ENVIRONMENTAL ISSUES

RESEARCH REPORT

Prepared By:

CENTRE FOR INDIGENOUS ENVIRONMENTAL RESOURCES

March 31, 2005

CIER, the Centre for Indigenous Environmental Resources, is a national Aboriginal-directed environmental non-profit organisation. We offer research, technical services and education & training services to Aboriginal and non-Aboriginal communities, governments and private companies in four interrelated topic areas: forestry, climate change, water, and sustainability.

Please direct any inquiries about this document to:

Centre for Indigenous Environmental Resources
3rd Floor – 245 McDermot Avenue
Winnipeg, Manitoba R3B 0S6

Tel: (204) 956-0660
Fax: (204) 956-1895
E-mail: earth@cier.ca
Web: www.cier.ca

This document has been designed for double-sided printing and was originally printed on 100% post-consumer content process chlorine free (PCF) paper.

Table of Contents

1.0 INTRODUCTION

The research on this topic included a review of the current scientific information on environmental issues facing First Nations in Canada. The intention of this research was to determine what *Western science* is reporting as the environmental issues facing First Nations. CIER considered a search of peer-reviewed journal to be important because it represents areas of academic research and therefore generation of new information, and it contains information considered credible by the scientific community. The research also provided confirmation of the issues raised by the participants in the dialogue stream.

As mentioned, scientific research on environmental issues, illustrates the type of primary research reported by peer-reviewed journal and, in some cases government departments. There is a extreme lack of academic research on First Nation environmental issues as is evident from the relatively few scientific sources of information discussed in this report. This could be due, in part, to the fact that the federal government and hired consultants undertake much of this research, which then does not get submitted for peer-review and publishing. In most cases, the research focuses on the issue (e.g. forestry impacts) rather than on how it affects First Nations, and typically includes only a short discussion of implications for First Nations. In select cases, the researchers focus directly on the impact on First Nations. This research relates most often to areas of culture, language, and people. These gaps in the topics researchers are undertaking (e.g. habitat, biodiversity, climate change, water quality, etc.) suggesting that primary scientific research would be an important area of work for the COEE.

The following section represents a review of the classical scientific literature and discussion of some of the environmental issues facing First Nations in Canada. Environmental concerns are organized around CIER's portrayal of the environment for the purposes of the Web of Life graphic in the COEE Information Kit. As such, 'environment' is separated in the following components for the literature review: plants, animals, land, water, air, language, people, and culture.

2.0 PLANTS

2.1 OVER HARVESTING OF TRADITIONAL PLANTS

The literature discusses many conservation issues surrounding a global increase in the consumption of medical plants for nutraceutical and herbal use. These issues include over-harvesting, reduced species diversity and possible extinction of Indigenous plant species (Lantz, 2001), as well as secondary impacts on the entire ecosystem (Sheldon et al. 1997). A loss of

traditional plants could in some cases threaten the traditional ways of life by the loss of traditional sources of food, medicinal plants and plants used in spiritual ceremonies. This loss could directly affect the health of Aboriginal people as well as the health of the surrounding environment. Some regulations already exist for the protection of endangered species, although more restrictions may be needed with the ever-increasing demand for traditional plant use. There are concerns however, about the ability of First Nations to continue to have access to these species after they become protected by legislation such as the *Species at Risk Act* (SARA - http://www.speciesatrisk.gc.ca/default_e.cfm).

2.2 LOSS OF INDIGENOUS OR CULTURAL KEYSTONE SPECIES

Plants are an important resource for First Nations: There are plants that are used as identifiers of communities, those that are used for medicinal purposes, and those that are used as traditional food sources (Garibaldi and Turner, 2004). There are a number of sources that document First Nation plant use in Canada, such as Robert Marles et al. (2000), "*Aboriginal Plant Use in Canada's Northwest Boreal Forest*" as well as studies Turner and Peacock, 1995 and Simonsen et al. 1997. If Indigenous species are lost, the traditional uses of those plants and the ensuing culture are also lost. Garibaldi and Turner (2004) propose naming plant species with particular cultural significance as, "*cultural keystone species*" because they "…*play a unique role in shaping and characterizing the identity of the people who rely on them*." The researchers also question how changes to the landscape and ecosystem affect Aboriginal culture and how these cultures can help with conservation efforts of cultural keystone species. They state:

> *Indigenous and local people occupying a particular landbase and depending upon it for survival almost invariably identify with a relatively limited complex of species that they consider exceptionally important to their daily lives. A cultural keystone species such as red laver seaweed or wapato, once identified, can serve as a starting point from which to assess the effects of environmental disturbance or stress on a culture and whether it is able to withstand change without losing its identity. If they [the group in question] are able to continue to use and relate to their most prominent and culturally significant species, they will be better equipped to retain their cultural identity. Conversely, losing access to such species, or moving away from the knowledge about them, can foreshadow or symbolize a more drastic loss of language and culture. Conservation initiatives whose intention is to account for the social and cultural considerations of ecosystem use may benefit especially from identifying and focusing on cultural keystone species.*

Fortunately, conservation efforts of Indigenous species have increased as extinction and loss of traditional knowledge about Indigenous plant species has become more prevalent. In addition, efforts to conserve these plants have started to include First Nation traditional knowledge and

practices to better ensure an holistic view of the conservation of Indigenous species (Garibaldi and Turner, 2004).

There is also the potential for the ecosystem to be unbalanced after the loss of a particular species, which may take years to re-establish (Sheldon et al. 1997)

2.3 INTRODUCTION OF NEW SPECIES

The introduction of new plant species to an already existing habitat can sometimes cause severe impacts on the surrounding ecosystem (Blossey et al. 2001). The non-Indigenous introduction of a plant species may lead to threats on already rare and endangered species, especially if the new species proliferates uncontrollably and alters the balance of the ecosystem. As mentioned earlier, resources commonly utilized by First Nations may be affected by the loss of Indigenous plant species. The introduction of purple loosestrife in many areas in Canada is an example of the effects of non-Indigenous species invasion in North America and the possible management scenarios that accompany it (Blossey et al. 2001).

2.4 CLEARCUTTING

Clear-cutting is a method of harvesting timber products by removing all the trees in one area at a time. Evidence exists that clearing large tracts of land affects species diversity and species richness as well as alters the balance of the existing ecosystem (Cockle and Richardson, 2002). In the boreal forest in Canada, clear-cutting may increase the amount of snow accumulated in the winter and then subsequently increase the snowmelt flow in the spring, which may change water flow patterns in forested First Nations (Murray and Buttle, 2001).

In addition to having ecological effects, clear-cutting may also affect the economic base of nearby communities, through the alteration of recreational and commercial activities. One study in particular, predicted that clear-cutting and subsequent watershed disturbances would have a large impact on commercial and recreational fisheries in a nearby-forested area (Loomis, 1989). There is a substantial amount of information that illustrates First Nations' reliance on forested areas for a variety of resources and activities (see Canadian Boreal Initiative website for examples - http://www.borealcanada.ca/index_e.cfm). Some of these activities include commercial berry picking, collection of medicinal plants and in some areas, the collection of timber. Although more research is needed on the effects of clear-cutting on First Nations, the loss of forested resources through large-scale removal cannot but affect people who rely heavily on these resources.

2.5 INADEQUATE FOREST MANAGEMENT PRACTICES

There are many issues and questions surrounding forest management practices as they relate to First Nation peoples in Canada. These include: "Is the management strategy sustainable in terms of a First Nation definition of sustainability and does it consider the significance of the forest to First Nations (Berkes et al. 2002)?" "Do the management practices sufficiently involve inhabitants of First Nations or users of the forested areas (Dickerson and Ross, 2000, Turner, 2001)?" "Does a particular forest management practice have long-term effects on wildlife or the balance of the ecosystem (Thompson et al. 2003)?" "Are the goals and views of the land similar between forest management advisors and First Nation users (Anderson et al. 2000)?" "Lastly, will Aboriginal peoples lose an economic base of resources with the use of particular forest management strategy (Beckley, 2000; Berkes, 2002)?"

In recent years, there have been many initiatives that aim to understand and possibly mitigate some of the problems that First Nation peoples experience with inadequate forest management. For example, many organizations such as Smartwood (http://www.rainforest-alliance.org/programs/forestry/smartwood/) and the Forest Stewardship Council (http://www.fsccanada.org/) have created underlying principles of sustainable forest harvesting that not only consider the rights and well being of Indigenous peoples but also include the ecological, economic and social factors as well (see Turner, 2001 for a list of these organizations).

3.0 ANIMALS

3.1 LOSS OF TRADITIONAL FOOD SOURCES

The Centre for Indigenous Peoples' Nutrition and Environment (CINE) at McGill University (http://www.cine.mcgill.ca/TFood.htm), has conducted a great deal of research on the importance of traditional food to Indigenous peoples. CINE has also looked at the effects on human health and culture because of the loss of traditional food sources due to contamination or non-traditional influence. Some of the negative impacts of the loss of traditional foods include health problems from eating high-fat, low-nutrient food (Receveur et al. 1997), increased costs associated with buying non-traditional food (Wein, 1994), and the loss of culture associated with hunting, trapping and fishing traditional food sources (Oostdam et al. 1999; CINE website).

3.2 CONTAMINATION OF FOOD SOURCES

Contamination of traditional food sources may occur because of atmospheric or oceanic transport or because of the presence of local activities that add contaminants directly or indirectly as a by-product of industry. The contamination of Aboriginal traditional food sources

has serious health implications for First Nations, including those in the Arctic (Archibald and Kostasky, 1991; Oostdam et al. 1999). Adverse effects of consumption of contaminated food may include illness, developmental problems, and higher incidences of infant mortality (Oostdam et al. 1999). Across Canada, there are currently many projects looking at routes of contamination and the effects of contamination on human health. Some of these projects are included under The Northern Contaminants Program (NCP) (http://www.ainc-inac.gc.ca/ncp/index_e.html), and The National First Nations Environmental Contaminants Program (NFNECP) (http://www.afn.ca/Assembly_of_First_Nations.htm).

3.3 VALUE AND SIGNIFICANCE IS NOT ASSESSED

Historically, wildlife has provided many First Nation people with a source of nourishment and a source of identity by being a prominent topic in their language, their ceremonies, and their stories (Erdoes and Ortiz, 1984). Only recently has the relative importance of certain wildlife species to Aboriginal peoples in relation to their overall culture and use been a topic of research. Garibaldi and Turner (2004) define a "cultural keystone species" as the "*culturally salient species that shape in a major way the cultural identity of a people, as reflected in the fundamental roles these species have in diet, materials, medicine, and/or spiritual practices*." They argue that the loss of a particular "cultural keystone species" may be complimented by a loss in identity because of the value of particular species to different communities. They also argue that taking the cultural value of a particular species into consideration will enable better conservation practices in the future because it will provide a better appreciation and understanding of traditional knowledge systems. Including traditional ecological knowledge within conservation efforts and wildlife management is necessary to ensure that customary uses of wildlife can be sustained (Moller et al. 2004).

3.4 INADEQUATE HARVEST MANAGEMENT

There are examples of inadequate harvest management of fish and wildlife in many parts of the world. In Canada, the Atlantic fisheries serves as an important example of improper harvest management (Pitcher, 2001). The stress placed on fisheries in the Atlantic regions of Canada has affected the economic situation and culture of several First Nation and other communities. Pitcher states that the focus of fisheries management should be on the adoption of proper and concise management goals as well as techniques, and that the inclusion of Indigenous peoples in terms of traditional ecological knowledge in fisheries management may be valuable.

With regards to wildlife, Ferguson et al. (1998) looked at the relative differences between biologist and Inuit observations on caribou management in northern Canada and noted how the combination of Inuit observations in population management of caribou might be beneficial. This is only one example of how the importance and value of wildlife in terms of Aboriginal perspectives is now being viewed as an important concept in wildlife management and sustainable harvesting. The importance of "co-management" of wildlife populations between Indigenous communities and government agencies has now led to frameworks, programs and guidelines that ensure the value of wildlife to Aboriginal communities is properly assessed before any decisions are made. One example of this inclusion is seen with the Beverly and Qamanirjuaq Caribou Management Board to manage caribou populations in Northern Canada (see: http://www.arctic-caribou.com/ for more information).

4.0 LAND

4.1 INDUSTRY DEVELOPMENT

Environmental impacts of industry development often face First Nation and other people across Canada. First Nations are often more susceptible to effects of industrial development, because they are closely tied to the natural environment in many ways. The pulp and paper industry is one example and has experienced scrutiny because of the effluents it creates and the land that it degrades when logging (McMaster et al. 2003). A large amount of trees are needed for paper production, and large areas of forests are cleared, leaving near barren or barren lands in the wake of logging. Clearing forests affects First Nations by reducing their traditional land base, affecting the overall balance of the surrounding ecosystem, and reducing the overall resources that may be utilized by the First Nation at large. Another important environmental effect of paper production is the release of toxic effluents such as dioxins into the aquatic ecosystem. Dioxins have been shown to affect the reproductive systems in fish at low concentrations and have serious human health implications to those who are exposed to them (http://www.ejnet.org/dioxin/). There are also other environmental impacts associated with paper production that may affect First Nations, namely, the production of air pollution from the pulp and paper mill, the large consumption of energy and water to turn pulp into paper and the creation of enormous amounts of solid waste (Stanley, 1996).

There are many environmental concerns arising from activities associated with the mining industry that may affect First Nations. Exploration of the mining site, resource extraction, smelting and refining of metals and eventual mine closure after resource exhaustion all have

potential environmental impacts on the surrounding ecosystem (Environmental Mining Council of British Columbia http://www.miningwatch.org/). Ripley et al. (1996) provides a complete review of the environmental effects of the mining industry. Trail road development in the exploration phase of a mine, for example, may increase water and soil erosion, may segment traditional territory lands and subsistence-related activities, and may affect the movement of animals living in the area (Botkin et al. 2004). The extraction of metals and other resources causes wildlife and fisheries habitat loss and increased sedimentation in some areas. There is also a threat of acid production and leaching from the waste rock, mining pit walls and tailing catchments which may cause surface and groundwater contamination. The smelting and refining of metals requires significant amounts of energy and water and produces sulphur dioxide emissions. At the end of a mine's life cycle and after its eventual closure, environmental threats remain. Acids that have accumulated over the life cycle of the mine can still leach to water sources. There is often little chance for re-vegetation of an old mine or for the resettlement of wildlife, making the space of little value afterwards.

The onshore and offshore oil and gas industry is another industry that has an effect on First Nations across Canada because of its impact on natural resources. Oil and gas activities have had a long history in British Columbia. As a result, many First Nations (and their traditional lands) have been involved in and affect by oil and gas developments. A great deal of research has been done on the oil and gas industry in BC; some has specifically focused on giving information to First Nations about development in their areas (Offshore oil and gas research group – Simon Fraser University, 2004; Royal Roads University – Bibliography, 2004). Examples of effects from oil and gas industry evident in Alaska are relevant to First Nations in Canada because of the migration of animal and fish resources. In Alaska, oil and gas activities have shown to effect the migration of marine and land animals such as caribou and bowhead whales. There is also concern about how this industry affects the quality of plants and animals used by food in Alaskan Aboriginal peoples in terms of possible contamination as a by-product of industry. Equally important, concerns of oil spills and other contaminant issues and how they affect many other tundra and marine ecosystems are also very prevalent (The National Academies Press, 2003 - http://www.nap.edu/books/0309087376/html/).

4.2 LOSS OF LAND AND LAND RIGHTS

When a First Nation loses their land and land rights because of relocation, the threat of natural disasters or the development of industry, in many cases, they also lose their traditional access to resources such as food, shelter, and water. When the rights to an existing large piece of land decrease because of encroaching industrial development such as logging or because of environmental damage caused by hydroelectric flooding, a decrease in the economic base of the Aboriginal community also decreases (RRCAP, 1996). Equally important to losing material goods, a way of life, an intimate knowledge of the land, a confidence in daily activities and a part of one's spirituality may also be lost. The Report on the Royal Commission on Aboriginal Peoples (1996) cites many examples of Aboriginal people who have felt a sense of loss in some way or another because of the removal from their land.

4.3 INCREASED POPULATION ON RESERVES

A study looking at First Nations Demography in Canada (INAC, 2004), predicted an overall population increase on First Nations reserves by 2010. With this increase in population, a similar increase in demand for services in the health, housing, social welfare, local infrastructure, local economy and education sectors is also expected. While services in all of these sectors increase, it becomes increasingly important to develop clear and concise environmental management plans for First Nation reserves to deal with the increase in land development and the inherent increase in waste in a sustainable way.

4.4 POTENTIAL AGRICULTURAL INFLUENCES

Agriculture has a large influence on the health of the Canadian environment because of its prevalence and diversity across Canada. Agriculture may affect First Nation communities in terms of the location or disappearance of traditionally used habitats and the plants and animals that inhabit these areas. Environment Canada echoes this sentiment in its report assessing biodiversity in Canada, which states that, "*the loss of habitat to agriculture accounts for the endangerment of a disproportionately high number of species in Canada*." The agriculture sector in Canada has responded with many initiatives that aim to promote and restore an increase in biodiversity in areas that are affected by agriculture, although none of these initiatives specifically state the involvement of First Nations in their development or completion (see - http://www.agr.gc.ca/policy/environment/pdfs/biodiv/bioinit_aafc.pdf for a list of these initiatives).

4.5 INADEQUATE LANDFILL MANAGEMENT

There is growing concern over the current landfill management practices in some First Nations in Canada. Placing waste into landfills is a very common way of dealing with municipal waste in communities across North America (Themelis, 2002). There are many negative impacts on the environment associated with landfills, including the possible contamination of surface and underground water sources from contaminates leaching from the landfill over time, the generation of methane and carbon dioxide, and the possible mobilization of mercury into the environment because of favourable conditions. The large amount of land required to accommodate a landfill is also a negative effect because this land is often considered reusable after the landfill is closed (Themelis, 2002).

There are projects underway to assess some of these landfill concerns in First Nations in Canada. With funding from the National First Nations Environmental Contaminants Program (see Assembly of First Nations webpage - http://www.afn.ca/), one study from The First Nations University of Canada in Saskatchewan aims to look at the effects of landfill practices on environmental health in several First Nations communities:

> *The Saskatoon Tribal Council, Mistawasis, Whitecap Dakota and Muskoday First Nations, and Muskeg Lake Cree Nation are partnering in this project. The concern in this area is contamination of surface and ground water sources by present and historical landfill practices. The extent of contamination is unknown and has been identified as a top priority by the Saskatoon Tribal Council Health and Family Services. Researchers plan to investigate contaminant sources, leachate pathways, and concentrations along the flow paths. Their work will provide critical information required for regulatory initiatives, remediation, monitoring and management of landfills on and off reserve.*
>
> *(http://www.afn.ca/Programs/Health/environment health/04-update.htm)*

4.6 ALTERNATIVE ENERGY

Many First Nation communities, especially those situated in remote areas, often face many challenges related to energy demands. First, energy is expensive and First Nations often import fuel, which adds to the expense of providing energy to the community. Energy use also has negative environmental impacts, especially if there is a heavy reliance on diesel fuel. The use of diesel fuel adds greenhouse gases to the atmosphere as well as threatens localized pollution problems (Indian and Northern Affairs Canada and Natural Resources Canada, 2001). Several government departments and First Nation organizations have started to develop sustainable alternative energy programs that may reduce the expense of energy use in the long run while simultaneously considering the health of the environment (e.g. The Aboriginal and Northern

Community Action Program (ANCAP) - http://www.ainc-inac.gc.ca/clc/index_e.html). Alternative energy sources include solar, wind, biomass or biodiesel, waterpower and earth energy.

Improving the energy efficiency of homes and of buildings is another strategy that aims to reduce the demand on energy as well as the environmental effects of high-energy use (Natural Resources Canada, 2004). There are several programs aimed at improving the energy efficiency of houses and buildings in Canada in order to improve the quality of housing and to reduce local energy demands (e.g. Commercial Building Incentive Program - http://oee.nrcan.gc.ca/newbuildings/cbip.cfm, Natural Resources Canada's Office of Energy Efficiency -http://oee.nrcan.gc.ca/corporate/programs.cfm?PrintView=N&Text=N).

5.0 WATER

5.1 ON RESERVE WATER MANAGEMENT

Poor water quality and the contamination of water resources have serious implications on human and ecosystem health. The resulting water quality of a contaminated water source increases the incidences of disease and in some cases, death (Peterson, 2004; Health Canada, 2003). Unfortunately, there are a significant number of First Nations with poor water quality, which is a major human health concern and an inconvenience for people living in these communities (INAC, 2003). Contamination occurs in these communities because of point source pollution, poor water and wastewater management, and/or poor infrastructure for water quality protection (INAC, 2003). These concerns are the drive for projects currently underway though federal departments such as Health Canada and Indian and Northern Affairs Canada to improve water quality on reserves (INAC, 2003).

5.2 WATER RIGHTS

The importance of water resources to Aboriginal peoples is well documented throughout history. Aboriginals used water for drinking, irrigation, fishing, trade, transportation and recreation. A good discussion of water resources and how they relate to Aboriginal peoples in Canada is found in Claudia Notzke's, "*Aboriginal Peoples and Natural Resources in Canada* (1994)." In her book, Notzke relays several concerns regarding Aboriginal water titles and rights. Some of these concerns include; 1) a lack of defined Aboriginal rights or ownership to water resources, 2) lost economic opportunities as a result of ill-defined water titles or rights and 3) little or no consideration of Aboriginal rights or titles when undertaking large-scale water resource projects such as hydroelectric or construction projects.

5.3 CONTAMINATION FROM INDUSTRIAL AND AGRICULTURAL RUN-OFF

Contamination of water resources also occurs on a much larger scale because of point source pollution from industries such as the pulp and paper industry (Wiseman and Gobas, 2002). Point source pollution from industries can lead to the contamination of food, which in turn, may lead to human health and social concerns (Wiseman and Gobas, 2002). First Nations are more likely to be affected by the contamination of water resources as a result of their close proximity to coastal regions, inland lakes and waterways, and their dependency on food sources collected from the surrounding waters.

Another source of water contamination occurs from non-point source pollution from agricultural production (Carpenter et al. 1998). The addition of nutrients such as phosphorus and nitrogen, through agricultural practices, can lead to the eutrophication of rivers, lakes, and streams. Eutrophication can severely affect fisheries, recreation use of water, industrial uses of water, and the drinking potential of water (Carpenter et al. 1998). First Nations relying on a body of water that has undergone eutrophication would suffer as a result of decreasing suitability of the water as habitat and as a source of water in general.

5.4 FLOODING OF LAND DUE TO HYDROELECTRIC DEVELOPMENT

There are many serious effects of hydroelectric development flooding for Aboriginal communities (Notzke, 1994). Contamination of fish in newly formed reservoirs occurs because of methyl mercury accumulation in the food chain (Hall et al. 1997). Unfortunately, First Nation reliance on reservoir fisheries as a source of food in some communities may lead to sickness because of mercury poisoning (Hoover et al. 1997; Wiener et al. 2003).

The flooding of land changes the overall landscape of an area. Due to this change, there may be an alteration in migration patterns and habitat choices of animals and birds, resulting in a decreased ability to hunt and fish in certain areas (Notzke, 1994; Hoffman, 2002). Changes in watershed structure also change the water flow in particular areas that are relied upon by many people for recreation, irrigation, source of food and sometimes, drinking supply (Hoffman, 2002). An important adverse effect is the possible relocation of many people living in the affected areas of flooding (Hoffman 2002) which in turn, can have serious affects on the social and economic welfare of a community (Report of the Royal Commission on Aboriginal Peoples, 1996; Loney, 1995).

6.0 AIR

6.1 CLIMATE CHANGE

The threat of global warming and climate change because of a loss in the earth's ozone layer presents a very real and challenging environmental problem. Many theories exist to explain what the effects of climate change will look like. Environment Canada has made several predictions on the impacts of climate change across the country. Some of these predictions that are relevant to First Nation communities in Canada include: 1) higher temperatures in the summer in some areas would result in more heat-related illnesses; 2) higher incidences of insect-borne diseases due to changes in temperature and precipitation; 3) water supply concerns in drought-prone areas as well as in non-drought prone areas; 4) water level changes in lakes and water storage basins, which might have an impact on waterfowl, fisheries and wildlife; and 5) possible changes in current land uses due to changes in precipitation and temperature might make traditional activities such as farming, hunting and fishing susceptible to changes as well. For more information on the effects of climate change on each province in Canada See Environment Canada's, "Green Lane" (-http://www.ec.gc.ca/climate/overview_canada-e.html).

The Government of Canada's document entitled, "Climate Change Plan for Canada" (2002) (http://www.climatechange.gc.ca/plan_for_canada/plan/index.html) recognizes climate change concerns as they related to remote Aboriginal and northern communities. These communities are of particular interest because of the prediction that climate change will have a "disproportionate impact on Canada's north" compared to other parts of Canada (see page 48 of the Plan for more information). The Canadian Public Health Authority (CPHA - http://www.ccah.cpha.ca/effects.htm) expresses additional concerns with climate change and its potential effects on the traditional diets of Aboriginal peoples because of the prediction that climate change will alter the distribution of wildlife, fish, and vegetation in several regions.

6.2 AIR POLLUTION

Exposure to air pollution from cities and pollutant-producing industries is a concern for both First Nation and others. Serious health conditions may arise when exposed to a mixture of gaseous and particulate air pollutants, known as 'smog' (Health Canada - http://www.hc-sc.gc.ca/english/iyh/environment/smog.htm). Conditions such as asthma, respiratory disease and eye and nose irritations can be more prevalent when living in an area with increased concentrations of air pollution (Environment Canada - http://www.ec.gc.ca/air/health_e.html).

Several initiatives such as Environment Canada's "*Georgia Basin/Puget Sounds International Airshed Strategy*" are addressing First Nation air pollution concerns. This strategy aims at managing air quality concerns existing in the greater Vancouver and Seattle regions, which are regions that have experienced large population growths in previous years. Vehicles, wood stoves, open burning of waste and wood, industrial combustion sources and power plants cause air pollution in these areas. First Nations and Tribal agencies are involved in the development of strategies aimed at decreasing air pollution in these areas.

The Aamjiwnaang First Nation in Ontario has also expressed concern over air pollution from nearby industries in their region. In a recent study, PollutionWatch ranked three companies situated close to the Aamjiwnaang First Nation in Ontario's "Top 10 List of Respiratory Polluters".

PollutionWatch is a collaborative association between the Canadian Environmental Law Association and Environmental Defence and tracks pollution across Canada based on data collected by Environment Canada through the National Pollutant Release Inventory (NPRI) (http://www.pollutionwatch.org/home.jsp).

6.3 INDOOR AIR QUALITY

Indoor air quality is a concern in some First Nations because of the increased incidences of mould in houses and buildings (Indian and Northern Affairs Canada - http://www.ainc-inac.gc.ca/ps/hsg/cih/hs/index_e.html). Mould problems may be more prevalent on reserves because of poor construction and maintenance of houses, poor ventilation, and high moisture activities. Exposure to mould may cause respiratory health problems and may exacerbate effects of allergens on people susceptible to allergies (Canadian Mortgage and Housing Corporation, 2003). There is information available on how to reduce the incidences of mould and what to do about mould exists. There are also training sessions that exist for builders, home inspectors, public health inspectors and maintenance crews on general indoor air quality issues as well as on specific mould issues relating to First Nation communities (Canadian Mortgage and Housing Corporation, 2003 - http://www.cmhc-schl.gc.ca/en/burema/onreop/onreop_007.cfm). Despite these resources, CIER continues to be told by First Nations that poor indoor air quality, mould and associated health effects are a concern.

7.0 PEOPLE

7.1 LACK OF ECONOMIC AND EDUCATIONAL CAPACITY

Many First Nations rely on outside research and advice regarding environmental issues in their communities. This costs the community money and also weakens the capacity of the First Nation to manage their lands and resources (Simpson, 1998). Building capacity in terms of education and economic development in First Nation communities is perhaps the most important step for making the protection of the environment a priority in each First Nation community. It is hard to do research, mitigate environmental problems, and monitor the environment without programs and funds to support them. It is also desirable to have people living in the community with the knowledge and training to conduct research, manage resources sustainability and develop solutions to environmental problems when they arise. The Institute on Governance reported on capacity development as it related to the report for the Royal Commission on Aboriginal Peoples. The report states that in order to achieve self-governance for First Nations, capacity development is necessary in many areas including, land and resources management, business development, employment development, training, health and healing, culture, education as well as in governance. The report also summarizes different methods that economic and educational capacity can be improved in First Nations (Institute on Governance, 1997). Many First Nations have begun taking the necessary steps to build their own capacity for doing research on their environments and for documenting changes within the ecological community. In addition, several organizations have been established to support First Nation capacity-building and to offer technical advice related to the environment (see http://www.ccednet-rcdec.ca/en/pages/links_1.asp for a list of some of these organizations). The Centre for Indigenous Environmental Resources (CIER) is one such organization (www.cier.ca).

7.2 RELOCATION

The Report of the Royal Commission on Aboriginal Peoples (RRCAP, 1996 - http://www.ainc-inac.gc.ca/ch/rcap/sg/sgmm_e.html) goes into great detail about the effects of relocation on Aboriginal communities across Canada. The RRCAP includes information on why relocation occurred and what affects it had on the culture, the economy, and the health of Aboriginal people. Some of the effects included a loss of cultural-based knowledge about the environment, and a reduction in the economic base of the community because of a reduction in resources. The most significant impact of relocation may be the loss of confidence, the loss of

identity and the increase of physical and psychological stress observed among those people who were relocated (RRCAP, 1996).

7.3 LOSS OF TRADITIONAL ACTIVITIES

Sustainable use of resources through traditional and cultural activities such as hunting, trapping and fishing and others are one way of ensuring survival of those resources for future generations. Events such as the relocation of a community, the encroachment urban centres and industry, and by the loss or reduction of a species may threaten these traditional activities. Many traditional and cultural activities, such as ceremonies and rituals, language and harvesting practices, are often tied to the use of one particular species. This is true in the case of the Western red-cedar (*Thuja plicata*) for First Nation peoples, such as the Haida Gwaii living on the coast of British Columbia (Garibaldi and Turner, 2004). The sacred Western red-cedar is closely linked with the identity of these people in terms of their ceremonies, language and canoe-building capabilities. Unfortunately, many of the traditional uses of the Western red-cedar have changed for the Pacific coastal First Nations because of logging pressures and the creation of protected areas in the region (Garibaldi and Turner, 2004). Black ash (*Fraxinus nigra* Marsh.) is an important economic and cultural species for eastern Canadian and American First Nations. In particular, it is an important species for the traditional art and practice of basket weaving as well as being a valuable medicinal species. Members of First Nations in the east have been concerned with species decline of Black ash since the 1980's and with the resulting decline in the practice of basket making. Based on this concern, they have become involved with conservation and management practices to support this species' survival (The Canadian Model Forest Network - http://www.modelforest.net/e/what_/netw_/200110e.html).

8.0 LANGUAGE

8.1 LOSS OF TRADITIONAL LANGUAGE

The loss of Indigenous languages around the world is said to be in a "state of crisis" (Crawford, 1995), and First Nations in Canada are not exempt from this problem. The resulting loss of a traditional language within Aboriginal communities has a significant impact on the livelihoods of aboriginals in Canada (Sachdev, 1998). Residential school experiences in the past have contributed to generations of First Nation language loss by forcing children to speak English instead of allowing them to speak their traditional languages (Report of the Royal Commission on Aboriginal Peoples (RRCAP), 1996). One quote taken from the RRCAP describes some of the effects of the residential school experience, "…*the loss of language through forced English*

speaking, the loss of traditional ways of being on the land, the loss of parenting skill through the absence of four or five generations of children from Native communities, and the learned behaviour of despising Native identity." Other issues associated with a loss of language include, a loss of individual and group identity, a loss of self-worth and a loss of culture (Crawford, 1995; Kirkness, 1998). Although there are many challenges facing Aboriginal communities and the preservation of their languages, there is some suggestion that the ultimate responsibility of preserving traditional languages relies on the community in question (Kirkness, 2002). However, resources must exist within all levels of education, community and government involvement to ensure that traditional languages are maintained and preserved.

A loss of traditional knowledge about the natural environment is also an important consequence of Indigenous language loss (Tsuji, 1996). In the past, First Nation people relied heavily on the land for survival, for cultural activities and for their spirituality. In Saanich Inlet, BC, many of the plant species in the region were used for medicines, food sources, technological, and spiritual or ceremonial purposes. The traditional languages of Sencoten and Hul'qumi'num each have corresponding names for all of the plant species in the area and many locations in Saanich Inlet are named after these plant species (Simonsen et al. 1997). Many First Nation languages stemmed from a relationship to the environment and were passed down through oral traditions through the generations. Oral traditions today remain important to the survival of First Nation language and culture and as a result, are the subject of many initiatives aimed at teaching young people the importance of keeping their traditional languages alive (Sault College - http://www.saultc.on.ca/NativeEducation/AboriginalLinks.htm, SK Public School Division - http://olc.spsd.sk.ca/DE/resources/firstnationsliterature/oraltradition.html, BC Education - http://www.bced.gov.bc.ca/irp/bcfns12/ceotl.htm).

Sources of information online include:

1. **Indigenous Languages Across the Community, 2002** (Barbara Burnaby and Jon Reyhner eds.) - http://jan.ucc.nau.edu/~jar/ILAC/
2. **Nurturing Native Languages, 2003** (Jon Reyhner, Octaviana V. Trujillo, Roberto Luis Carrasco, and Louise Lockard eds.) - http://jan.ucc.nau.edu/~jar/NNL/
3. **Revitalizing Indigenous Languages,1999.** (Jon Reyhner, Gina Contoni, Robert N. St. Clair, and Evangeline Parson Yazzie eds.) - http://jan.ucc.nau.edu/~jar/RIL_Contents.html

4. **Teaching Indigenous Languages, 1997** (Jon Reyhner ed.) - http://jan.ucc.nau.edu/~jar/TIL_Contents.html

8.2 LANGUAGE BARRIERS

In Fisher River, Manitoba, Sachdev (1998) documented the importance of the traditional Cree language within the community and noticed a generational gap regarding the importance of traditional language maintenance. The adults in the community thought Cree language maintenance was more important than did the younger members. This generational pattern is a common occurrence within the majority of First Nations and provides a good example of how generational gaps in language might coincide with a gap in traditional knowledge. This becomes a problem as the gap widens, and First Nation youth are no longer as connected to their land and surroundings as generations before them.

As mentioned previously in the discussion of residential schools, the language barrier between two generations in the same community became more of problem as predominately English education systems, and government institutions came into existence (Blair et al. 2002). With predominately English policies and education systems, a barrier exists between the needs of a First and the desire of predominately English government or private institutions. Kirkness (2002) implies that it is important for governments to acknowledge the need for Aboriginal people to maintain their language, their voice, and their way of life through the use of programs aimed at maintaining and preserving traditional languages in Canada.

9.0 CULTURE

9.1 LOSS OF ATTACHMENT TO LAND AND LOSS OF TK

Previous sections have touched on some of the threats to First Nation culture as they relate to the environment. Some of these threats include the loss of traditional activities and the associated loss of identity and culture (Oostdam et al. 1999; Garibaldi and Turner, 2004), and the loss of attachment to the land and culture because of relocation (RRCAP, 1996). An environmental effect as a result of the detachment of Aboriginal peoples from their land represents the loss of traditional ecological knowledge (TEK) that is held by Aboriginal people and communities (RRCAP, 1996; Tsuji, 1996). The value of traditional knowledge is gaining recognition for it value as a long-term record of ecosystems, relationships, and management techniques, historically and in the present.

9.2 LOSS OF SUBSISTENCE WAY OF LIFE

First Nation culture has many connections to traditional food sources. The loss of these food sources as a result of the reduction of traditional land use areas (RRCAP, 1996) or the contamination of plants and animals from industrial sources creates a threat to culture (The National Academies Press, 2003; Berti et al. 1998). In terms of environmental management, harvesting traditional foods may help to maintain First Nation peoples connection with nature and may promote an environmentally sustainable way of life (Ship, 1997). The hunting and gathering of traditional food is also an important way of subsistence for many Aboriginal people and a loss of subsistence would mean a resulting loss of culture and self-sufficiency (RRCAP, 1996).

10.0 CONCLUSIONS

As mentioned, the research conducted on environmental issues represents a scientific literature review and illustrates the type of primary research reported by peer-reviewed journals and, in some cases government departments. The research that has been done is largely issue-based with impacts on, or issues for, First Nations being secondary and generally only briefly addressed. Where First Nation issues are more prominent, the research tends to be focused on cultural effects. While this is important, research on First Nation issues related to the land, water, flora and fauna is needed.

Overall, there is an obvious lack of academic research on First Nation environmental issues. This could be due, in part, to the fact that the federal government and hired consultants undertake much of this research which then does not get submitted for peer-review and publishing. In most cases, the research focuses on the issue (e.g. forestry impacts) rather than on how it affects First Nations and typically includes only a short discussion of implications for First Nations. In select cases the researchers focus directly on the impact on First Nations. This research relates most often to areas of culture, language, and people. These large gaps in the topics researchers are undertaking (e.g. habitat, biodiversity, climate change, water quality, etc.) suggesting that primary scientific research would be an important area of work for the COEE.

11.0 REFERENCES

Anderson, D., Wishart R., Murray A. and D. Honeyman. 2000. Sustainable forestry in the Gwich'in settlement area: ethnographic and ethnohistoric perspectives. Sustainable Forest Management Network Publication 2000-9. [Online] URL: http://sfm-1.biology.ualberta.ca/english/pubs/PDF/PR_2000-9.pdf

Archibald, C.P. and Kostasky, T. 1991. Public health response to an identified environmental toxin: Managing risks to the James Bay Cree related to cadmium in caribou and moose. Canadian Journal of Public Health. **82: 22-26**.

Beckley, T. 2000. Sustainability for whom? Social indicators for forest-dependent communities in Canada. Sustainable Forest Management Network Publication 2000-34. [Online] URL: http://sfm-1.biology.ualberta.ca/english/pubs/PDF/PR_2000-34.pdf

Berkes, F., Davidson-Hunt, I., Ruta, T. and J. Sinclair. Scientific and First Nation perspectives of non-timber forest products: a case study from the Shoal Lake watershed, northwestern Ontario. Sustainable Forest Management Network Publication 2002-4. [Online] URL: http://sfm-1.biology.ualberta.ca/english/pubs/PDF/PR_2002-4.pdf

Berti, P., Receveur, O., Chan H.M. and H.V. Kuhnlein. 1998. Dietary exposure to chemical contaminants from traditional food among adult Dene/Métis in the western Northwest Territories, Canada. Environmental Research. **76:131-142**.

Blair, H., Rice, S., Wood, V. and J. Janvier. 2002. Daghida: Cold Lake First Nations work toward language revitalization. In *Indigenous languages across the community,* B. Burnaby & J. Revhner (Eds.). Flagstaff, AZ: Northern Arizona University. **Pp. 89-98**.

Blossey, B., Skinner, L. and J. Taylor. 2001. Impact and management of purple loosestrife (*Lythrum salicaria*) in North America. Biodiversity and Conservation. **10:1787-1807**.

Botkin, D., Demarchi, R., Frost, D., Gunn, A., Marmorek, P., O'Gorman, D. and S. Riley. 2004. Environmental effects of a mining road through the traditional territory of the Taku River Tlingit First Nation: a critique of proposed management plans for a new mining road. Report to the Taku River Tlingit First Nation by the Independent Science Panel. Final report.

British Columbia Firestorm Review. 2004. [Online] URL: http://www.2003firestorm.gov.bc.ca/firestormreport/toc.htm

Canadian Mortgage and Housing Corporation. 2003. Mold Matters: a resource guide for First Nations housing providers. [Online] URL: http://www.cmhc-schl.gc.ca/en/burema/onreop/onreop_007.cfm

Carpenter, S. R., Caraco, N. F., Correll, D. L. Howarth, R. W., Sharpley, A. N. and V. H. Smith. 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. Ecological Applications. **8: 559 – 568**.

Cockle, K.L. and J. S. Richardson. 2003. Do riparian buffer strips mitigate the impacts of clearcutting on small mammals? Biological Conservation. **113:133-140**.

Crawford, J. 1995. Endangered Native American languages: What is to be done, and why? The Bilingual Research Journal. **19: 17-38**.

Dickerson, M. O. and M. Ross. 2000. Sustaining Aboriginal boreal forest communities: exploring alternatives. Sustainable Forest Management Network Publication 2000-35. [Online] URL: http://sfm-1.biology.ualberta.ca/english/pubs/PDF/PR_2000-35.pdf

Erdoes, R. and A. Ortiz. 1984. *Native American Myths and Legends*. Toronto, ON: Random House of Canada. **527 p**.

Garibaldi, A. and N. Turner. 2004. Cultural keystone species: implications for ecological conservation and restoration. Ecology and Society. **9(3): 1**. [online] URL: http://www.ecologyandsociety.org/vol9/iss3/art1/

Government of Canada. 2002. Climate Change Plan for Canada. [online] URL: http://www.climatechange.gc.ca/plan_for_canada/plan/pdf/full_version.pdf

Hall, B. D., Bodaly, R. A., Fudge, R. J. P., Rudd, J. W. M., and D. M. Rosenberg. 1997. Food as the dominant pathway of methylmercury uptake in fish. Water, Air and Soil Pollution. **100:13-24**.

Health Canada (Federal-Provincial-Territorial Committee on Drinking Water). 2003. Virological Quality of Drinking Water - Document for public comment. [Online] URL: http://www.hc-sc.gc.ca/hecs-sesc/water/publications/virological_quality_dw/toc.htm

Hoover, S., Hill, R. and R., Watson. 1997. Estimating risks from exposure to methylmercury: application to First Nations people in Canada. Water, Air and Soil Pollution. **97:107-118**.

Hoffman, S. M. 2002. Powering injustice: hydroelectric development in northern Manitoba. In *Environmental Justice: Discourses in International Political Economy*. Byrne, John, Leigh Glover and Cecilia Martinez, eds. Energy and Environmental Policy. Volume 8. New Brunswick, NJ: Transaction Publishers.

Indian and Northern Affairs Canada. 1996. Report of the Royal Commission on Aboriginal Peoples. [Online] URL: http://www.ainc-inac.gc.ca/ch/rcap/sg/sgmm_e.html

Indian and Northern Affairs Canada and Natural Resource Canada. 2001. Climate, it's about change – an overview of energy efficiency and renewable energy in Aboriginal and northern communities. EE/RE CD-ROM.

Indian and Northern Affairs Canada. 2003. National assessment of water and wastewater systems in First Nation communities. [Online] URL: http://www.ainc-inac.gc.ca/ps/hsg/cih/ci/ic/wq/wawa/index_e.html

Indian and Northern Affairs Canada. 2004. Implications of First Nations demography. [Online] URL: http://www.ainc-inac.gc.ca/pr/ra/execs/index_e.html

Kirkness, V. J. 2002. The preservation and use of our languages: respecting the natural order of the creator. In Indigenous Languages Across the Community. B. Burnaby and J. Reyhner eds. Flagstaff, AZ: Northern Arizona University. [Online] URL: http://jan.ucc.nau.edu/~jar/ILAC/

Lantz, T. Z. 2001. Examining the potential role of co-operatives in the ethical commercialization of medicinal plants: plant conservation, intellectual property rights, ethics, and the Devil's Club (*Oplopanax Horridus*). British Columbia Institute for Co-Operative Studies Occasional Papers. [Online] URL: http://web.uvic.ca/bcics/research/occasional/paper3-medicinal-plants.html

Loomis, J. B. 1989. A bioeconomic approach to estimating the economic effects of watershed disturbance on recreational and commercial fisheries. Journal of Soil and Water Conservation. **44: 83-87**.

Loney, M. 1995. Social problems, community trauma and hydro project impacts. The Canadian Journal of Native Studies. **15: 231-254**. [Online] URL: http://www.brandonu.ca/library/cjns/15.2/default.htm

Marles, R. J., C. Clavelle, L. Monteleone, N. Tays, and D. Burns. 2000. Aboriginal Plant Use in Canada's Northwest Boreal Forest. University of British Columbia Press and Natural Resources Canada, Canadian Forest Service. University of Washington Press. **368 p.**

McMaster , M.E. , J.L. Parrott and L.M. Hewitt. 2003. A Decade of Research on the Environmental Impacts of Pulp and Paper Mill Effluent in Canada (1992-2002). National Water Research Institute, Burlington , Ontario . NWRI Scientific Assessment Report Series No. 4. **84 p**. [Online] URL: http://www.nwri.ca/pulpandpaper/index-e.html

Moller, H., Berkes, F., O'Brian Lyver, P., and M. Kislalioglu. 2004. Combining science and traditional ecological knowledge: monitoring populations for co-management. Ecology and Society. 9(3): 2. [Online] URL: http://www.ecologyandsociety.org/vol9/iss3/art2/main.html

Murray, C. D. and J. M. Buttle. 2001. Clearcutting impacts on snow accumulation and melt in a northern hardwood forest. Proceedings of the 58th Annual Eastern Snow Conference. [Online] URL: http://www.easternsnow.org/proceedings/2001/Murray.pdf

Natural Resources Canada. 2004 Energy Efficiency Trends in Canada, 1990-2002. [Online] URL: http://oee.nrcan.gc.ca/neud/dpa/data_e/Trends04/Trends2004.pdf

Notzke, C. 1994. *Aboriginal Peoples and Natural Resources in Canada*. North York: Captus Press Inc. **337 p**.

Offshore Oil and Gas Research Group, School of Resource and Environmental Management. Simon Fraser University. 2004. A review of offshore oil and gas development in British Columbia. [online] URL: http://www.rem.sfu.ca/sustainableplanning/CoastalFirstNationsOOGReport.pdf

Oostdam, J. V., Gilman, A., Dewailly, E., Usher, P., Wheatley, B., Kuhnlein, H., Neve, S., Walker, J., Tracy, B., Feeley, M., Jerome, V., and B. Kwavnick. 1999. Human health implications of environmental contaminants in Arctic Canada: a review. The Science of Total Environment. **230: 1-82**.

Peterson, H. 2004. What will it take to improve First Nations drinking water? Aboriginaltimes.community. [Online} URL: http://aboriginaltimes.com/health/First%20Nations%20water%20contamination/view

Pitcher, T. J. 2001. Fisheries managed to rebuild ecosystems? Reconstructing the past to salvage the future. Ecological Applications. **11: 601-617**.

Receveur, O., Boulay, M., and H.V. Kuhnlein. 1997. Decreasing traditional food use affects diet quality for adult Dene/Métis in 16 communities of the Canadian Northwest Territories. Journal of Nutrition. **127:2179-2186**.

Ripley, E., Redman, R. and A. Crowder. 1996. Environmental impacts of mining. Delray Beach, FL: St. Lucie Press. **356 p**.

Royal Roads University. 2004. British Columbia offshore oil and gas socio-economic issue papers. Bibliography. Prepared for Western Economic Diversification Canada. Science and

Technology and Environment Division. Victoria, BC. [online] URL: http://www.royalroads.ca/resources/tab+8+bibliography.pdf

Sachdev, I. 1998. Language use and attitudes among the Fisher River Cree in Manitoba. Canadian Journal of Native Education. **22: 108 –119**.

Simonsen, B.O., S. Peacock, J. Haggerty, J. Secter, and F. Duerden. 1997. Report of the First Nations Cultural Heritage Impact Assessment and Consultation. Component; Bamberton Town Development Project. First Nation Management Committee. Submitted to The Environmental Assessment Office, Province of BC and Greystone Properties Ltd. [online] URL: http://www.racerocks.com/racerock/rreo/rrrefer/bamber/toc1.htm

Simpson, L. 1998. Aboriginal peoples and the environment. Canadian Journal of Native Education. **22: 223-237**.

Sheldon, J. W., Balick, M. J. and G. M. Laird. 1997. Medicinal plants: can utilization and conservation coexist? Advances in Economic Botany. **12: 1-104**.

Ship, S. J. 1997. Environmental contaminants and traditional foods. National Inuit and Inuit Community Health Representatives and Organization. In Touch Magazine. Volume 8. [Online] URL: http://www.niichro.com/Environ/Enviro2.html

Stanley, A. 1996. The environmental consequences of pulp and paper manufacture. Friends of the Earth. [Online] URL: http://www.foe.co.uk/pubsinfo/briefings/html/19971215150024.html

Themelis, N.J. 2002. The environmental impacts: Assessing waste-to-energy and landfilling in the US. Waste Management World, International Solid Wastes Association. July-August. 35-41. [Online] URL: http://www.seas.columbia.edu/earth/wtert/wmwpapernjt.pdf

The National Academies Press. 2003. Cumulative environmental effects of oil and gas activities on Alaska's North Slope. [Online] URL: http://www.nap.edu/books/0309087376/html/

Thompson, I. D., Baker, J. A. and M. Ter-Mikaelian. 2003. A review of the long-term effects of post-harvest silviculture on vertebrate wildlife, and predictive models, with an emphasis on boreal forests in Ontario, Canada. Forest Ecology and Management. **177: 441-469**.

Tsuji, L. J. S. 1996. Loss of Cree traditional ecological knowledge in the western James Bay region of northern Ontario, Canada: a case study of the sharp-tailed grouse (*Tympanuchus phasianellus phasianellus*). The Canadian Journal of Native Studies XVI. **2:283-292**.

Turner, N. J. 2001. “Doing it right”: issues and practices of sustainable harvesting of non-timber forest products relating to First Peoples in British Columbia. B.C. Journal of Ecosystems and Management. 1: 1-11. [Online] URL: http://www.forrex.org/jem/2000/vol1/no1/art6.pdf

Turner, N.J. and S. Peacock. 1995. Traditional plant resource use of the Kamkanetkwa Region (including Scheidam Flats) by the Kamloops Secwepemc People. Report to Rush, Crane, Guenther and Associates, Vancouver, BC and the Kamloops Indian Band, Kamloops, BC.

United States Department of Agriculture. 2000. Plant Guide. Black ash, Fraxinus nigra Marsh. Natural Resources Conservation Service. National Plant Data Center. [online] URL: http://plants.usda.gov/plantguide/pdf/cs_frni.pdf

Wein, E. E. 1994. The high cost of a nutritionally adequate diet in four Yukon communities. Canadian Journal of Public Health. **85: 310-312**.

Wiener, J. G., Krabbenhoft, D. P. Heinz, G. H. and A. M. Scheuhammer. 2003. Ecotoxicology of mercury. In *Handbook of Ecotoxicology 2nd edition.* D. J. Hoffman, B. A. Rattner, G. A. Burton Jr. and J. Cairns Jr. (eds.).. Boca Raton, FL: CRC Press. 409 – 463.

Wiseman, C. L. S. and F. Gobas. 2002. Balancing risks in the management of contaminated First Nations fisheries. International Journal of Environmental Health Research. **12: 331-342**.

