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First Nations / Aboriginal Research Projects of the Sustainable Forest Management Network

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by

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INTRODUCTION

This report summarizes the First Nations and Aboriginal research projects of the Sustainable Forest Management (SFM) Network covering the period 1995/96 to 1998/99. Projects undertaken by SFM Network funded or partner funded researchers who have addressed Aboriginal / First Nations issues and/or undertaken projects in collaboration with First Nations peoples are described in two parts:

1. The Caribou Mountains Research Partnership
2. Other SFM Network First Nations Research Projects

As the only current First Nations partners in the SFM Network, the Little Red River Cree and Tallcree First Nations (LRRC/TC), whose traditional territories include the Caribou Mountains and Lower Peace River area of north central Alberta, are involved intimately in research focusing on issues relating to ecological and socio-economic sustainability. The Caribou Mountains/Lower Peace region is particularly suited to research relating to the impacts of natural and human disturbances as it is subject to both logging and forest fires, the latest being in 1995 where a significant portion of the Caribou Mountains plateau burned. While fewer in number, SFM Network research projects conducted in other areas of Alberta and Canada are equally broad in scope. The extent to which Aboriginal people and/or their knowledge form a component of this research is described.

Written primarily to assist the Network's Aboriginal Committee to chart a course for the next three years, this report also assesses these projects with respect to SFM Network objectives. By analyzing the strengths and weaknesses of these projects vis-à-vis the Network's recently developed Research and Networking Legacies, a number of challenges and opportunities to involving Aboriginal people and their knowledge into the development of sustainable forest management practices are identified. This, in turn, in combination with the more obvious contributions that Aboriginal people can make to sustainable forest management, will assist the Network to focus future research efforts with First Nations communities.

CARIBOU MOUNTAINS RESEARCH PARTNERSHIP

Sustainable development of the Boreal Forest can only be achieved through a multi-disciplinary approach that includes a true partnership with Aboriginal / First Nations peoples. To fulfil this philosophy, the Caribou Mountains Research Partnership was created in 1996 as a joint

research program between the SFM Network and the LRRC/TC (Map 1). This program was initiated with the shared understandings that:

- Our ability to understand and effectively manage Boreal Forest resources requires First Nations input, and
- Participation of First Nations partners is an under-developed, but critical, component of sustainable forest management.

The primary goal of the partnership is to facilitate First Nations involvement in the development of sustainable forest management strategies by integrating scientific knowledge with traditional ecological knowledge. With the guidance of the Management Committee and the direction of Dr. Bruce MacLock, four research projects (fish, macroinvertebrates, water quality and vegetation mapping were advanced sufficiently for field work to commence in 1996, whereas field work for the four other programs (fish parasites, paleoliminology, ecotourism and moose) were initiated the following year. More recently, projects addressing environmental health, critical wildlife, and co-management have been initiated.

Fish Communities of the Caribou Mountains Plateau (1996-97)

Fish in the Caribou Mountains are an important part of the subsistence economy of the LRRC/TC and support a fly-in sport fishing business centred at Margaret Lake. While the LRRC/TC perceive a decline in Caribou Mountains fish populations in recent years, fires in 1995 raged through many stream and lake watersheds. Research on watershed disturbances, such as fire and logging, suggest that increased nutrient loading associated with these disturbances have repercussions for the composition, abundance's and population age/size structures of fish populations. In recognition that sustainable fisheries management for the Caribou Mountains region should understand the impacts of watershed disturbance on fish, Dr. Bill Tonn with Dr. Peter Aku, Joanne Mitchell (M Sc.), Dr. Eric Demers and Dr. Garry Scrimgeour, of the SFM-Network initiated a study in 1996 in order to:

- Describe fish communities in small (<100 ha surface area) and large lakes on the Caribou Mountains plateau;
- Compare species diversity, abundance, growth and population size structures of fish communities in lakes with burnt watersheds to those in systems without recent disturbance:
- Develop statistical models for predicting fish community structure based on watershed characteristics; and
- Develop a cooperative fisheries management approach that is formed by the merger of academic and TEK.

Since characterizing fish communities in large lakes is temporally and financially consuming, only a descriptive survey with some management inferences drawn from other areas was possible. Fish studies were conducted on nine lakes in the Caribou Mountains, between June-August 1996 and 1997. Twelve species of fish, including, arctic grayling, lake trout, northern pike, walleye, and lake whitefish were netted, with Wentzel Lake having the most species (n=9). Northern pike was found in all 10 lakes. The length, weight and sex were determined for all fish, while the stomach contents were collected from arctic grayling, lake trout and northern pike. Aging structures were collected for all species, except burbot and lake whitefish. Length-weight and length-frequency distributions (as measurements of population structure) and condition factors (as indicators of individual fitness or "health") were calculated for each species. Longnose and white sucker had the highest condition factors, whereas for game fish, arctic grayling, lake whitefish, walleye, lake trout, and northern pike had, in descending order, the highest conditions. Relative fish abundance, in terms of catch per unit effort (CPUE) using gillnets was calculated for 6 of the 10 lakes with sufficiently high numbers of fish. With the CPUE for lake whitefish, cisco, and northern pike being the highest, respectively, in Pitchimi, Margaret and Eva lakes.

Hydroacoustic technology represents a non-destructive means of estimating abundance's and individual biomasses of fishes, and provides a more complete time- and spatial-scale picture of fish distributions within a lake than is possible with gillnets. Fish echo signals (pings) were recorded on digital-audio tapes, and processed and analyzed with the HADAS system at the Université de Montréal. Fish densities were estimated for Margaret, Pitchimi and Wadlin lakes, with Pitchimi having a recorded density 4-5 times that of the other two. Variables found to be of possible importance in determining the structure of fish communities in lakes were lake depth, lake area, and amount of inorganic nitrogen and phosphorous.

This project has contributed information about fisheries in the Caribou Mountains, and thus will serve as a baseline to assess impacts of fire and logging on important fish populations in the region. As importantly, it has determined what watershed characteristics may be important for understanding the size, health, age, etc. of fish populations in regional lakes. Differences in species diversity, abundance's, growth and population structure of fish populations in lakes with burnt and unburnt watersheds was not significant.

This project attempted to understand natural disturbance (Research Legacy 1) and contribute to the development of strategies for sustainable forest management (Research Legacy 2). However, while Celestan Nanooch of the LRRC/TC assisted in this work, no systematic effort was made to document or incorporate TEK that would inform desirable watershed characteristics for fish populations and/or the impacts of fire, logging and other disturbances on fish populations.

Fish Parasites in the Caribou Mountains (1996-97)

Parasites, which occur naturally, can affect the physical and reproductive health of fish. Natural and human disturbances can influence parasite activity in fish. For example, increased nutrient inputs after a fire may result in increases in certain zoo-plankton species, which serve as intermediate hosts for fish parasites. Combined with local knowledge that there has been a decrease in fish populations in regional lakes, Dr. Cameron Goater, Dr. Garry Scrimgeour and Rebecca Baldwin (M.Sc. candidate) of the Department of Biological Sciences, University of Lethbridge, in 1997 undertook a study of the biology and life cycles of fish parasites from lakes in the Caribou Mountains in an effort to:

- Describe the occurrence and densities of parasites in common fish species from lakes in the Caribou Mountains,
- Compare parasite loadings measured in 1996-97 with those described from two previous studies in the 1960s, and
- Assess linkages between parasite loadings and watershed characteristics, including water quality.

A total of 20 common parasites were identified from over 900 fish representing 12 different species. Only one of these, Diphyllobothrium, which was unusually common in the Caribou Mountains, has the potential to infect humans. The occurrence of another parasite, Traenophorus, was high enough in lake whitefish and cisco in some lakes as to make these species unmarketable.

Although no further fieldwork is planned, Rebecca, as part of her thesis, is analyzing data obtained in 1997 to address objectives related to comparing parasite loadings in fish from the 1960s and the impacts of fire on parasite occurrence and densities. This project sought to understand how natural disturbance affects parasitic loadings in fish, and thus was an attempt to address SFM Network Legacy 1 (Understanding Disturbance). While Celestan Nanooch of the

LRRC/TC assisted in the field research, no effort was made to document TEK of fish/parasite interactions and relationships.

The Influence of Water Quality on Macroinvertebrates in the Caribou Mountains (1996-97)

Watershed disturbances, such as fire and logging, may cause changes in the food supply of macro-invertebrates, and thus fish populations at higher levels on the food chain. As water quality research from 1996 suggested that phosphorous concentrations are higher in lakes with burned, as opposed to unburned, watersheds in the Caribou Mountains, Dr. Ellie Prepas with Drs. Garry Scrimgeour and Paul Dinsmore of the SFM Network undertook research to determine if littoral macro-invertebrate densities would also be higher. This research was part of an on-going study of the effects of the 1995 fires on aquatic food webs in the Caribou Mountains. As results from 1996 showed that phosphorus and macro-invertebrate abundance's were approximately twice those of lakes in unburned watersheds, research in 1997 sought to:

- Quantify and compare nutrient and macro-invertebrate abundance's in lakes with watersheds burned in 1995 with lakes having unburned watersheds,
- Compare these data with those collected in 1996, and
- Complete a field experiment to determine which nutrients limit macro-invertebrate abundance.

Bottom-feeding or profundal macro-invertebrates were studied by Dinsmore in an effort to establish their relationships to water quality and physical features of lake basins. Of the 26 lakes measured (nine in the Caribou Mountains), sludge worms, midges, fingernail clams and round worms accounted for over 96% of all macro-invertebrates. A parabolic relationship was found between profundal macro-invertebrate biomass (PMB) and amount of dissolved oxygen such that PMB was low in lakes where dissolved oxygen was either less than 3 mg per litre or greater than 7 mg/L. The most likely explanation for this finding is that, where dissolved oxygen remains above a critical minimum year-round, other factors such as food availability begin to influence PMB. It was discovered that dissolved oxygen concentrations and water temperature explained 37% and 23% of the variance in PMB in the lakes sampled. In contrast to previous studies on unproductive lakes, phosphorus and chlorophyll were not significant predictors of PMB. However, more frequent sampling of PMB and water quality variables, and study of ecological and life history characteristics of macro-invertebrates are needed to improve the predictive power of the above model.

This study, now complete, sought to collect data relevant to understanding the effects of natural disturbance on an important part of the aquatic food system. As such it addressed SFM Network Research Legacy 1 (Understanding Disturbance). Members of the LRRC/TC appear not to have been involved in this research.

Vegetation Mapping and Critical Vegetation Research in the Caribou Mountains (1996-98)

No recent mapping of timber or understory plant species of cultural and potential economic value in the Caribou Mountains plateau has been undertaken by provincial government or forestry interests. Moreover, few studies have addressed the basic ecology of, or the potential impacts of timber harvesting on, these species. In order to conduct impact studies of economically and culturally important plant species prior to exploitation, Leslie Monteleone, a M.Sc. candidate under Dr. Mark Dale, Department of Biological Sciences, University of Alberta, is undertaking mapping and critical vegetation research that will assist the LRRC/TC to take informed management decisions about the Caribou Mountains area.

Mapping in F-10

Work on the Caribou Mountains plateau in the summer of 1997 was a continuation of mapping of the Footner Lake Forest Management Area F-10 begun the previous summer. Delineation of vegetation types for the northeastern portions of F-10 continued during the fall and winter of 1997/1998. Vegetation types were coded following standards set out in the *Alberta Vegetation Inventory Standards Manual* (1991), including code types to indicate locations of potential caribou and bison habitat. Work during the summer of 1997 concentrated on establishing field study plots for the critical vegetation experiments/research, rather than on coding and delineation. Presently, delineation and coding of vegetation types are ongoing, and expected to be concluded by the end of the calendar year. As only two-thirds of F-10 has been delineated and coded to date, it is recommended that the project continue until the whole of F-10 has been mapped to AVI standards.

Groundtruthing, the most expensive component of the project, was conducted for the northeastern portion of F-10 in August 1997. Accompanying Leslie Monteleone were Vern Neal and Bernard DeVries, a University of Regina researcher interested in the relationships between lichen communities and woodland caribou. Vegetation types and anomalies were noted on air

photos as they flew over the area. Several plants growing on an island near Margaret Lake Lodge do not appear to be present elsewhere on the plateau. Also, some lichen and liverwort species on the island appear to grow better here compared to other locations. Two more islands were surveyed to address the above question, with the conclusion that uncommon species, lichen and liverwort populations do not flourish to the extent observed on the "island" beside Margaret Lake Lodge. This suggests that the flora on the island at Margaret Lake Lodge is rather unique and therefore, care should be taken to preserve it.

While much of F-10 was surveyed at least once in the spring of 1997, increased groundtruthing is recommended for 1998 to improve accuracy in coding of vegetation types. Specifically, a remarkable number of disturbances, including seismic lines, well-sites, old airstrips, and fire study plots at Big Fish Lake, were noticed on the air photos and during groundtruthing. Many of these have known dates of disturbance, thus providing good sites for data collection with respect to re-vegetation after disturbance events. Rare plants also provide a focus for future groundtruthing efforts. Alberta Environment is compiling a database for rare or occasional plant species throughout Alberta. One of the species they have listed as rare and in need of further referencing is Polar grass (*Arctagrotis arundinacea*). While groundtruthing in 1996, this species was found in a sedge meadow which was one of the "buffalo meadows" that was under study.

Critical Vegetation Research

Few studies of the basic autecology of individual understory plant species in the boreal forest have been undertaken, and only those of economic value have been studied in any detail. Even fewer studies have addressed the impact of harvesting on potentially important economic understory plants. As it is important to undertake ecological and harvest impact studies prior to commercial exploitation or before preferred habitat is altered by forestry, Leslie is seeking to increase ecological knowledge of four medicinal understory plant species; and to assess the impacts of harvesting them from their natural habitat. The four species, cloudberry, gumweed, kinnikinnick (or bearberry), and valerian, are found throughout the general study area which encompasses Footner Lake Forest Management Areas F-2 through 8 in north-central Alberta. Specific sites were located using air photos and the TEK of LRRC/ TC elders.

Life history information including aspects of germination, growth, reproduction, and habitat niche preference were recorded for each species and compared to previously published scientific studies. Habitat preference was limited to recording site and environmental conditions in the immediate vicinity. Vegetation sampling within each plot was performed to determine common species associations. The majority of the 1997 summer field season was spent, with the assistance of LRRC/TC, establishing study plots for the critical vegetation study. The harvesting study involved setting up two 2×2-m plots for each of the four plant species, with further subdivisions to measure percentage of plant cover and harvesting intensity. Cloudberry, kinnikinnick, gumweed, and valerian plots were established and harvested at varying intervals throughout the summer of 1997. Soil samples were obtained at each site at the time of harvest and site characteristics were recorded.

During the 1998 summer field season, harvest sites will be revisited and re-growth rates recorded. The data will be analyzed to help determine what acceptable percentage of each species can be harvested from a site and still sustain a viable population. Where appropriate, study plots will be re-harvested during 1998 at the same intensities, to gain some measure of the effects of repeated harvesting pressure on the study species and provide more information for developing sustainable harvesting rates. A report on the effects of harvesting on these species, including management recommendations derived from the results, should be completed by the spring of 1999.

Leslie's mapping project provides the LRRC/TC with maps of vegetation types within F-10 that can be used for management decisions. They may also be of potential interest to industry and research institutions. At the same time, the critical vegetation research will allow the LRRC/TC to take informed management decisions regarding the uses and impacts of disturbance on critical understory plants in their region of the boreal forest. LRRC/TC elders and other community members who have lived and worked (hunted and trapped) in the area for decades, including Henry Moberly, Alexis Meenen, Celestan Nanooch and Dominique Habitant, shared their TEK of wildlife and ecosystems relationships with Leslie. These individuals were especially instrumental in finding study plot locations for critical vegetation research. In return, Leslie shared with the LRRC/TC, scientific knowledge and academic skills that may be of value to them in the future. As such, these studies address a number of SFM Network Legacies including understanding disturbance (Research Legacy 1), multiple and cumulative impacts

(Research Legacy 4), and creation of highly qualified personnel (Networking Legacy 1) and partnerships (Networking Legacy 2). However, Leslie's research raises some issues about which the SFM Network should be aware.

Leslie has established an excellent working relationship with the LRRC/TC based on mutual respect and trust, and has stated that each year she learns "an enormous amount of TEK from (LRRC/TC) elders." However, she is somewhat reluctant to divulge what she has learned to others for fear of breaking this trust. Much of the TEK about medicinal plants that LRRC/TC elders have shared with Leslie is regarded by them as proprietary, if not sacred. However, she undoubtedly has obtained, or has access to, non-proprietary TEK that could inform sustainable forest management practices (e.g., local knowledge of impacts of fire, logging and other natural and human disturbances on these plants). However, as her supervisor has told her that TEK is not a part of her research, no effort been taken to design culturally appropriate methods to systematically collect, interpret, and use or apply non-proprietary TEK. As a consequence the potential contribution of TEK to non-timber aspects of sustainable forest management has not been realized. While it is hoped that Leslie will be able to address these issues in the future, they are of fundamental importance to SFM Network objectives. Researchers working with Aboriginal people and TEK must have an adequate grasp of the issues and challenges that confront this type of research. If they do not, there is a very real possibility that TEK will be devalued in the eyes of some stakeholders in the boreal forest.

Effects of Watershed Disturbances on Water Quality and Plankton in the Caribou Mountains (1996-98)

Studies elsewhere in North America have indicated that nutrient concentrations, primarily nitrogen and phosphorus, increase in lakes within burned watersheds after fire. This, in turn, may result in an increase in aquatic plant densities and biomass, which may affect fish and people who depend on aquatic ecosystems. The effects might be positive, as for example when increased nutrient loading in unproductive lakes results in increased phytoplankton and plant growth. Alternatively, they may be negative, as in the case of already productive shallow lakes where increases in decaying matter may strip deeper waters of dissolved oxygen resulting in the winterkill of fish under the ice.

As the 1995 fire in the Caribou Mountains may have caused substantial increases in nutrient concentrations in some lakes, and in recognition of the fact that knowing how fire

affects watersheds is important for sustainable forest management, Preston McEachern, Ph.D. candidate under Dr. Ellie Prepas, Department of Biological Sciences, University of Alberta, designed a research study to quantify the effects of this natural disturbance process on water quality and aquatic life in the Caribou Mountains. Preston's major objectives were to:

- Identify relationships between watershed characteristics and nutrient content of lakes;
- Build predictive models that relate the extent and timing of watershed fire disturbance to water quality and fish;
- Determine what water quality aspects are of concern to LRRC/TC FN; and to
- Develop a co-operative management approach to managing water resources combining TEK and science.

With the assistance of Celestan Nanooch, research in 1996/97 focused on a several lakes representing a wide range of productivity as measured by nutrient concentrations and algae biomass, which is known to be dependent upon the amount of phosphorus in the water. However, while research in 1996 indicated this to be true for Margaret Lake, the amount of algae in smaller lakes did not seem to be controlled by phosphorus. Limited research in 1997 revealed that this might be due to light penetration into the water column and also to nitrogen limitation. Moreover, while blue-green algae is known to increase in lakes with high nutrient concentrations after fire, algal toxin concentrations were found to be extremely low.

Research in 1997 sought to undertake more frequent sampling of lakes so as to identify true differences between lakes and to produce a better data base to build predictive models explaining how fire in watersheds affects water quality. This research also sought to determine if water quality as measured in 1996 was recovering by 1997. For the first time, streams were also sampled and a LRRC/TC assistant, Rod Blesse, was hired in 1997 in order to exchange knowledge and ideas about the value of lakes and water quality to Aboriginal people. The volumes of lakes were also measured in order to calculate nutrient loadings.

This increased sampling effort allowed greater precision in interpretation. Whereas phosphorus and nitrogen concentrations were significantly higher in burned lakes compared to reference lakes, algae biomass did not increase because of limited light availability owing to dissolved organic matter from peatlands which gives water a dark-brown colour. The fact that nitrogen limitation of algae increased in burned lakes is a concern for management as this may cause future occurrences if toxin-producing blue-green algae. Research results also indicated that the impacts of the 1995 fire on water quality have not abated after two years. Total phosphorus concentrations remained the same between 1996 and 1997, and nitrate and ammonium

concentrations in burned lakes actually increased. The presence of melted permafrost and increased decomposition may mean that fire effects will be felt for many years in the Caribou Mountains.

In 1998 Preston plans to undertake a research experiment based on monitoring stream water quality before and after timber harvesting. Sampling stations will be set up on two streams between the Caribou Mountains plateau and the Peace River in order to gather pre-treatment and post-treatment data needed to measure the impacts (export of nutrients and natural chemical changes) of timber harvesting on water quality. Preston will also sample water from the Wentzel River, upstream of a proposed timber harvesting area, to collect pre-treatment information on water quality that can also be compared with those data already gathered from lakes in the Caribou Mountains.

Another component of Preston's work will focus on the TEK and values that the LRRC/TC possess with respect to water use and quality. In 1997 Preston established very good working relationships with the LRRC/TC based on mutual respect of each other's backgrounds and needs. Subsequently, there was a transfer of knowledge and expertise from both sides. This summer Preston plans to work LRRC/TC TEK holders to record community perceptions of water quality (e.g., what characteristics are essential from an Aboriginal perspective to maintain an acceptable level of water quality) and past impacts of fire and human disturbance on water quality.

This project, which is the only one of its kind in Alberta to address the effects of fire on water quality in the boreal forest, is an important contribution to the objectives of the SFM Network. Specifically, it addresses Network Research Legacies 1(Understanding Disturbance) and 2 (Strategies for Sustainable Forest Management), and both Networking Legacies (Highly Qualified Personnel and Partnerships). It is hoped that with proper guidance and support from the Network, Preston will be able to effectively incorporate Aboriginal people and their knowledge into the development of practices for sustainable forest management.

Garden River Moose Survey Research Project (1997-98)

Fluctuating water levels related to the Bennett dam, increased industrial pollution of the Peace River and its tributaries, loss of traditional waterfowl hunting habitat to cropland, and declining caribou and bison populations have increased the dependence of the Little Red River

and Tallcree First Nations (LRRC/TC) of north central Alberta on moose. Moose, always a highly valued species, is now the major source of local protein for the LRRC/TC community of Garden River. In addition, the moose has deep spiritual and social meaning to the LRRC/TC; the hunting and sharing of moose creates important bonds among community members, and to the land itself.

A growing Aboriginal population, combined with industrial interest in the forest and increased hunting by licensed hunters, prompted the LRRC/TC to begin collecting local knowledge and scientific information about moose that could be integrated into a management plan. As moose management in Alberta does not include harvest data from the Aboriginal hunt, the resulting underestimate of annual harvest by present management agencies may result in moose populations being hunted below sustainable levels. Indeed, the province's total moose population has apparently declined from an estimated 250,000 in 1974 to only 90,000 in 1990.

Concern over moose lead the LRRC/TC to enter into an arrangement with the Cynthia (Cindy) Pyc, a Masters student at the University of Calgary under the direction of Michael Robinson of the Arctic Institute of North America, to undertake research that would help:

- Determine if current moose harvests in the Garden river area are sustainable;
- Develop a framework for co-management of moose hunting in the region;
- Promote cross-cultural communication and understanding between Aboriginal people and other stakeholders in the sustainable use of moose.

A total of 22 LRRC/TC men, representing 41% of the potential hunters in the community, were interviewed in the late spring and early fall of 1997, the last during a moose hunt in which Cindy participated. Issues relating to the overall number of moose and ratio of males to females taken, current and former areas where were moose were hunted, and generational differences in traditional ecological knowledge (TEK) were addressed, as were opinions concerning current regulations and management practices. In addition, TEK of moose ecology, life history, habitat preferences and hunting techniques was obtained. For example, Cindy learned from the elders where, when and why moose move to/from different habitats; how to tell the age and sex of moose from their tracks; when and why certain types of moose are preferred over others; and why hunters sometimes choose not to kill moose when encountered in the bush (e.g., to let the nursing calves grow).

This knowledge will be integrated into a co-management framework being developed by Cindy as part of her thesis. However, for the time being, the results of the interviews have been

compiled into a community report, “Hunting in the Bush is Our Culture”, which contains aspects of TEK and community development issues not directly pertinent to Cynthia’s thesis. This report provides many interview quotes as well as the context for them, making it accessible and useable to both community members and non-local stakeholders. It also identifies and discusses issues, while forwarding recommendations for the community to act upon. Some of the more general recommendations include ongoing collection of moose harvest data, expansion of the survey to John D’Or and Fox Lake, and the training of a community member take the lead role in conducting the interviews and managing the data.

The Garden River Moose Survey, now complete, complements a number of SFM Network’s objectives. In particular, the documentation of TEK about moose behaviour, seasonal movements and habitat, in addition to the generation of harvest data needed to manage moose hunting, addresses using alternative social institutions to foster sustainable forest management (Research Legacy 2: Objective 5), and developing effective methods of public involvement or inclusion of peoples in resource management decision-making and governance (Research Legacy 2: Objectives 6). Just as importantly, Cindy’s efforts to involve Andrew Nanooch, Celestan Nanooch, Paul Tallcree, Augustine Tallcree, Brendon Nanooch, Ernest Kaskamin, Dorthy Shupac, and Ambrose D’Or, not only as research subjects, but as researchers, are important steps towards creating highly qualified personnel for sustainable forest management (Networking Legacy 1) and effective partnerships (Networking Legacy 2). What is missing, and what was not part of Cindy’s research, was the documentation of TEK about the impacts of natural (e.g., fire) and human (e.g., logging) disturbances on moose and moose habitat. Such knowledge will be especially crucial for managing impacts on moose habitat in the context of sustainable forest management in this region. Fortunately, just such a project is being proposed as part of this year’s research (see 1.11).

Environmental Health Concerns of the Little Red River & Tallcree First Nations (1997-98)

The transition to reserve life and the loss of the traditional economy has left many Aboriginal people in Canada’s boreal forest feeling lost and hopeless, unsure about their identity or purpose in life. As a result, problems related to alcohol and substance abuse have become serious concerns for the LRRC/TC. The LRRC/TC decided to undertake research, in collaboration with Natasha Blanchet-Cohen under the direction of Drs Philippe Grabbe and

George Haas of the Institute for Research on Environment and Economy (IREE) at the University of Ottawa, to focus on the socioeconomic upheaval that has resulted from the establishment of reserves. The purpose of this study was to:

- Identify and present key components of environmental health for the LRRC/TC;
- Draw the environmental health portrait of three generations of men, identifying patterns and determinants; and to
- Put forward recommendations for increasing the number of people who are able to manage and adapt to life within the reserve environment.

Men were targeted specifically in this study. Although men and women of all ages have deeply been affected by the change in livelihood resulting from settlement on reserves, men's roles and sense of worth in the community have been shaken more than those of women. One sees this in the fact that a higher number of women are pursuing formal education, and are more likely to maintain steady employment. It is the women who appear to be coping better in today's changing world.

As a basis for this study, it was assumed that a person's ability to manage or adapt to his/her environment was identified as a key determinant of their health. Standard mental health indicators, such as drinking habits and suicide attempts, were signs of someone not coping with their environment. LRRC/TC elders and other community members played an active role in defining research objectives and guiding the study. Given the sensitive nature of the study topic, the project did not go ahead without the full support and understanding of the community. Once support was received, Natasha provided technical support for two community residents, Mona Dumas and Fern D'Or, to participate in conducting and assessing 150 interviews.

Approximately 25% of the male population above 18 years old were interviewed in three age categories: 18-30, 31-44 and >45 years old. Special care was taken to obtain a representative sample from each of the three communities surveyed. Questions dealt with time spent on the land in traditional pursuits, employment history and level of education, as well their opinions on future prospects for themselves and the community. In order to classify men as to the extent to which they were able to manage their environment, three categories of connectedness were identified:

1. Those men coping successfully with reserve life,
2. Those attempting to cope, and
3. Those drifting (not coping).

Results of the study indicated that men older than 45 years are the most well adjusted (healthy) of the three generation. Although they have been deeply affected by the transition to year-round life on the reserve, having spent their childhood in the bush equips them with an inner strength. While men above 45 succeed in coping, this is not always the case for their children. Children born during the transition towards reserve life have had difficulty adapting to the new lifestyle. Many are not content or at peace. Amongst men below 45, approximately equal proportions were classified as managing, attempting to manage, and drifting. Based on the interviewees and other community members, three areas were identified as critical to the health of the LRRC/TC Nation:

1. Reduction of alcohol consumption;
2. Creation of meaningful employment opportunities; and
3. Encouraging individuals to improve their formal education.

Although the decision to take control of one's life is a personal one, employment was identified as a key source of connectedness for improving environmental health of young men. As such, this research is now being used by the LRRC/TC to create employment prospects for their young men in the forest industry. By obtaining forest tenures from the province and reaching agreements with forest companies with respect to the sustainable utilization and management of the forest, the LRRC/TC have developed an economic plan which would employ over 200 young men who are now attempting to engage, but cannot due to lack of skills, training and resources. Unfortunately, while the LRRC/TC has received support from industry and the province, they have yet to receive federal government support for seed funding to make this dream a reality.

The research for this project is now complete. It has addressed SFM Network objectives by:

- Focusing on First Nations aspects of social and economic sustainability in Canada’s boreal forest (Research Legacy 2: Objectives 4 and 5)
- Developing skills and knowledge among both graduate students and Aboriginal people to address the complex realities of social and economic sustainability in Canada’s boreal forest. (Networking Legacy 1).

Developing Culturally Appropriate Sustainable Tourism in the Caribou Mountains (1997-99)

The LRRC/TC have experienced many changes over the centuries. Even so, their connection with the land remains integral to their culture and identity. Whether this connection is reflected in the LRRC/TC tourism plan, which was developed in the late 1980's, is a matter of interest; this plan indicated the LRRC/TC's desire to shift from consumptive (i.e., hunting and fishing) to non-consumptive tourism activities for the region, without compromising their cultural values and way of life.

Eco- and cultural tourism are forms of non-consumptive tourism that have become popular in recent years. A natural setting, such as the Caribou Mountains which is a unique subarctic wilderness, that offers a choice of activities is an important element in a successful eco-tourism experience. Development of successful eco-tourism experiences in cross-cultural settings also require consultation and collaboration. In this process, it is not uncommon to diverge from the goal of creating sustainable tourism opportunities to focus on other issues. This was the situation encountered by John Colton, Ph.D. candidate under Dr. Tom Hinch, Department of Physical Education and Recreation, University of Alberta.

As Margaret Lake Lodge, owned and operated by the LRRC/TC, has not operated at capacity for several seasons, the focus of John's study was drawn toward examining the market potential of the lodge and the available eco-tourism and recreational opportunities in the region. Both, however, are required to assess the level of support for tourism development and to establish a strategy for tourism development in the Caribou Mountains. Analyses of existing studies on eco-tourism market potential in the region produced promising results. At the same time, the Caribou Mountains appear well suited to provide a variety of eco-tourism and cultural tourism opportunities, including:

- hiking
- wildlife viewing and bird watching
- fishing and camping adventures
- subarctic/boreal wilderness treks
- boating/canoeing adventures
- sight-seeing flights
- conferences and retreats
- winter visits (ice fishing, trap-line visits, snowmobile touring, and cross-country skiing).
- cultural knowledge camps
- visit to a trappers cabin

- industry cross-cultural tours

While it is evident that eco- and cultural tourism opportunities exist in the Caribou Mountains-Lower Peace region, and that impending industrial activities may impact their development, John has considered several related issues. These include the commodification of culture, whereby cultural knowledge/experience is exchanged for economic gain. In order for the local community to decide, and maintain control over, what parts of their culture will be commodified and incorporated into the eco-tourism experience, John has formulated a number of research questions that attempt to address this issue. Also being addressed, in conjunction with the LRRC/TC, are issues relating to infrastructure, staffing, and capacity-building. Finally, John is also asking questions relating to whether proposed resource developments for the region (e.g., logging and mineral, oil and gas exploration) are compatible with eco-tourism experiences, and whether there is support in the community for this type of tourism.

Due to be completed by the end of this calendar year, this project touches on issues relating to SFM Network Research Legacy 4 (Multiple and Cumulative Impacts), and Networking Legacies 1 (Highly Qualified Personnel) and 2 (Partnerships).

Reconstruction of Holocene Fire Chronology in northern Alberta and Saskatchewan (1997-99)

Forest fire and associated vegetation disturbance and recovery form a natural cycle within the boreal forest ecosystem. Current forest harvest practices within the boreal forest may be improved by a better understanding of past climate/fire/vegetation relationships. One way to determine the frequencies and intensities of past fire disturbances is to examine the charcoal, sediment and pollen deposits that accumulate in discrete annual layers on the bottom of lakes. This field of study is known as *paleolimnology*. Sediments are deposited annually in lake bottoms as laminations, which can be used as indicators of age, similar to the way tree rings are used. Forest fires produce large amounts of charcoal particles, which make their way into these sediments. Counting the number of laminations containing charcoal provides estimates on the frequency of fire events in the past, while charcoal particle sizes offer insight as to the proximity of a fire to the lake. Mineral grain composition in the sediment is related to fire occurrence as mineral matter inputs into lakes increase after tree roots are burned. Pollen from terrestrial vegetation is also deposited in the sediments and can be identified to species. Fossil pollen

records provide a valuable database of past plant communities and how each species responded to fire disturbance.

Consistent sediment preservation with time provides an extremely valuable for reconstructing past environmental changes. However, certain conditions are necessary for this to happen. These occur at several lakes in the southern Caribou Mountains. Arlene Collins, a Ph.D. candidate in the Department of Earth and Atmospheric Sciences at the University of Alberta under the direction of Dr. Ian Campbell, analyzed sediment cores from Fleming Lake, in particular. This research has provided data on the fire history of the Caribou Mountains and on the Holocene of northern Alberta in general. The objective of this project was to reconstruct the fire chronology of the Caribou Mountains for the last 2000 years. Preliminary analyses of samples from the upper layers of Fleming Lake sediment showed them to be almost charcoal free. The layer immediately above contained numerous woody charcoal particles and charred beetle fragments, which probably accumulated during the 1995 burn year.

Cores from Fleming Lake were taken in February 1998, and another will be collected during the winter of 1998/99. Laboratory analyses will begin during the summer of 1998, which include examining representative laminations for pollen, charcoal, mineral composition, magnetic susceptibility of the minerals, carbon content and geo-chemical analyses of the water among the sediment particles. This summer, Fleming Lake will be sampled for suspended sediment in the water column to determine settling rates of particles and the diversity of particles that are entering the lake from the surrounding land, as well as pH levels, temperature, oxygen content, and pollen deposition patterns on the lake bottom.

By reconstructing recent and Holocene fire chronologies, this project develops an understanding of how the intensity, frequency and size of natural disturbances shape forest structure and landscape pattern in a particular region of Canada's boreal forest (Research Legacy 1: Understanding Disturbance). However, it appears to have under-utilized a key source of knowledge and information that would assist in this endeavour, i.e., the knowledge of LRRC/TC elders about the frequency, intensity and size of past fire events, and their impacts valued forest resources. While this knowledge may not extend back for more than 150 years, it is likely to contribute specific information relevant to interpreting lake cores from this time period, and to extrapolating these interpretations to broader spans of time. In other words, this refined

chronology could perhaps be used to inform patterns and sequences in core samples covering much longer time periods.

As Aboriginal knowledge of fire chronologies and their impacts on valued ecosystem components in the boreal forest has, to date, been an under-utilized tool in the SFM-Network's attempt to understand natural disturbance, a TEK project is being proposed for this year. A member of the LRRC/TC First Nation will be retained to assist Arlene in collecting samples on-site and then analyzing them in the laboratory. In so doing, s/he will gain capacity in this field as well as the specifics of Arlene's data. At the same time, this individual will work closely with Dr. Marc Stevenson to develop a research design to document LRRC/TC elder knowledge of fire history and impacts.

This project contributes directly to SFM Network objectives by undertaking scientific and TEK research that will shed light on the fire chronologies and the impacts of fire in the Caribou Mountains region of the boreal forest (Research Legacy 1: Understanding Disturbance). In addition, the exchange of knowledge and expertise that will most surely take place between Arlene and her LRRC/TC assistant complements SFM Networking Legacy 1, developing highly qualified personnel.

Effectiveness Study of the Caribou-Lower Peace Cooperative Planning Board (1998-99)

A new project developed under the SES theme for 1998 entails evaluating the recently created Cooperative Forest Management Planning Board in the Caribou-Lower Peace Special Management Area. Directed by Dr. Naomi Krogman, and assisted by Leslie Tereseder (Masters candidate), Department of Rural Economy, University of Alberta, this project is an attempt to evaluate the effectiveness of the partnership formed by the LRRC/TC, Daishowa-Marubeni International Ltd. (DMI), Footner Forest Products Ltd., Alberta Environmental Protection, the Municipal District of Mackenzie, and Wood Buffalo National Park to achieve cooperative management of the Caribou-Lower Special Management Area. Part of a larger mandate of the Alberta Provincial Government to develop memorandum's of understandings (MOUs) with First Nations to achieve cooperative forest management, this co-management board has yet to meet or take any cooperative decisions because of two recent developments:

1. DMI has postponed indefinitely it's plans for a $950 million expansion of it's Peace River pulp mill operations, and

2. The LRRC/TC are in the process of developing an MOU with the Province to reallocate the "wood basket" in light of the above, and to develop an institution to take on the responsibility to cooperatively manage disturbance and impacts in this special management area.

Consequent to DMI's reduced role in timber harvesting and milling in the area, the Province will likely re-negotiate its Forest Management Agreement (FMA) with DMI. Thus, the constitution and composition of the Planning Board will depend on re-allocations of timber resources to industry and First Nations, and nature of the MOU between the LRRC/TC and Province of Alberta. In the interim, Dr. Krogman and Leslie Treseder will:

- Monitor the success of the MOU between the LRRC/TC and Province with respect to its ecological, social and economic sustainability aspects, and
- Assess the effectiveness of the adopted cooperative planning and management process and Planning Board actions.

Another important component to this project involves working with a First Nation researcher to increase local capacity to address a host complex social, economic and political issues confronting Aboriginal peoples' effective participation in cooperative forest management. More directly than another SFM Network projects in the Caribou Mountains-Lower Peace region, this two year study addresses Research Legacy 2 (Strategies for Sustainable Forest Management), and specifically SFM Network Objective 5 (Using Alternative Social Institutions to Foster Sustainable Forest Management).

Caribou Mountains Critical Wildlife/Habitat Integrated Research Project (1998-99)

The southeastern escarpment of the Caribou Mountains is currently slated for oil/gas exploration (1999?), mineral exploration (1998) and logging (2001). This virtually undisturbed area of northern Alberta appears to contain critical habitat for bison, caribou and moose, each of which is of particular concern to the LRRC/TC. However, little knowledge has been documented about what habitats are critical for these species, and at what times of the year. Drs. Milton Freeman (Department of Anthropology) and Robert Hudson (Department of Renewable Resources) of the University of Alberta have recently submitted a proposal to develop a study, in concert with the LRRC/TC, to document local knowledge about the seasonal distributions, movements and critical habitats of these species prior to industrial disturbance. Tanja Schramm, a Ph.D. student under Dr. Hudson, has been identified to undertake a substantial portion of the TEK research with the LRRC/TC elders. At the same time, TEK relevant to assessing the impacts of fire and other natural disturbances on these species will be documented. Aboriginal

people and their observations will also assist in assessing the individual and cumulative impacts of the industrial activities during and subsequent to disturbance. Finally, literature reviews concerning the TEK of 1) moose, caribou and bison in other boreal regions, and 2) impacts of natural and human disturbances on their patterns of movement and behaviours will be undertaken to provide a comparative framework for this research.

A methodology will be designed with the LRRC/TC to document and represent TEK in a culturally appropriate manner. Knowledge gaps and testable hypotheses generated from this research will be addressed by graduate students having backgrounds in biology, ecology and/or botany. Aboriginal and graduate student researchers participating in the TEK and science-based phases of research will gain expertise and capacity to undertake and integrate both types of research in ways that maximize the contributions of each to sustainable forest management. The combination of TEK and scientific knowledge will also be used practically to inform decisions taken by the Caribou Mountains/Lower Peace Cooperative Planning Board concerning resource use prioritization and cumulative impact assessments. As such, this project will assist the SFM-Network, and Dr. Naomi Krogman in particular, to evaluate the effectiveness of the Board in developing and implementing sustainable forest management practices.

Methods by which to incorporate TEK into forest planning and practices are poorly developed. This project will assist the SFM-Network to develop models for and approaches to integrated research projects that attempt to realize the potential of contributions of Aboriginal people and their knowledge to sustainable forest management. As a multidisciplinary effort, this project will address a number of other SFM-Network Research Legacies, including understanding natural and human disturbances (Research Legacy 1), developing strategies and methods for sustainable forest management (Research Legacy 2) and understanding multiple and cumulative impacts (Research Legacy 4). In addition, it provides an excellent opportunity to develop highly qualified personnel from academia as well as the Aboriginal community (Networking Legacy 1), and to develop effective partnerships with First Nations communities (Networking Legacy 2).

OTHER SFM NETWORK FUNDED FIRST NATIONS RESEARCH

SFM Network researchers have undertaken a number of other projects involving Aboriginal peoples in northern Alberta, Northwest Territories, and Quebec (Map 2), including the:

- Dene Tha', Alberta
- Whitefish Lake First Nation, Alberta
- Cree communities in Treaty 6, 8 and 11 areas
- Metis communities, Alberta
- Gwich'in Dene First Nation
- Attikamek First Nation

Some of these projects are components of, and ancillary to, larger projects addressing broader socio-economic issues within a multi-cultural context, as a group of projects they cover a range of Aboriginal issues in the boreal forest including:

- Co-management
- Traditional knowledge
- Aboriginal health

Co-operative Forest Management and the Whitefish Lake First Nation (1995-99)

In 1994 the Whitefish Lake First Nation (WFLFN) signed a co-operative management agreement with the Alberta government, the first of its kind in Alberta. Subsequently, an implementation plan for this agreement was developed in 1995/96 with the assistance of Michelle Ivanitz, under Dr. Cliff Hickey of the Canadian Circumpolar Institute (CCI), as part of her Ph.D. research. This implementation plan outlined various components required to achieve co-operative forest management between the province of Alberta and WFLFN. In 1996-97, WFLFN and the Canadian Circumpolar Institute jointly submitted a proposal to:

- Develop a specific research process to carry forward the Implementation Plan, and
- Provide an additional increment of Aboriginal, government, industry and university cooperation to indicate the viability of this kind of partnership in land-use planning and the development boreal forest resources.

Four basic steps were identified by the WFLFN to ensure effective planning for the use of the forest:

1. Creation of a comprehensive information base required to evaluate the needs/issues of the First Nation;
2. Formulation of short and long-term objectives related to the planned development of the FMA;
3. Identification of activities required to achieve objectives; and

4. Execution of activities and evaluation of results.

With the assistance of David Natcher, a Ph.D. student under Dr. Cliff Hickey, this joint partnership sought to document traditional and current land-use and occupancy in S-9 Forest Management Unit, and to merge this information with GIS (geographical information systems) technology in order to facilitate sustainable forest management decisions. To obtain as complete a picture as possible of First Nations land-use and occupancy, studies were initiated inventory and map critical habitats for valued forest plants and animals, archaeological and cultural heritage resources, traplines, hunting, fishing and berry-picking areas, non-renewable resource locations, non-timber values of the forest, etc. This research was overseen by the Whitefish Lake Elders Advisory Council, which served as a steering committee throughout the development and duration of the project, including the design of research protocols and methodology. From the information obtained in the interviews, individual map biographies representing the respondent's lifetime involvement on the land were created. From these maps, a composite map showing collective patterns of land-use was produced. Composite maps of various categories (as listed above), represent an initial account of the traditional and contemporary land-use of the WFLFN. As a result, an impressive database on these and other subjects of concern to the WFLFN has been created. In fact, as a consequence of this research, the cooperative FMA between the province and WFLFN has been expanded to include fisheries, wildlife and heritage resources.

Another aspect of research centred on the documentation of non-market values of forests and value differences between men and women who use the forest. Whereas Natcher's research attempted, in part, to address non-timber values of the forest, a literature review of gender issues in cooperative forest management was initiated. While this research has not yet completed, CCI has plans to continue and expand it in 1999, conducting interviews with community elders and women.

The SFM Network funded research that has been undertaken by CCI in collaboration with the WFLFN is an excellent example of the type of partnerships that can be built and the kinds of products that can be produced in order to achieve sustainable forest management. This project empowered WFLFN representatives to incorporate TEK into an automated land management system, thus enabling them to make informed decisions with government and industry partners about the use, health and sustainability of local resources, while considering the socio-cultural concerns of community residents. Even though the de-contextualization of TEK

through its rendering into GIS and the incorporation of TEK into cooperative forest management remain formidable challenges to First Nations, this project has contributed substantially to SFM Network Research Legacy 2 (Using Alternative Social Institutions to Foster Sustainable Forest Management) and Networking Legacy 1 (Highly Qualified Personnel) and 2 (Developing Effective Partnerships). In particular, there has and continues to be a general and reciprocal transfer of awareness, understanding and capacity vis-à-vis sustainability issues, cooperative management, and research.

Environmental Research Design and Cree Traditional Knowledge (1996-98)

An increasing demand from Aboriginal communities and local governments for research-based environmental information has developed in recent years. However, problems concerning access to high quality research resources and their interpretation have arisen in many contexts. Dr. Carl Urion with Ralph Makokis and Walter Lightning (Ph.D. candidates) of the Department of Anthropology, University of Alberta , initiated a two year project to document patterns of Aboriginal access to research resources and to articulate a Cree knowledge-based perspective on environmental research processes in the creation of a model research design. Focused on communities in the Treaty 6, 8 and 11 areas, the research involved:

- A survey of over 250 researchers and aboriginal clients in order to determine perceptions of research access, quality and utility;
- Comparative evaluation of research use by eight Aboriginal communities/organizations;
- Articulation of Cree organizational principles for conducting environmental research in boreal forest based on a year-long study with Cree elders, and a study of TEK applied to current issues analytic methods of discourse analysis, ethnographic semantics, and traditional narrative;
- Creation of model research design for either environmental impact assessment or audit of a specific site; and
- Workshop presentation of results and invitation to critique findings and model.

One of the major and unexpected findings of this research has been the need to conceptualize health in terms that are neither mechanistic nor particularistic, but which incorporate particularistic observation of linear relationships in a larger, dynamic descriptive framework. This study addresses Research Legacy 2 (Strategies for Sustainable Forest Management), and specifically SFM Network Objective 5 (Using Alternative Social Institutions to Foster Sustainable Forest Management).

Community Health Through Traditional Knowledge (1996-97)

It is firmly established that the health of First Nations in Canada is significantly below the national average. Although the reasons for this are varied, federal attempts to remedy this situation by injecting more money into health care, especially in remote northern communities, have failed to produce results, largely because attempted solutions are culturally inappropriate and frequently involve greater disruption for individuals and communities already experiencing significant stress and change. Part of the solution may be to utilize the underground network of traditional healers already in place in northern communities who have received holistic training to deal with the interaction of social, psychological, spiritual and environmental/physical factors that influence health. However, there are significant challenges to using traditional healers and their knowledge for the benefit of northern Aboriginal communities, including lack of local confidence in the efficacy and safety of traditional medicine and healing practices. In order address this issue Dr. David Young and Craig Candler (M.A. candidate) of the Department of Anthropology, University of Alberta, undertook a study in the Wabasca-Demarais community of northern Alberta to document:

- Attitudes of community members toward traditional healing knowledge and practices;
- Whether or not community members wish to see traditional healing incorporated into the health transfer program currently being negotiated;
- Perceptions of community members about the impacts of logging and other extractive activities on the health of the community, and;
- Ideas about what can be done to ameliorate the negative impacts, and to amplify the positive impacts, of logging.

The project initially encountered resistance from the local Pentecostal faction who viewed traditional medicine as the "work of the Devil." However, opinion slowly began to shift and research was soon permitted on-reserve. Out of this initial research, a focus group of respected elders was formed to oversee three programs for the second year of work:

1. Reconciliation between warring factions (i.e., the traditionalists and Pentecostals), in the community.

As a community cannot be healthy until it is whole, the researchers took the position that being traditional and modern are not contradictory since traditional values can provide the basis for screening out harmful influences and adopting progressive strategies. In brief, a healthy northern Aboriginal community must be based on traditional values, knowledge and structures if it is to have a sense of identity which will enable it to survive in a modern world. Young and Candler

thus provided assistance to the group of elders in order to facilitate and operationalize a policy for traditional health practice.

2. Transmission of traditional knowledge

If a community is to regain a clear sense of identity based on traditional values, knowledge and structures, it is not enough to document tradition; it must be passed on to succeeding generations. One way of doing this is to work with local educational authorities to incorporate more traditional content in school curricula, which Young and Candler are pursuing.

3. Cooperation between Indigenous and Western Scientists

In addition to seeking greater community health through healing internal divisions and promoting the revitalization and transmission of traditional values and TEK, it is important to ensure that this knowledge plays a role in management decisions. A major concern encountered in the community was that, while industry professes an interest in TEK, western scientific knowledge and its practitioners usually wind up "calling the shots." Young and Candler have proposed to hold workshops that seek to identify overlaps between the two knowledge systems and to explore these common understandings in a way that encourages genuine cooperation of indigenous and western scientists in developing sustainable forestry practices.

The traditional health and TEK aspects of this project address SFM Network Research Legacy 2: Objective 5 (Using Alternative Social Institutions to Foster Sustainable Forest Management) and Networking Legacy 2 (Developing Effective Partnerships), as do efforts to explore and address community health and factionalism in the contexts of the loss of tradition and the expansion of the Judeo-Christian /capitalist-industrial complex.

First Nations Community Development and the Mennonite Centre Committee (1996/97)

Non-government organizations (NGOs) frequently operate more effectively and economically in northern and remote settings in Canada than government agencies. A case oft cited in support of this assertion is that of the Mennonite Centre Committee (MCC). The Native Concerns Branch of the MCC has placed community development workers in several northern Aboriginal communities. Dr. Rod Wilson of the Department of Anthropology, University of Alberta, has undertaken an examination of the efficacy of the MCC to respond to specific needs of multiple communities in the boreal forest. As part of larger multi-disciplinary proposal

submitted by the CCI under Dr. Cliff Hickey, this research has only indirect relevance to SFM Network Research Legacy 2 (Strategies for Sustainable Forest Management).

Sustaining Boreal Forest First Nation Communities: Exploring Alternatives (1996-98)

A diverse team of researchers, under Michael Robinson of the Arctic Institute of North America (AINA), is undertaking research with the Dene Tha' of northern Alberta and other First Nations to explore alternative forms of tenure which respect and reflect First Nations traditional values, beliefs and activities. In partnership principally with the Dene Tha', but also the Waswanapi Cree of Quebec, the Dene Cultural Institute and the Slavey community of Ft. Providence, AINA originally proposed a number of components under this project:

- Evaluation and analyses of partnerships formed to document traditional land-use and occupancy and to manage data arising from such studies (e.g., GIS), with an emphasis on evaluating the extent to which TEK is integrated with scientific views and the extent to which traditional lifestyles and economies can be preserved in planning for forest management (Joan Ryan, Brenda Baker, Mike Robinson, Monique Ross and Tracy Campbell);
- Exploration of the theoretical and ethical issues and ramifications of collecting TEK, and of the Aboriginal values and belief systems on which perceptions of the forest and its uses are held with an eye towards identifying conflicts and congruencies (Dr. Luc Bouthillier and Joan Ryan);
- Fieldwork to focus on the TEK of uses and roles of fire in environmental stewardship (Dr. Luc Bouthillier and Joan Ryan);
- Development of training plan for two Dene in small business and marketing (Mark Dickerson, Tracy Campbell and Karim-Aly Kasam);
- Evaluation of ALPAC Aboriginal Program (Dr. Luc Bouthillier and Jamal Kazi); and
- Analysis of case studies of selected community based management institutions in order to develop framework greater participation of communities in forest management (Dr. Luc Bouthillier and Monique Ross).

The main thrust of the AINA project – the study of alternative co-management structures and appropriate forest tenure models that meet both community and industry needs while using TEK to inform decision-making about sustainable forestry – continued with the Dene Tha' First Nation and Russian Sami Association of the Kola Peninsula into 1998/99. The Dene Tha' "Process for Consultation" and the "Murmansk Oblast Duma Co-management Initiative" are being followed with the input of Cindy Pyc and Fiena Grace Chambers. This research is linked with work undertaken by Dr. Luc Bouthillier and Martin Pelletier with the Waswanapi Cree. Research by Monique Ross on participatory mechanisms, such as co-management regimes, will

continue to focus on the legal implications of these alternatives. Critical questions that AINA is continuing to address are:

- What are the best means for including TEK in community-industry resource referrals?
- Is GIS an appropriate tool for the integration of TEK into boreal forest decision-making?
- How are mutually accepted trade-off's best developed when bush economy resource use and industrial forest harvesting plans conflict?
- Is the continuance of the bush economy a true criterion of forest sustainability?
- Can co-management develop in the absence of clear recognition of Treaty and Aboriginal rights?
- What are the changes needed in forest legislation to accommodate both the bush economy and industrial forestry, and to implement Treaty rights?

The three presentations, numerous publications (two peer-reviewed publications and five contributions to two books), two workshops and other contributions (Dene Tha' land-use atlas, one completed Masters, etc.) by AINA based on this research are substantive products from this project. However, perhaps more than any other research undertaken to date, this project asks questions and confronts issues integral to SFM Network Research Legacy 2 (Using Alternative Social Institutions to Foster Sustainable Forest Management). Moreover, in developing an effective partnership with the Dene Tha', it has addressed SFM Networking Legacy 2.

Human Health and Boreal Forest Management (1996-99)

Dr. Tee Guidotti, with the assistance of Dr. Nancy Gibson and Molly Turnbull (Ph.D. candidate), University of Alberta, is undertaking research in three areas relating to human health and boreal forest development in northern Alberta:

- Population Health
- Occupational Health
- Climate Change and Human Health

Whereas occupational health studies do not have a direct link to Aboriginal communities, more germane is the research being conducted on the impacts of climate change on human health in the boreal forest. Specifically, understanding how climate change and human health interrelate will assist Aboriginal communities support and plan for sustainable economic and ecological development.

More pertinent, is the population health research being undertaken by the project team. First Nations and Metis communities in the boreal forest are experiencing a host of changes and pressures to change as a result of the expansion of forest industries and new approaches to

managing forests and forest resources. While a number of models have been used to identify the perceptions of forest communities regarding their health, project team members are working with Cree elders from several northern communities to explore Cree views of environment and health in order to develop a base from which to negotiate community-based positions and strategies.

Molly Turnbull is primarily responsible for work with Aboriginal communities. She has established a framework and community contacts for assessing health risk perceptions in forest-dependent Metis communities in northern Alberta, an invisible Aboriginal population that is culturally distinct from First Nations peoples. In order to identify mechanisms for sustaining health, for prevention programs, and for service design and delivery an agreement has been reached with the Metis Nation of Alberta to undertake research on the implications and social health impacts of forestry in several Metis communities. In addition, Komali Naidoo Mahabeer is engaged in a specific health risk evaluation (hantavirus under conditions of boreal forest perturbation) that pertain to hunting and trapping as well as boreal forest management and are connected to Aboriginal populations primarily through lifestyle issues. Another issue being addressed is the potential conflict among public health authorities, the Aboriginal community and environmental advocates regarding the public health risk and appropriate advisories of the population.

Dissemination of research associated with health risk perception in boreal forest, and especially vulnerable Aboriginal, communities is a fundamental component of this project, as is the education of the general public about Aboriginal issues and concerns. As such, a book has been produced with contributions from project team members that inform issues involving the boreal forest and Aboriginal communities.

As an attempt to support sustainable communities through the research and development of sustainable forest management practices, which are in turn supported by boreal forest communities because their needs are meet and their health is protected, this project is a contribution to SFM Network Research Legacy 2 (Using Alternative Social Institutions to Foster Sustainable Forest Management).

Sustainable Forest Management in the Gwich'in Settlement Area, Northwest Territories (1998-99)

The Gwich'in Renewable Resources Board has sought out the University of Alberta and the Department of Anthropology, in particular, to assist in the development of a forest

management plan which is sensitive to the needs and priorities of Gwich'in elders and contemporary forest users. The project expands on collaborative research arrangements already in place between the Gwich'in First Nation and the University of Alberta. Research by two graduate students, under the direction of Dr. David Anderson, currently involves a mixture of archival research and community-based interviews aimed at documenting TEK. An overview of the history of timber and other forest resource uses, and the values attached to these, will be developed with the assistance of Gwich'in elders. Workshops will be held with elders, contemporary forest users, forestry experts employed by the Gwich'in and researchers in order to use the information and knowledge gathered to derive a viable forest management plan. The application of contemporary and historic data on forest use, along with fire and flood regeneration data from Dr. Ross Wein's research, will provide important tools leading to the development forest and community planning policies.

This project, not yet completed, will contribute to SFM Network Research Legacy 2 (Using Alternative Social Institutions to Foster Sustainable Forest Management) and Networking Legacy 2 (Developing Effective Partnerships).

Characterization of the Sustainability of Boreal Forest Dependent Communities in Quebec (1996-99)

Ecosystem-based forest management presupposes a constant effort to incorporate information on representative sites, on vital processes, and on target species into forest management decisions. In this context, it is important to emphasize human communities that depend on the forest, which in turn, requires understanding how individuals and communities respond to changes that stem from new forestry practices, from the adaptation of public policies, and from the evolution of community socio-economic conditions. Headed by Dr. Luc Bouthillier of Laval University, this project aims to establish what constitutes sustainability for boreal forest communities, including those with Aboriginal populations. In so doing, it attempts to explain the community-forest interface of three boreal forest communities in Quebec where 70% of the economic activity is generated by the forest sector. It does so by examining the political autonomy, cultural rooting, prevailing work organization, existing forest tenure arrangements, and economic capacities and characteristics of these communities. By means of sociological survey methods, the goal of the project is to determine how the inhabitants, both Aboriginal and non-Aboriginal, of these communities perceive and experience forest management. In addition to

explaining the forest/community interface, the project will test a community scale ecosystem-based analytical model that provides social guidelines to forestry practices.

In 1997-98, the natural, social and economic characteristics of the communities of La Tuque and Degelis were documented and produced as reports. In addition, an outline of the Giradville community was produced and an analysis of statistics from this region resulted in tables and graphs illustrating the demographic, social and economic situation of the region. In both the La Tuque and Giradville studies, interviews revealed the issues residents associate with their community's sustainability. In La Tuque, especially, community residents have hardly begun to grasp the importance of the forest in structuring their institutions and in defining their capacity to change. Modeling work that would allow testing of the forest community sustainability hypothesis in an evolutionary perspective also began, and a workshop on social forestry was held.

Current research involves:

- Re-starting the Abitibi project;
- Initiating a new case study for Bas-Saint-Laurent;
- Completing the qualitative work begun in Giradville;
- Moving on to modeling and assessment of forest development issues as seen by the community of Haut-Saint-Maurice; and
- Applying the inductive research strategy used for Giradville (Desy) and Haut-Saint-Maurice (Bouthillier) to the community of Sayabec (Cote).

The latter will consist of gathering data on the nature of forest-dependent communities through semi-directed interviews to identify issues that explicitly link the community to the forest, thus enabling identification of assets and obstacles to community sustainability. Although the Attikamek First Nation plays a major role in the Haut-Saint-Maurice, interviews to date do not reflect this reality. Nevertheless, a Ph.D. student under Dr. Luc Bouthillier, is planning to work with the Attikamek community of Weymontachie, thus allowing many comparisons with the project in La Tuque. A public consultation process has been started with the Waswanipi Cree of James Bay to understand how the forest industry relates to this Cree community. Although not supported by the SFM Network, the results of this work will be linked to the larger SFM funded community project.

To date, SFM research in Quebec has not specifically addressed Aboriginal forestry or sustainability issues. Nevertheless, research is being planned to this end and the methodologies and techniques being explored and developed may have relevance to Aboriginal research issues

and projects. Notwithstanding this project's lack of explicit First Nations involvement and research, it promises to contribute significantly to SFM Network Research Legacy 2 (Using Alternative Social Institutions to Foster Sustainable Forest Management).

ASSESSMENT OF THE FIRST YEARS OF SFM NETWORK FIRST NATIONS RESEARCH

First Nations and Geographical Representation

Aboriginal/First Nations peoples have a significant role to play in achieving sustainable forest management in Canada's boreal forest. Without the meaningful and direct involvement of First Nations peoples and their knowledge into the development of forest management practices and strategies, the social, cultural, economic and ecological sustainability goals of the SFM Network will not be attainable. While the SFM Network has begun to take some steps towards addressing Aboriginal/First Nations issues in the boreal forest, these, for the most part, have been small and uncoordinated. The Caribou Mountains Research Program with the LRRC/TC represents an important first step to develop a research partnership with forest-dependent First Nations. However, the full contribution of LRRC/TC peoples and their knowledge (TEK and otherwise) to the development of sustainable forest management practices and strategies have yet to be realized. The reasons for this, while varied, stem largely from the very different cultural backgrounds of academically-trained researchers and knowledgeable First Nations members with whom they work. The inability of the SFM Network to address cross-cultural training and education so as to maximize the contributions Aboriginal peoples and their knowledge to Network objectives was recently identified by the Mid-Term Review Panel of SFM Network as an area needing significant improvement (Mid-Term Review of the Sustainable Forest Management Network, 1998:3):

> The benefits of the program in the areas of Aboriginal training/education and technical and professional assistants were not nearly as well developed in terms of outcomes. There is no evidence of formal dialogue on integrating indigenous and scientific knowledge, or how such integration would occur. The formal interaction between First Nations communities and long-term education and training in environmental resource management needs attention. ….. The educational goals concerning First Nations, industry and the general public are not well developed or articulated. The SFM program should consider developing one or two three-credit courses that cover topics that all graduate students could take, such as:

> indigenous knowledge, international issues relating to resource management, public policy and the process of developing and implementing management strategies based on scientific and indigenous knowledge.

The Panel also observed that, although the involvement of Aboriginal partners has started, there is only one First Nations partner (LRRC/TC), and that the Network "needs to continue to make strong efforts to include additional Aboriginal partners" (1998:5). While a few NCE funded researchers are undertaking research with First Nations in the NWT and Quebec, Aboriginal research and projects are concentrated in northern Alberta. This is not to suggest that the research being undertaken among the LRRC/TC, WFLFN, Dene Tha' and other First Nations and Aboriginal communities in Alberta is not bearing fruit -- the work on developing alternative forest management strategies and structures offers much promise. However, if the SFM Network is going to fulfill its objectives vis-à-vis Aboriginal issues and projects, it must develop partnerships with other First Nations and Aboriginal communities in other areas of Canada. Currently, a number of potential Aboriginal partners with whom a dialogue has been established may be found in northeastern B.C., Quebec, and Ontario. A workshop to address SFM Network First Nations research issues, projects and partnerships is planned for 7-8 October 1998 (see below), and will hopefully lead to a number of new First Nation partners and research initiatives.

Thematic Gaps

The SFM Network has made a good start at exploring strategies and alternative institutions for incorporating Aboriginal people into sustainable forest management (SFM Network Research Legacy 2). While the effort to incorporate First Nations into decision-making that directly effects the sustainability of their cultures, socio-economies and activities on forested lands is laudable, the substantive contributions of such mechanisms will take time to assess as decisions are taken, implemented and evaluated.

The SFM Network has failed to address, as the Mid-Term Review Panel observed, the incorporation of TEK into the research aimed at developing sustainable forestry policy and practices. In particular, there has been an obvious under-utilization of TEK relating to understanding disturbance (SFM Network Research Legacy 1) and assessing multiple and cumulative effects (SFM Network Research Legacy 4).

Scientific research is being undertaken by SFM Network researchers in both Alberta and Quebec to reconstruct recent and Holocene fire chronologies in order to develop an understanding of natural disturbance processes in the boreal forest. However, the TEK that Aboriginal peoples may possess about past fire events has until recently not been recognized as a significant contributor to this legacy. In particular, Aboriginal elders may harbour much knowledge required to understand how:

- The intensity, frequency and size of fire and other natural disturbances shape forest structure and landscape patterns in Canada's boreal forest (Objective 1); and
- Natural disturbance and cutting practices combine to structure landscape patterns and species biodiversity (Objective 2).

While TEK of fire and other natural disturbances may not extend back for more than several generations, this knowledge is likely to contribute specific information relevant to interpreting the upper sediments of lake cores. In turn, these interpretations could be extrapolated to preserved lake core sediments covering much longer periods of time. Whereas TEK could be used to inform fire disturbance patterns and sequences for short and broad time spans, it is also pertinent to understanding the impacts of fire on valued boreal forest resources and regeneration rates under both natural disturbance and harvesting regimes.

How to use forest ecosystems to meet human needs and desires while maintaining their biological diversity, ecological integrity and long-term productivity remains a fundamental challenge to the SFM Network, and to sustainable forest management generally. Central to this problem is the need for concepts, tools and processes for evaluating the multiple and cumulative effects of human activities and their management in space and time. SFM Network researchers "will be developing understanding of how natural systems operate and respond to human activities, and then putting this scientific knowledge to appropriate uses in the planning, evaluation and regulation of these activities" (Mid-Term Review Document, Sustainable Forest Management Network of Centres of Excellence 1998). However, it would seem that Aboriginal people in many areas of the boreal forest have experienced and witnessed the multiple and cumulative impacts of a host of industrial and other human activities (e.g., logging, mining, hydro-electric developments, etc.) on their forests, terrestrial and aquatic resources, socio-economies, and cultures. While there has been no systematic effort to date by the Network to document and apply such knowledge, the understandings and knowledge that Aboriginal people

possess about multiple and cumulative impacts are directly relevant to the SFM Network's working principles for evaluating multiple and cumulative effects:

- Ecological knowledge and tools are required to predict the possible future conditions of boreal forest landscapes, and to explain the consequences of cumulative effects relative to critical ecological elements and environmental objectives (ibid. 1998:45);
- Social and economic information and processes are required to incorporate values and objectives into the formulation of management scenarios, and to interpret whether to not the cumulative effects of management are acceptable and desirable (ibid).

Systemic Challenges

The above areas do not exhaust the research contributions that Aboriginal people and their knowledge can make to the development of sustainable forest management practices and strategies. They do, however, provide a background and a context against which a number of systemic barriers to realizing these contributions must be considered and addressed by the SFM Network. These include determining what are the most effective and appropriate ways and means to:

- Document, interpret, render and apply TEK to forest management strategies, decisions and actions, without devaluing, misappropriating and/or misusing this knowledge?
- Integrate scientific knowledge with TEK, if indeed this is a desirable objective, recognizing the tremendous power imbalance that currently exists in the ability to use and apply knowledge that informs the latter system?
- Incorporate Aboriginal management systems and philosophies, and the TEK that informs them, into contemporary forest management policy, planning and practice?
- Educate those cultured in the western scientific tradition about the differences that distinguish traditional Aboriginal management systems from the environmental management system of the dominant culture, and why both are prerequisites for sustainable forest management?
- Strengthen and provide efficacy, meaning and value to traditional systems of management and knowledge in order to ensure their continuing contributions to the development of sustainable forest management strategies and practices?
- Build capacity in Aboriginal communities for them to:
    1. share with and educate the scientific/environmental management community about traditional systems of management and knowledge, and to benefit from such exchanges and;
    2. acquire scientific and environmental management knowledge and training?

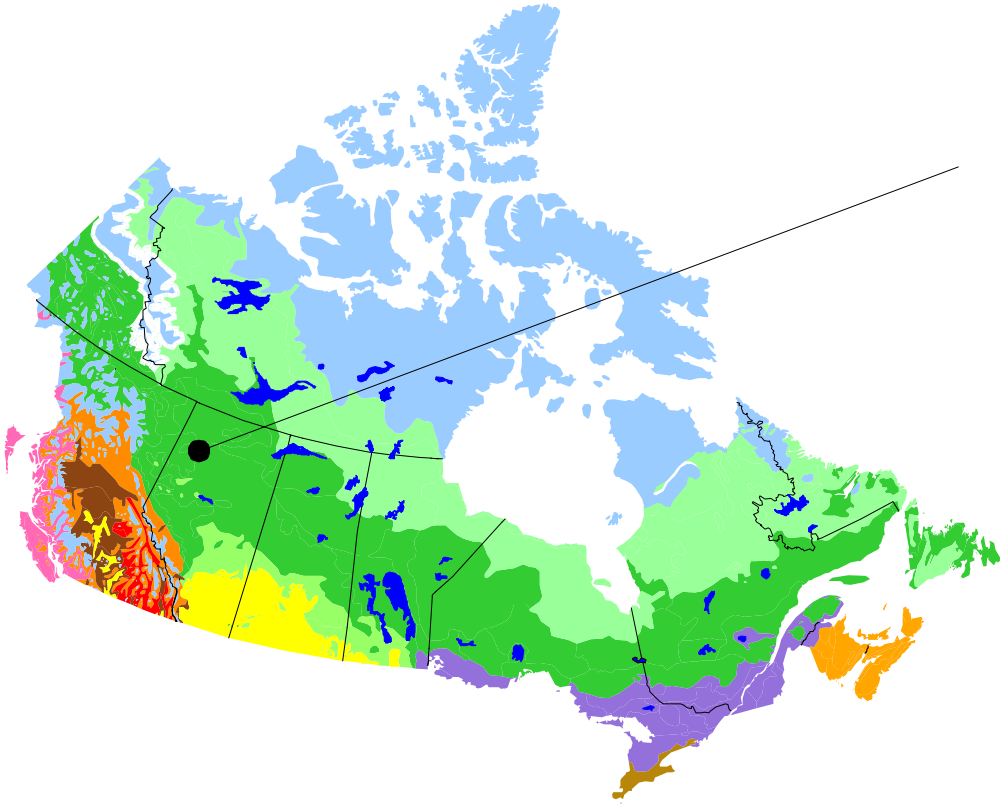
SFM NETWORK FIRST NATIONS WORKSHOP: CHARTING A COURSE FOR THE FUTURE

While the information and issues addressed in this report will assist the SFM Network's Aboriginal Committee to focus research objectives over the next several years, a two-day First Nations workshop is planned for 7-8 October 1998. This workshop intends to bring together SFM Network researchers, partners and potential partners in an informal gathering in order to:

- Assess what SFM Network researchers have done to date, and what they are currently doing, with respect to incorporating First Nations issues, people and their knowledge into research projects;
- Determine how this research has (or has not) addressed SFM Themes, and now Legacies, and why;
- Identify the issues and challenges that confront SFM Network efforts to maximize the potential contributions of Aboriginal people and their knowledge to sustainable forest management;
- Provide direction to the SFM Network with respect to First Nations issues and projects by setting research priorities and scopeing out potential cooperative research opportunities; and
- Develop an integrated and cooperative First Nations research strategy within the SFM Network and with potential partners.

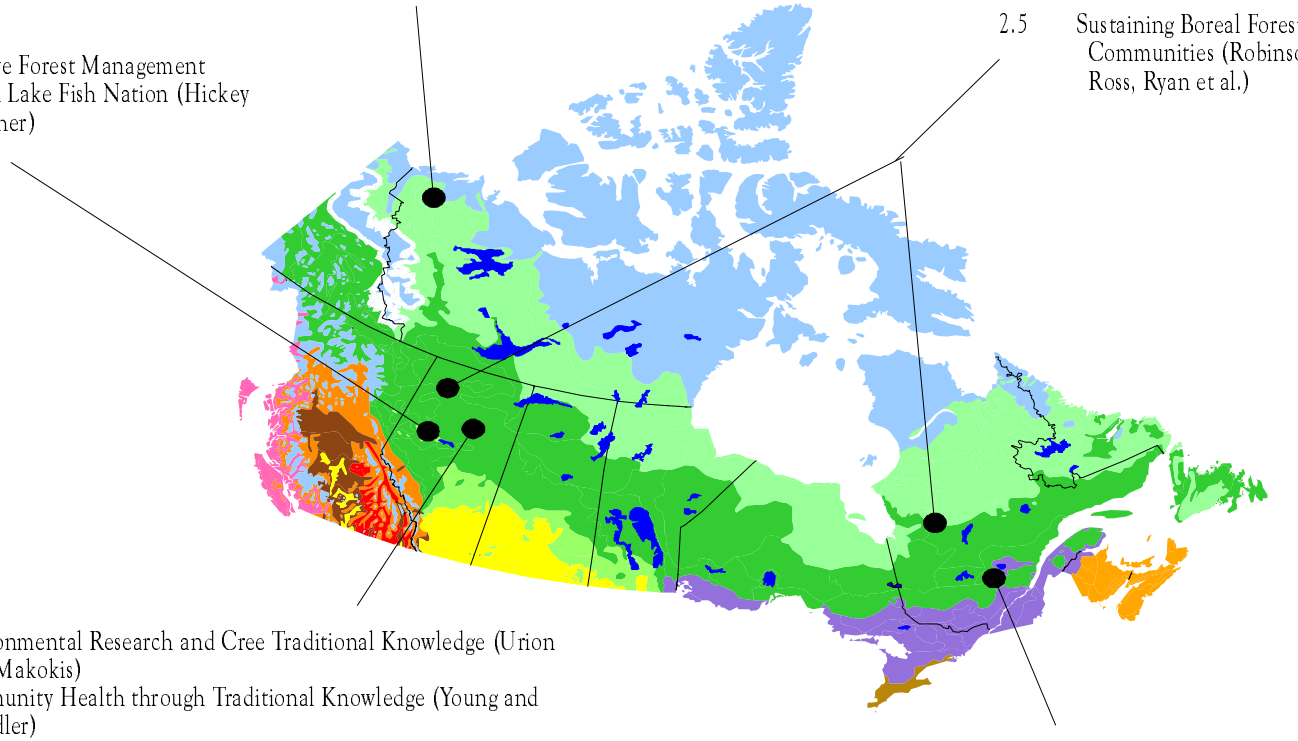
In so doing this workshop will assist the Network, and its newly created Aboriginal Committee, to chart a course of action over the next several years in an effort to realize the potential contributions of First Nations people and their knowledge to sustainable forest management.

1.0 Caribou Mountains Research Partnership



1.1 Fish Communities (Tonn, Scrimgeour, Aku et al.)
1.2 Fish Parasites (Goater and Baldwin)
1.3 Water Quality and Macro-Invertebrates (Prepas, Dinsmore, Scrimgeour)
1.4 Vegetation Mapping and Critical Vegetation (Dale and Monteleone)
1.5 Watershed Disturbances on Water Quality and Plankton (Prepas and McEachern)
1.6 Garden River Moose Survey (Robinson and Pyc)
1.7 Environmental Health of the LRRC/TC First Nations (Crabbé, Haas and Blanchet-Cohen)
1.8 Culturally Appropriate Tourism (Hinch and Colton)
1.9 Holocene Fire Chronology (Campbell and Collins)
1.10 Effectiveness of the Caribou-Lower Peace Planning Board (Krogman and Treseder)
1.11 Critical Wildlife/Habitat (Freeman, Hudson and Schramm)

2.0 Other SFM Network First Nations Research Projects



2.7 Sustainable Forest Management in the Gwich'in Settlement Area (Anderson)

2.1 Cooperative Forest Management Whitefish Lake Fish Nation (Hickey and Natcher)

2.5 Sustaining Boreal Forest First nation Communities (Robinson, Bouthillier, Ross, Ryan et al.)

2.2 Environmental Research and Cree Traditional Knowledge (Urion and Makokis)

2.3 Community Health through Traditional Knowledge (Young and Candler)

2.4 First Nations Community Development and the Mennonite Centre Committee (Hickey and Wilson)

2.6 Human Health and Boreal Forest Management (Guidotti and Turnbull)

2.8 Characterization of Sustainability of Québec's Boreal Forest Dependent Communities (Bouthillier et al.)