated with black spruce cover. If these plants were to be included in a forest management plan due to their NTFP value, different habitats would have to be identified within an ecosite type to locate areas of abundance.

The NTFP inventory revealed that abundance, more so than composition, differed across ecosite types. For example, regarding the species selected based on importance to Shoal Lake First Nation, velvet-leaved blueberry shrubs were not absent from any ecosite types but their percent cover was higher in ecosite types 11 and 12 (Fig. 8). The herbs woodland strawberry, most abundant in ecosite type 11, and dewberry or dwarf raspberry, most abundant in ecosite types 19 and 29, were found to be significantly different ($< \alpha$ 0.01) in abundance across ecosite types (Fig. 9). The trees birch and white pine were also significantly different in abundance across ecosites (Fig. 10).

Birch

Paper birch was a species of significance in this study due to its high NTFP value. Knowledge of how birch is growing, such as the quantity and size of birch, across the landscape may prove useful in selecting areas for managing birch as an NTFP. The NTFP inventory in this study revealed different types of birch growth in the birch forest patches across the landscape. Birch trees had significantly higher abundance (i.e. mean cover) in ecosite types 19 and 29 and were less abundant in ecosite types 11 and 12 (Fig. 10). Although individual sites with relatively high quantities of birch trees (> 20 trees) were found in all ecosite types, mature birch trees were significantly larger and more robust in ecosite types 19 and 29 (Fig. 11). There were also more and significantly larger birch snags in ecosite types 19 and 29 (Fig. 11), indicating that birch grew more rapidly and reached a larger size in these ecosite types versus ecosite types 11 and 12. The differences in birch growth were related to the contrast in site conditions found between ecosite types. Ecosite type 11 and 12 sites, with drier, shallower sandy soils on rocky uplands, in contrast to ecosite types 19 and 29 with moister, deeper loamy to clayey soils at lower or level slope positions allowing for optimal growth. This agrees with other studies that indicate, although paper birch is able to tolerate a wide variety of soil and moisture conditions, it prefers relatively moist, nutrient-rich sites (Bell 1991; Rowe 1956; Wang et al. 1998).

There was also a higher occurrence of fire evidence (i.e. charcoal pieces in the soil) at ecosite type 19 and 29 sites versus ecosite type 11 and 12 sites. Since fires that expose mineral soil are important for the establishment of birch (Heinselman 1981), it may be that fires of the

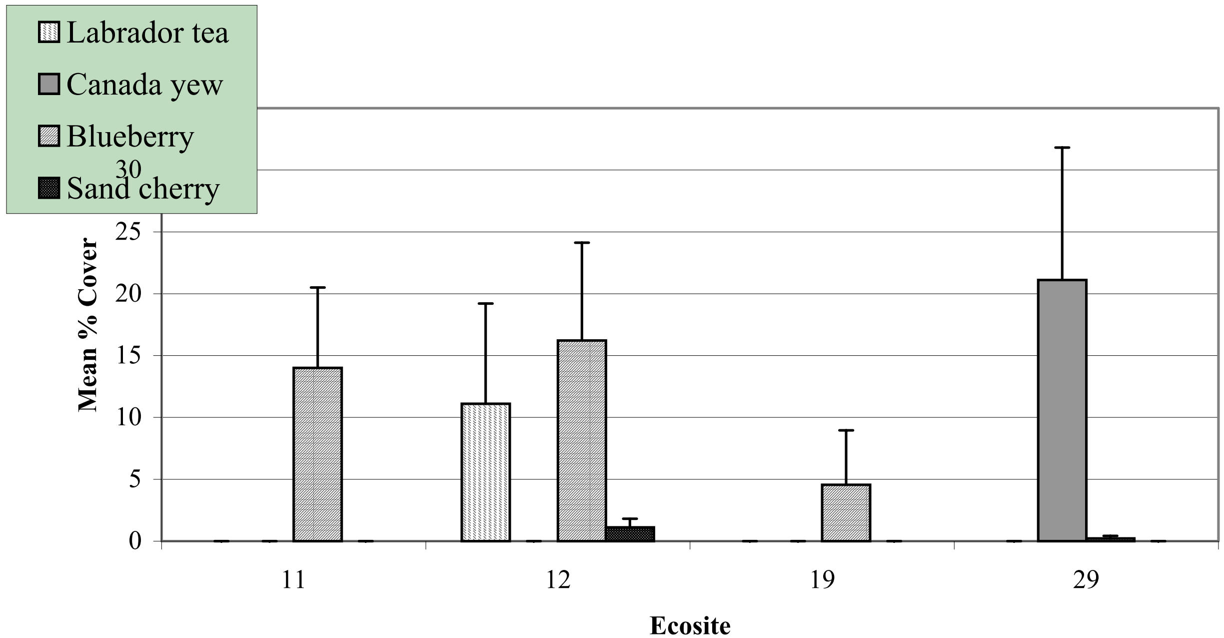


Figure 8. Mean percent cover of selected shrub species: Labrador tea (*Ledum groenlandicum*), Canada yew (*Taxus canadensis*), velvet-leaved blueberry (*Vaccinium myrtilloides*), and sand cherry (*Prunus pumila*) in ecosite types 11, 12, 19, and 29.

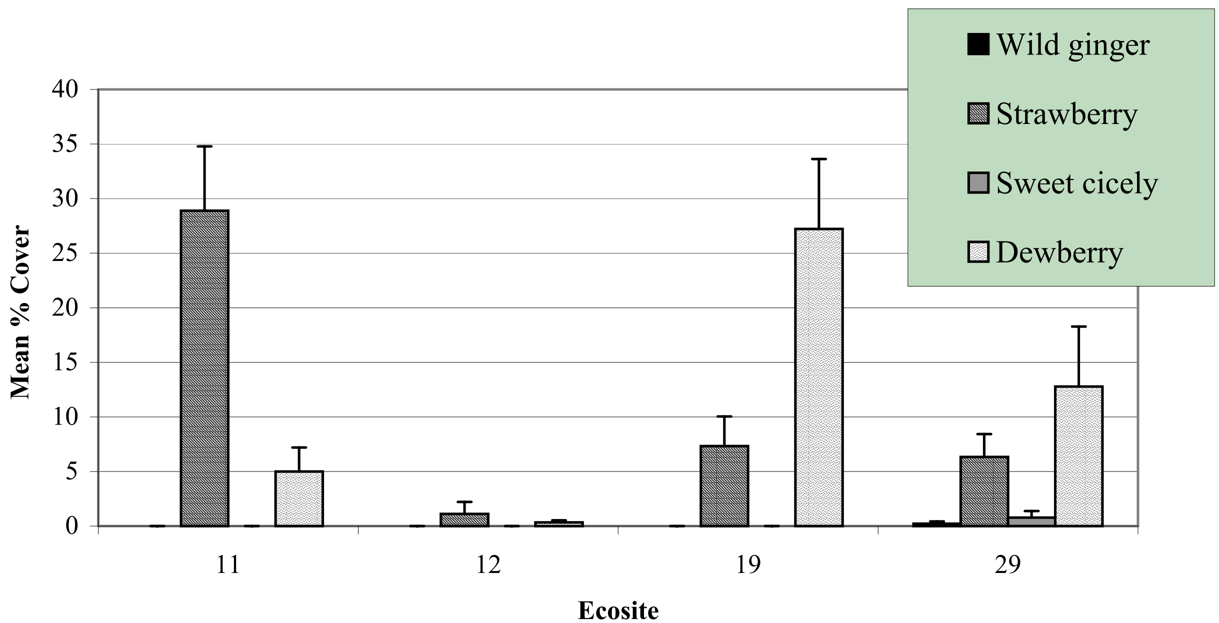


Figure 9. Mean percent cover of selected herbaceous species: wild ginger (*Asarum canadense*), woodland strawberry (*Fragaria vesca*), sweet cicely (*Osmorhiza longistylis*), and dewberry (*Rubus pubescens*) in ecosites 11, 12, 19, and 29.

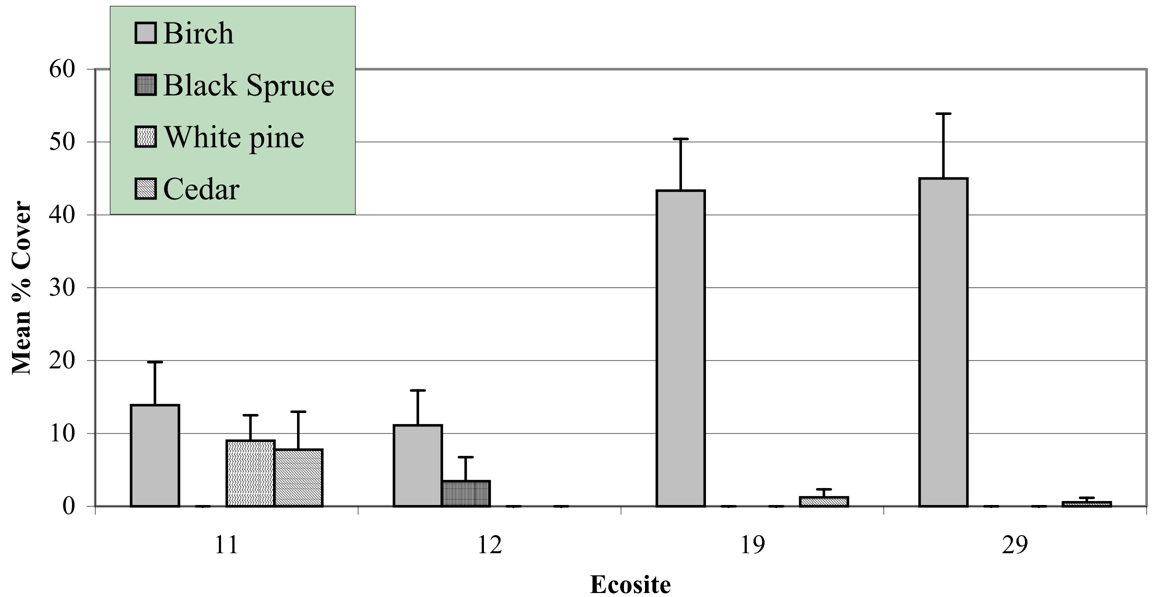


Figure 10. Mean percent cover of selected tree species: Birch (*Betula papyrifera*), Black spruce (*Picea mariana*), White pine (*Pinus strobus*) and Cedar (*Thuja occidentalis*) in ecosites 11, 12, 19, and 29.

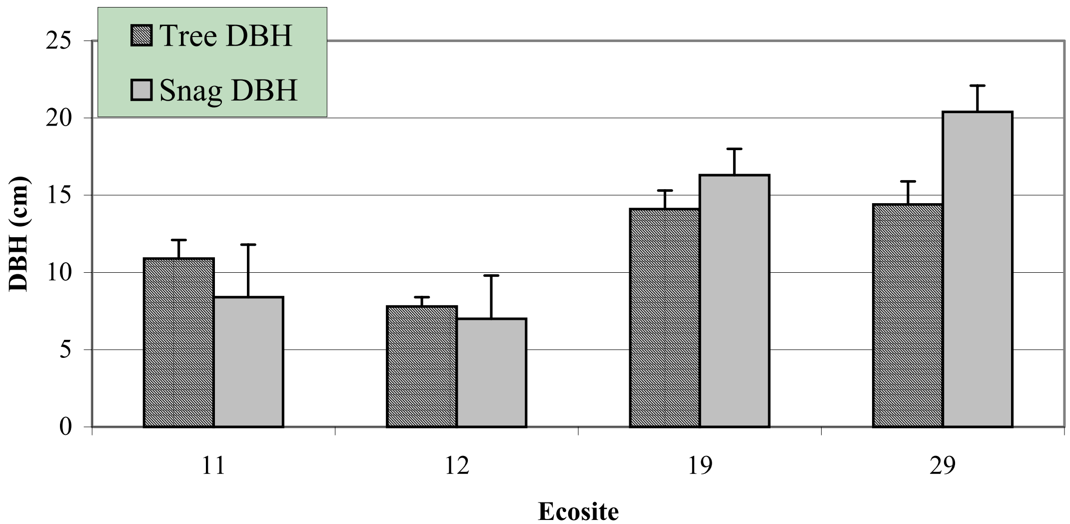


Figure 11. Mean diameter at breast height (DBH) in centimeters of birch (*Betula papyrifera*) trees (> 10 m) and snags (standing dead trees > 1.3 m) in ecosites 11, 12, 19, and 29.

appropriate intensity in ecosite types 19 and 29 allowed for greater birch establishment. Once established, proper growing conditions such as the increased moisture and nutrient regime found in ecosite types 19 and 29 would likely allow birch to increase in abundance and size over other drier, nutrient-poor ecosite types such as 11 and 12.

Bark from paper birch is a particularly valuable part of the tree used in NTFPs. Bark quality was examined to determine whether characteristics of a plant species, birch, required for creating an NTFP, birch bark baskets, varied with ecosite type. Birch bark quality measures of bark thickness, lenticel length, and number of lenticels were not significantly different across ecosite types. However, it was discovered that these quality measures were correlated to individual tree age. Older birch trees indicated thicker bark, longer lenticels, and a lower number of lenticels. Therefore, characteristics of the individual tree, despite ecosite type, appeared to have an influence on bark quality.

Summary

This study found that the Ecological Land Classification system of ecosite types currently in use by forest managers in Ontario are not useful units for identifying the composition and abundance of plant NTFPs in birch forest patches. Ideally, site types that are relatively uniform in environmental conditions as well as distinct from other site types would be the most useful in identifying NTFP plant species. However, this was not the case regarding ecosite types. Data analysis showed that the ecosite types sampled were not equally distinct from each other in plant species composition. It was also discovered that because ecosites are large and variable in habitat, certain NTFP plant species have specific habitat niches where they are most abundant within ecosite types.

Field inventories such as conducted in this study are necessary in order to gain reliable information about what kind of NTFP plant species are occurring and where they are most abundant on the land. The NTFP inventory in this study revealed information about plant species composition and abundance beyond what is available in ecosite type descriptions (Table 4). Ecosite type descriptions as found in the Terrestrial and Wetland Ecosites of Northwestern Ontario Field Guide (Racey et. al. 1996) focus mainly on overstory tree composition. The NTFP inventory in this study was particularly useful in gaining more complete data on understory plant species composition and abundance. For example, the shrub Canada yew was not listed as a species representative of ecosite type 29 in the ecosite field guide. However, the NTFP inventory revealed that it occurred in 3 of the 9 ecosite type 29 birch forest patches that were sampled and had a mean percent cover of 21 % (Fig. 9).

Table 4. Plant and environment information provided in an ecosite type description from the Terrestrial and Wetland Ecosites of Northwestern Ontario Field Guide [9] in comparison to data gathered from the NTFP inventory conducted in an ecosite type in this study.

Field Guide Ecosite Type Description Provides:	**NTFP Inventory Description Provides:**	**Comparative**
• Frequently occurring [a] trees, shrubs, and herbs	• Frequently occurring [b] trees, shrubs, and herbs • Less frequently occurring trees, shrubs, and herbs • Abundance (percent cover) • NTFP growth data (e.g. birch tree dbh, height, age) • NTFP quality data (e.g. birch bark quality measures)	• Similar general plant community composition information, although NTFP Inventory allows for more complete composition data and adds information about less frequently occurring plants • NTFP Inventory adds abundance information, which can then be compared to abundance in other site types. • NTFP Inventory allows for description of how a particular NTFP is growing in different site types, and description of NTFP quality in different site types
• Frequently encountered parent materials and soil types • General description of topography	• Soil type and moisture regime • Other environmental data (e.g. slope position, canopy closure (shade/light), evidence of fire, presence of human activity)	• NTFP Inventory adds site specific information about soil types and moisture regimes • NTFP Inventory allows for more detailed description of environment which can then be linked to plant composition and abundance data

[a] > 40 % of sample plots used to compile the ecosite type description.
[b] > 40 % of sample plots in this study in the actual ecosite type.

Overall differences in birch growth were reflective of the contrast in site conditions between groups of ecosite types, 11/12 and 19/29. This indicated that groups of ecosite types similar in environmental conditions would be useful in identifying areas of different birch growth across the forested landscape. However, it would first be necessary to define different types of birch growth within ecosite types using an inventory method as in this study to gather growth data like size and abundance of trees.

Ecosite types were found to be too large and variable to predict a consistent type of bark quality throughout, but there may be certain site conditions associated with patches of high quality bark trees at a smaller scale. Ultimately this was a preliminary study of bark quality and further studies, with increased sample size would be required to better define the relationship between bark quality and ecosite type or site conditions within ecosite types.

MANAGEMENT IMPLICATIONS AND CONCLUSIONS

Research Protocols and Agreements

The research undertaken in this project would not have been possible without an investment in establishing a research protocol and agreements. Protocols and agreements are necessary to address the power imbalance existing between First Nations and research institutions, management agencies and industry. Building trust and mechanisms of transparency and accountability are integral to these agreements. The implications presented below exist within the context of such agreements regarding First Nation and scientific knowledges.

Relating First Nation Knowledge to Scientific Knowledge

We found in our research that knowledge could be shared between First Nation people and scientific research. It was necessary to establish a common lexicon of plants to facilitate communication. The description of the biophysical landscape also has the potential to be utilized as the basis to construct habitat types. Elders were able to list plants found in different types of sites. The caveat to this research is that elders insisted that institutions of knowledge and legitimacy of knowledge be respected. Authoritative knowledge and legitimate information generates out of cultural processes. Knowledge can be shared but must become legitimate and authoritative in its own cultural context. The use of First Nation knowledge in forest management does not thus make forest management authoritative or legitimate for First Nation people.

First Nation NTFP Values

The main trend regarding First Nations and forest management is the incorporation of values into forest management plans. The approach, however, has been naïve and simplistic. To take a simple case we can look at the specification of values. Mapping assumes that values are static in both space and time. For instance, a temporally static approach is relevant for the built landscape such as burial grounds, village sites and other archeological artifacts. Mapping may also be relevant for mapping biological values which possess slow rates of change. For example, medicinal plants which grow in the shade of an old growth mixed-wood stand on deep soils. The spatial character of this value may be accurate due to a slow cycle of change of the habitat, a mature stand may last 20 to 200 years.

There are also habitats which have emerged from the activities of people on the land. These places are often integral to First Nation livelihood activities and have emerged out of their activities. Places can emerge as static values through the activities of people on the land. However, some activities on the land were related to shorter cyclic process. These values emerge out of the dynamics of the landscape, for example the blueberry. Blueberries reach a maximum production 3-10 years after a disturbance on particular site types. A blueberry harvesting patch which was utilized 30 years in the past is not a good place to harvest blueberries in the present. Our research has found that management should make more effort to specify values in terms of forest dynamics and peoples activity on the land. Specification would allow a decision to be made in terms of protection versus intentional activities to have a value emerge into a landscape.

Rapid NTFP Inventories

Maintaining NTFPs within the landscape

NTFPs which are dynamic will emerge into and disappear from the landscape through time. It is not possible to protect such sites. The intent of the rapid NTFP inventory was to demonstrate tools that could be used by First Nations and the resource management agencies to identify sites with potential for x-use. For instance, in northwestern Ontario, there is a need for the careful management of birch forest patches as they are valuable to First Nations as a source of NTFPs, and there is an increasing interest in harvesting of birch to supply timber mills. All of the ecosites in this study were designated as birch working group (all contained a high amount of birch relative to other overstory trees), however the NTFP inventory revealed that ecosite types 19 and 29 contained the most abundant and largest birch trees. It would be important to keep a percentage of these ecosite types on the landscape for NTFP use, such as harvesting large strips of bark or constructing specialty wood products. However, in harvesting bark for birch basketry, an area containing smaller, younger aged trees with bark that has less blemishes may be preferable an area containing many large, older birch. Ultimately it would be important to keep a variety of different types (size and age classes) of birch growth on the landscape to ensure availability for a variety of NTFP uses.

Assessing NTFP opportunities and threats

Information about understory plant species in birch forest patches gained from an NTFP inventory such as this would be useful in identifying important NTFP areas to be included in forest management plans. It would also be important for First Nation communities to have a record of what plant NTFPs are on their land, especially those that may be sought after for their commercial value. In this study eleven of the twelve plant species selected based on their importance to the Shoal Lake First Nation were of commercial value (Ruta 2002). For example, sand cherry is a dwarf shrub that is culturally valuable to the First Nation people at Shoal Lake, as well as being identified as a rare wild plant of economic importance in Ontario (Catling and Porebski 1998). The rapid NTFP inventory in this study detailed the type of habitat associated with this plant and the abundance of the plant. This type of information would help to define areas where it is crucial to protect valuable NTFP plant species. Also, this type of data would aid in defining areas where plant NTFPs are most abundant, and have the potential for a sustained harvest. Finally, a rapid NTFP inventory methodology could potentially be used by local harvesters such as First Nation communities interested in gathering NTFP data in their area.

Conclusion: Specifying and Communicating First Nation Visions for the Land

Management agencies have focused on integrating or incorporating First Nation knowledge into planning processes. Sometimes this is important in order to protect First Nation values. However, it assumes that both ecological and cultural processes are static. First Nation people are not permitted to adapt and innovate new forms of livelihood based upon their own systems of knowledge. Culture and ecologies become entities frozen in the past. First Nation people are allowed to pursue traditional activities which are often seen as the definition of Treaty rights. Rights which emerged in the late 1800's based and defined as a trapping way of life based on subsistence in spite of its participation in commerce and global trade. Resilience thinking pushes us to question the long-term feasibility of such a participation in forest management. Instead, it may be time that we examine how First Nations can communicate their visions for the land along with the tools to communicate and implement such visions.

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