THE ECOLOGY OF FOOD AND MEDICINE PLANTS AND THEIR GATHERING SITES AS DEFINED BY TL'AZT'EN NATION

by

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ABSTRACT

Aboriginal people, including Tl'azt'en Nation, have close and long-standing relationships with the environment. Plants were, and still are, important for food, medicine, and cultural purposes. Western societies have had a negative impact on many Aboriginal communities which can be seen in the loss of Traditional Ecological Knowledge (TEK). An example of this is with TEK regarding food and medicine plant use of Tl'azt'en Nation. This research was a collaborative project between Tl'azt'en Nation and the University of Northern British Columbia (UNBC). Tl'azt'en community members participated in every stage of the research and assisted in the determination of the research goals and objectives. This ensured that the appropriate knowledge was being documented and it was in a form that was presentable and acceptable to all involved. The study was conducted to collect TEK about the ecology of food and medicine plant gathering sites, to gain an understanding of the criteria for gathering individual plants for food or medicine use, to understand why traditional food and medicine plant gathering sites may fall out of use, and to provide information for a framework for the protection measures that will be necessary for the continuation of plant gathering activities and sites. In order to gather TEK, fifteen plants were selected to focus on and a total of ten Tl'azt'enne, considered to be knowledgeable about food and medicine plants, participated in various meetings, focus groups, interviews, and field sessions and shared their knowledge about the fifteen plants and their gathering sites. Tl'azt'enne who use plants for food and medicine purposes do not seem to have specific sites where plants must be collected for these purposes, as long as the plant is available in an undisturbed area, away

from people and in Tl'azt'en Territory, it can be gathered. Tl'azt'enne community members possess a deep understanding of plants and their gathering sites and have many concerns including the loss of TEK, changing landscapes, and ecological disturbances. Although Tl'azt'enne community members are concerned about the loss of TEK, they realize that TEK, like other knowledge systems, is adaptable. By having TEK recorded in "non-traditional" methods, such as in research projects like this, Tl'azt'enne are controlling the future and the preservation of their knowledge. The close interrelationship between Tl'azt'en Nation and their land must not be overlooked and researchers must respect indigenous people as keepers of TEK.

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TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

ACRONYMS

CURA – Community-University Research Alliance
JPRF – John Prince Research Forest
NTFP – Non-Timber Forest Products
TEK – Traditional Ecological Knowledge
UNBC – University of Northern British Columbia

DISCLAIMER:

Plant foods and medicines must not be prepared and administered on the basis of any information contained in this thesis. Attempts to administer plant preparations herein without the additional knowledge and skills of an Elder or expert is disrespectful and could result in waste or harm. The author, editors, the University of Northern British Columbia, Tl'azt'en Nation and the John Prince Research Forest bear no responsibility for actions taken based on information contained within this thesis.

INTRODUCTION

Thesis Topic Information

In the late 1800's, the *Indian Acts* of Canada strived to obliterate traditional Aboriginal forms of government and social organization in Canada (Simpson 1999). In later years, participation in traditional ceremonies, dances and songs became illegal in an attempt to assimilate Aboriginal Peoples into Euro-Canadian society. The Euro-Canadian school system particularly had a major impact on Aboriginal culture (Nock 1988, Anyinam 1995, Turner et al. 2000). As Aboriginal children were placed in residential schools as early as 1900, the traditional system of education started to break down (Nock 1988). Missionaries stressed the education of children in order to assimilate the Aboriginal population into the dominant Euro-Canadian culture. They were interested in educating the young, because they considered the older generation "beyond redemption" (Nock 1988). The government and churches believed it was necessary to separate children from their home environment and to eliminate, or reduce, parental influence as the younger generation was considered the only hope for assimilation and social change (Titley 1986). By the time they finished their schooling, they had become foreigners to their traditions, not only by failing to learn skills and knowledge of the land, but also by lacking an appropriate attitude for life on the land (Turner et al. 2000). In these schools, traditional languages were forcibly suppressed and effectively eliminated. This widespread loss of specialized vocabulary, such as names for plants, animals, and places, and discourse, associated with peoples' relationships to the land and the various life-forms, is a major tragedy (Turner et al. 2000). Formal schooling also led to the weakening of the existing social system (Barman et al. 1987). Although some residential

school children managed to learn traditional ways, or re-learned them later, the conventional perception is that the residential school system is responsible to a major degree for the loss of culture and tradition (Barman et al. 1987, Miller 1987).

Indigenous people are very diverse and generalization about their communities and cultures cannot be easily made. Economic, practical, spiritual, political, and historical relationships to homelands are unique to each indigenous community (Turner et al. 2000). Therefore, indigenous knowledge, including Traditional Ecological Knowledge (TEK), is not a uniform concept across all indigenous people (Smith 1999, Pidgeon and Hardy Cox 2002, Ball and Simpkins 2004). Indigenous knowledge is so much a part of the clan, band, community, and the individual that it cannot be separated from the possessor to be codified into a single definition (Battiste and Henderson 2000). This knowledge is not only elaborately tied to place and location, but also relationships and ways of being over time (Ball and Simpkins 2004).

The knowledge about plants and their cultural importance is a major component and expression of TEK (Turner et al. 2000). The identity of cultures, traditions, and lifestyles of many aboriginal people are often based on their use of plants (Shebitz and Kimmerer 2005). Although many food and medicine plant species themselves are not endangered, the knowledge about these plants is rapidly being lost throughout the world (Turner et al. 2000, Hamilton 2004). Knowledge about the types, distribution, ecology, methods of management, and extraction of useful properties of medicine plants is declining rapidly (Hamilton 2004).

As a researcher, it is important to note that it is disrespectful and inappropriate for researchers to document indigenous knowledge for the sole purpose of theses,

dissertations and academic advances. Quite often documenting TEK separates it from its creative, dynamic, living and personal nature, as well as increasing the chance of misuse and misinterpretation (Simpson 1999). With that being said, as TEK is being lost at a rapid pace from many communities, it is important to record it before it is gone. A number of Tl'azt'enne have retained TEK about traditional food and medicine plant use, plant gathering sites and the Dakelh names of these plants, so it is imperative to collect this knowledge while it is still possible to do so. This thesis documents TEK from knowledgeable Tl'azt'en community members. It is crucial to realize that although the knowledge is presented in this thesis, the ownership lies within the people who possess this knowledge. The TEK written in this thesis is the property of the Tl'azt'enne individuals who generously shared their knowledge, their time and their community.

Case Study Description

Tl'azt'en Nation

Tl'azt'en Nation belongs to the Carrier First Nations and are Athapaskan-speaking people (Brown 2002). The name "Carrier" was introduced through European explorers. In their own language, they refer to themselves as Dakelh "we travel by water" (CSTC 2007). The Dakelhne identify themselves as a number of small Nations connected with each other, each containing their own territory and land (Brown 2002). The territories tend to be linked to a lake system or a watershed. The Dakelhne inhabit the northern part of the Interior Plateau region, bounded on the west by the Coast Mountains, on the north by the Omineca Mountains, and on the east by the Rocky Mountains (Brown 2002) (Figure 1).

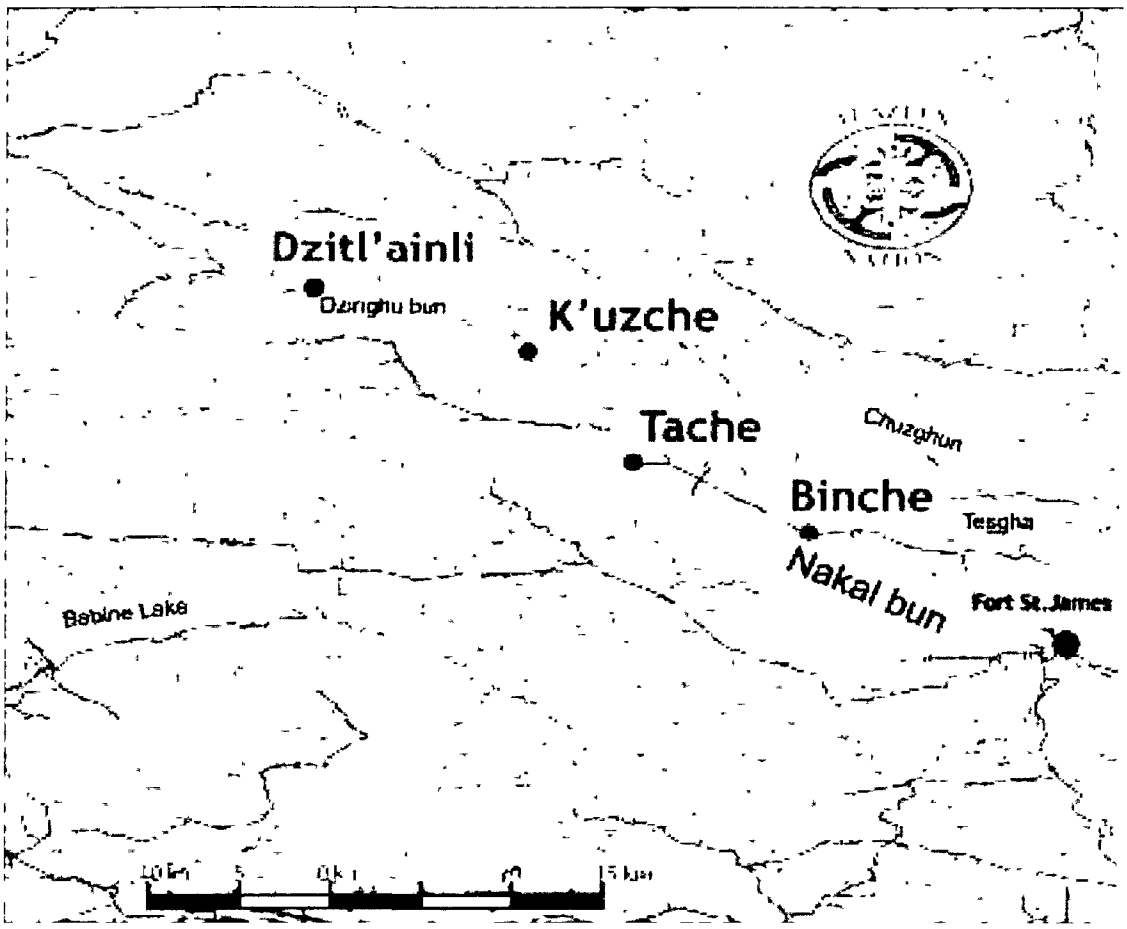


Figure 1: Map of the main settlement areas in Tl'azt'en Nations' traditional territory.

The upper reaches of the Fraser and Skeena River drainages extend through Dakelh territory and provided ample masses of spawning salmon, a staple in their diet (McMillan 1995). This supplied the Dakelh with an abundant food source and allowed for a relatively settled lifestyle. Each year, the salmon run occurred when plant gathering and hunting were also very productive. The primary resources used by the Dakelh, prior to European contact, were fish, small game, and plants/berries (McMillan 1995).

Tl'azt'en Nation ("people by the edge of the bay") inhabit approximately 6500 km^2 of land in north-central B.C, approximately 65 km north of Fort St. James. Prior to

contact, Tl'azt'en's traditional territory covered a vast area along Stuart Lake running up the Tache River almost to Takla Lake to the north (Tl'azt'en Nation 2009). Keyohs, traditional Tl'azt'en family territories that are used for subsistence purposes (Karjala and Dewhurst 2002), were managed by family units. It was not until the late 1800's that Tl'azt'enne began to gather in central communities in response to the fur trade and because of the demands of the Roman Catholic Church (Tl'azt'en Nation 2009). Tl'azt'en Nation is now comprised of 35 reserves, ranging between 0.4 and 817 ha in size, that are scattered throughout their traditional territory (Morris 1999). Tache is the administrative centre and the most populated reserve (Karjala 2001). This is where Tl'azt'en Nation's elementary school and health centre are also located. Most of their on-reserve population resides in the three main settlements of Tache, Binche, and Dzitlainli (Grainger et al. 2006). As of May 2010, the registered population of Tl'azt'en Nation was 1,614. There were 326 males and 286 females registered as living on a Tl'azt'en Nation reserve, 468 males and 496 females registered as living off of a reserve, and 25 males and 13 females registered as living on other First Nation reserves in BC (INAC 2010).

Tl'azt'en Nation is a part of the Carrier Sekani Tribal Council (CSTC) (Brown 2002, CSTC 2007) which was incorporated under the British Columbia Society Act in 1979 and includes about 12,000 people (CSTC 2007). The CSTC provides political and technical support to the First Nations who belong to the CSTC association. The Tribal Council is an advocate for, and frequently represents, the interests of its member-nations. The CSTC also provides technical and professional services to its member-nations in the areas of fisheries, education, economic development, community and infrastructure

planning, forestry, and treaty negotiations. There are eight First Nations in the CSTC: the Burns Lake Band (Ts'il Kaz Koh First Nation), Nak'azdli Band, Nadleh Whut'en First Nation, Saik'uz First Nation, Takla Lake First Nation, Wet'suwet'en First Nation, Stellat'en First Nation, and Tl'azt'en Nation (CSTC 2007).

Over the last few decades the land and people of Tl'azt'en Nation have been significantly affected by industrial developments such as the establishment of a mercury mine at Pinchi Lake in the 1940's, the construction of a railroad line by Pacific great Eastern Railway Company in the 1970's, and the development of the forestry industry (Morris and Fondahl 2002).

Study Site Ecological Information

The study region is dominated by the Sub-Boreal Spruce Biogeoclimatic Zone (SBS) BEC zone (Figure 2), combined with parts of the Mountain Hemlock (MH) and Englemann Spruce-Subalpine Fir (ESSF) zones. The SBS is found in the central interior of BC (Pojar et al. 1982). It is the southernmost zone of the Canadian Boreal Forest region. The SBS occurs at low and medium elevations (500-1300m). Upland coniferous forests dominate the sub-boreal landscape. Hybrid spruce (*Picea engelmannii* x *P. glauca)*, white spruce (*Picea glauca),* and subalpine fir (*Abies lasiocarpa)* are the dominant climatic climax tree species (Pojar et al. 1982). There is the Nechako-Fraser basin in the south and the Finlay, Parsnip and Peace Rivers in the north (Brown 2002). The watersheds of the Nass and Skeena rivers lie along its western edge. To the south, the homeland of the southern Dakelh comprises the basins of the Dean, Blackwater, and Quesnel Rivers. This region contains a number of large natural lakes (Babine, Stuart, and Takla Lakes) and man-made reservoirs (Cheslatta/Murray and Williston). The climate of

the region is a continental one, with long, cold winters, and short summers with relatively long, warm days. Overall, the region has relatively low precipitation (Brown 2002).

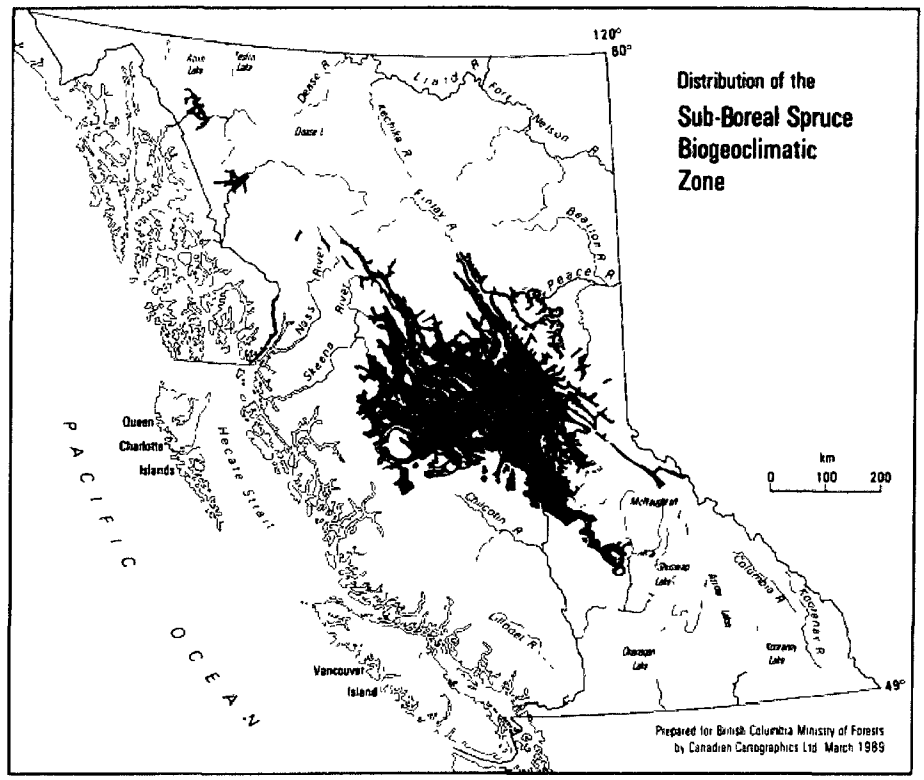


Figure 2: Map of the Sub-boreal spruce zone in British Columbia (Meidinger and Pojar 1991).

In the Fort St. James area, which includes some of Tl'azt'en Nations' traditional territory, forests are mostly made up of lodgepole pine and spruce, with balsam at higher elevations and scattered patches of aspen (Fort St. James LRMP 1999). There are some areas of Douglas-fir, particularly along the shores of Stuart Lake. A history of frequent wildfires has left a mosaic of forest ages. Old and mature balsam stands are found in the northern portion of the planning area, and are also associated with some patches of Douglas-fir elsewhere (Fort St. James LRMP 1999).

CURA (Community-University Research Alliance)

This research was a part of the Tl'azt'en Nation – UNBC Community University Research Alliance (CURA) project (http://cura.unbc.ca), "Partnering for Sustainable Resource Management". This CURA research was a collaborative, five-year project (2004-2009) funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) (Fondahl et al. 2009). There were four streams of research involved in this project: Tl'azt'en Traditional Ecological Knowledge, Improved Partnerships, Tl'azt'en Ecotourism, and Science/Environmental Education. The research for this thesis was conducted within the Tl'azt'en Traditional Ecological Knowledge stream and involved the collection of TEK regarding plant use for food and medicine purposes and the plant gathering sites. This study enabled the knowledge to be documented and allows Tl'azt'en Nation to perpetuate their TEK.

Through collaborative research, the Tl'azt'en Nation-UNBC CURA project hoped to enhance the capacity of Tl'azt'en Nation to effectively engage in culturally and ecologically sustainable natural resource management, and to improve the capacity of UNBC researchers and their students to effectively contribute to First Nation community needs (Tl'azt'en Nation and the University of Northern British Columbia CURA 2009).

Research Objectives

Objective 1 – to collect TEK about the ecology of food and medicine plant gathering sites;

Objective 2 - to gain an understanding of the criteria used for gathering individual plants for food or medicine use;

Objective 3 - to understand why traditional food and medicine plant gathering sites may fall out of use; and

Objective 4 - to provide information for a framework for the protection measures that will be necessary to the continuation of plant gathering activities and sites.

Thesis Structure and Overview

Chapter 1, Literature Review, provides an overview of the ideas, themes, and methods involved in researching TEK, Ethnobotany, and Community-Based and Participatory research. Chapter 2, Methodology, describes the methodology employed in this thesis research. Chapter 3, Results and Discussion, presents the findings of the research. I have used direct quotes and stories from Tl'azt'en community members in an attempt to avoid taking the information out of context. The people who possess the knowledge are the "experts"[1] and not the researcher who records it, therefore, I felt by using direct stories and quotes the chances of misinterpretations were reduced. Chapter 4, Conclusion, discusses the lessons learned from this study and summarizes the main findings.

[1] During one of the meetings with Tl'azt'en community members I was asked not to refer to the community members sharing knowledge about plants as "experts". One community member stated that they would prefer to be called "knowledgeable" and that the real "experts" were the Elders from many generations ago. Throughout the rest of this thesis, the knowledge sharers are referred to as "knowledgeable".

CHAPTER 1: LITERATURE REVIEW

TEK (Traditional Ecological Knowledge)

Traditional Ecological Knowledge (TEK) has been defined as ''a cumulative body of knowledge, practice and belief, evolving through adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment''(Berkes et al. 2000, 1252). It has also been described as the knowledge and insights acquired through extensive observation of an area or species (Huntington 2000). The definition of TEK demonstrates that there is a component of local observational knowledge of species and other environmental phenomena, a component of practice in the way people carry out their resource use activities, and a component of belief regarding how people relate to resources and ecosystems (Colding et al. 2003).

Indigenous[2] knowledge has been overlooked for many years in North America (Brant-Castellano 2000). Survival of many indigenous cultures are currently threatened by insensitive economic development, coercive education systems, assimilation into the modes of production and relentless movement toward market economies of the western society, and the increasing ecological destruction of Aboriginal peoples' homelands and resources (Turner et al. 2000). In residential schools, in the workplace, in social relations, and in political forums, Aboriginal people have been subjected to criticism of their culture which devalues their knowledge and worth. The transmission of traditional knowledge has been disrupted and the damage can be seen not only in the loss of past

[2] The terms Aboriginal, Indigenous, and local are all used to describe the people who inhabit a geographic region in which they have the earliest known historical connection or are considered "native" to Different authors use different terms and this summary uses terms used by each of the cited authors

knowledge and wisdom, but also loss of the process of knowledge creation and the use of cultural resources to enhance knowledge in daily life (Brant-Castellano 2000).

Before the arrival of written or electronic media in Aboriginal communities, TEK was passed on verbally to younger generations from older generations (Brant-Castellano 2000, Turner et al. 2000). It drew upon the shared experience of a common environment and history over many generations (Brant-Castellano 2000). Narratives told over and over to children and adults were an important mode of communicating TEK (Turner et al. 2000). This method of listening to stories about personal experience was, and is, a very effective way to learn as it allows the channels of communication to remain open and the flow of information can remain undistorted (Brant-Castellano 2000). Verbal teachings of this sort were intrinsic with the development of interpersonal relationships between the teacher and pupil. The teachings focused not only on the intellectual content, but also the emotional quality of the relationship. Through these traditional methods, younger generations were able to gain practical experience and knowledge through assisting and listening to Elders, or experts, and in the gathering and management of traditional resources and were also socialized into the culture of their community (Turner et al. 2000). Therefore, sharing TEK can be used as a way for younger generations to learn about their people's way of knowing, and to be involved in the intergenerational transmission of TEK and wisdom (Thompson 2003).

A challenge that Aboriginal educators face today is that the traditional ways of relaying indigenous knowledge have become increasingly unavailable to many Aboriginal people, especially the younger generations (Brant-Castellano 2000). Most of these generations spend much of their time in educational institutions that encourage

usage of, and eventual dependence on, the written English word as the primary source of communication. Youth are no longer submerged in the daily experiential learning about their lands and languages, which would allow them to keep in close contact with their Elders. Many Elders have never accepted the legitimacy of written word accounts, because in their eyes, information in their lives is active. Knowledge was constantly being debated, discussed, and revised in everyday activities. This disconnect between generations reduces the ability of the Elders to pass on their traditional and spiritual knowledge in the traditional way (Brant-Castellano 2000).

Preserving traditional knowledge may occur when the members of indigenous communities determine their own future, which may facilitate the preservation of their own indigenous knowledge. Aboriginal people must then be given the right to decide how to conserve their knowledge, and how, when, and if their knowledge will be shared with others (Agrawal 2004).

Incorporating Traditional Ecological Knowledge into Science and Management

All communities, TEK or western science based, strive to make sense of how the natural world operates and to apply this knowledge to guide practices of manipulating the environment in some way (Gadgil et al. 1993). Until recently, in an attempt to validate indigenous knowledge, researchers willingly adopted the methods and instruments of western science to test indigenous ideas, which demonstrated that few researchers actually accepted the usage of indigenous knowledge in itself (Agrawal 2004). In proposing that indigenous knowledge could be validated by means of scientific criteria, western science is set up as the ultimate authority and source of knowledge. Therefore, it

would then seem pointless to even distinguish between scientific and indigenous knowledge in the first place. Instead of debating the two, an integration of the knowledge obtained from both indigenous knowledge and western science should be used to gain access to a more complete understanding of the living world and the complex interactions found within it (Agrawal 2004). Science may have much to learn from TEK, as TEK can be a source of new ecological information (Kimmerer 2002). In fact, many scientific "discoveries" have been long known among indigenous communities, such as the effects of grizzly bear (*Ursus arctos horribilis*) foraging on the growth and persistence of glacier lilies (*Erythronium grandifolium*) (Turner et al. 2000). TEK may also provide western scientists with insight into historic ecological conditions (Gadgil et al. 1993, Ramstad et al. 2007). Knowledge of traditional indigenous land management could be crucial to scientists trying to understand the current ecology of "wild" populations and landscapes as indigenous peoples have had lasting impacts on ecosystems through selective cultivation of plants (Deur 2002).

In TEK, humans are seen as part of the natural world and it has a belief system that stresses the importance of respect for the rest of the natural world, which is also of value for evolving sustainable relations with natural resources (Gadgil et al. 1993). Traditional knowledge of biotic relationships involving plants or animals can aid in the identification, management, protection, and recovery of habitats or species. The increasing need for preservation of unique ecosystems, restrained use of resources, and ecological restoration in many parts of the world strengthen the need to include TEK in western science conservation efforts (Donovan and Puri 2004). Scientists and practitioners of TEK often share a common goal of species restoration and conservation

and it is important that they work together to conserve both the species and culture (Ramstad et al. 2007). The traditional management of wild root crops in south–central British Columbia is a good example of how TEK can be used to provide ecologically sustainable, nutritious, and culturally valued food sources. This information can then be used as a baseline for ecologists and restorationists in reestablishing degraded habitats and in gaining a better understanding the role humans have in shaping the environment (Turner et al. 2000).

An example of how western science and TEK can complement each other is with forest indigenous groups, such as the Ache in Paraguay, who have lived for generations mostly, or entirely off, the natural resources that forests provide (Naidoo and Hill 2006). The Ache are accustomed to moving through the forest without the aid of trail systems, and are possibly able to reach many areas that field biologists do not reach, due to the lack of accessibility. By moving throughout the forest, and not simply to those areas that are accessible by roads and/or trails, members of the Ache tribe have literally seen the vegetation in almost every part of Mbaracayu Forest Reserve. In the same area, detailed western science botanical investigations have been conducted over transects that enter less than a kilometer or two into the forest from a road's edge. Although these studies are more "scientifically" detailed than the Ache's experience with the forest, at issue is the depth of detailed ecological studies versus the extent of indigenous everyday use (Naidoo and Hill 2006). Melding both sources of information can possibly lead to a broader understanding of the forest as a whole, a benefit that has been noted for other ecological and cultural systems (Berkes et al. 2000).

Traditional knowledge of the land, and the relationships that exist, can provide a different, and even complementary, way to observe ecological relationships (Johnson 2000). Indigenous landscape perception often differs from that of western ecology. In western ecology, plant communities are often described based on the dominant plant species or geomorphic features (e.g., floodplain cottonwood forest, sphagnum bog, montane forest, hemlock forest, birch woods, or black spruce swamp). In indigenous knowledge, many descriptions tend to be primarily topographic and, for example, deal with the presence or absence of standing water or trees. The Gitksan landscape is organized traditionally with reference to mountains and rivers, and to drainage basins and divides. Lakes also act as prominent features and are often named and appear in oral histories. Plants are almost always discussed in terms of their uses and where they are found. Within the Gitksan, habitat descriptions such as 'in the swamp' or 'halfway up the mountain' are sufficient to depict the ecological setting (Johnson 2000).

The differences in perspectives have implications for the management of forest reserves where indigenous groups live (Naidoo and Hill 2006). Botanical classification of forest community types are typically based on species composition and diversity, while vegetation classification systems of indigenous groups (who have depended on the forests for generations) are most likely to classify forest communities type in such a way that best represent their potential provision of relevant ecosystem goods and services. For example, a major factor associated with Ache vegetation classes is the possibility of encountering important resources such as wild game and honey, which is defined by the inherent capacity of habitats to support such items, as well as the ease with which community members can move through particular forest types. In terms of sustainably

managing forest reserves where traditional use occurs, using indigenous forest classifications may be more directly relevant to the setting of resource use (Naidoo and Hill 2006).

Loss of Traditional Values and Knowledge

Indigenous people have close and long-standing relationships with their environment (Turner et al. 2000). However, many indigenous cultures are severely threatened by insensitive economic development, coersive educational systems, assimilation into the modes of production and inexorable movement toward the market economies of the dominant society, and by the ecological destruction of peoples' homelands and resources. The knowledge base for TEK is threatened worldwide and so are the possibilities for the continued expression and reproduction of this knowledge and the production that it provokes (Turner et al. 2000).

Traditional Plant Use by First Nations

Plant resource use was, and is, infused with ecological knowledge that may take on many forms (Turner et al. 2000). For example, the life cycle of different plant species which would include seasonal signals, flowering of a certain species, and production of certain berries, all act as indicators for people to know when to expect other events to occur, such as a salmon run or when certain roots can be collected (Turner 1998). Aboriginal people recognized succession and had an intimate understanding of the prime habitats for various species, the conditions under which they are most productive, and the best methods for processing and storing the plants for optimal utilization (Turner et al.

2000). Academics and decision-makers have emphasized the value of Aboriginal knowledge in determining the sustainability of ecosystem dynamics (Cunningham 2001).

Aboriginal people of British Columbia have been using wild plant species as a source of food and medicine for thousands of years (Turner 1992). Plant foods have contributed to Aboriginal diets both quantitatively and qualitatively (Turner et al. 2000) and hundreds of different plant species were being used medicinally before the arrival of the Europeans in the 18th and 19th centuries (Turner 1992). Some specific medicines were restricted to a specific language group or community, while others were used almost universally throughout the plant species natural range (Turner 1992). The plants selected for medicines by an Aboriginal group are related to local concepts regarding the disease or illness, the nature of the plant species used, and the worldview of the culture (Johnson 2006). The availability and the physical and chemical properties of the plant species determines which species and plants are selected for medicine purposes. As plants are seen as entities with their own intrinsic power to help, heal or withhold help, attitude is very important when gathering plants and must be respected (Johnson 2006).

As seen in Table 1, many First Nations in British Columbia have used, and still use, plants for food and medicine purposes. The Dakelh, Gitskan, Okanagan-Colville, Thompson and Wet'suwet'en First Nations all inhabit British Columbia, have access to many of the same plants as Tl'azt'en Nation, and have had detailed information of ethnobotanical knowledge documented and published. The following table describes the food and medicine uses of some of these plants.

Table 1: Food and medicine plant use by the Dakelh, Okanagan-Colville, Thompson, Gitskan and Wet'suwet'en First Nations in British Columbia.

Plant	Food	Medicine
Abies lasiocarpa Balsam Fir (Pinaceae)	• Thompson uses inner bark as food[1]	Bark blisters/pitch: • Dakelh boil pitch to treat lung ailments and tuberculosis, and use the pitch to treat wrinkles and sunburns[2] • Okanagan-Colville used blisters/pitch to induce vomiting and to release bowels, treat ulcers and appendicitis, treat general feeling of weakness and loss of appetite, and could be applied externally to treat goiters[3] • Thompson used blisters/pitch to treat sores; applied directly on cuts to help draw the poison out[1] • Gitskan used blisters/pitch to treat tuberculosis and to treat cuts and sores, especially from gonorrhea[4] • Wet'suwet'en took the pitch internally for sickness or to aid in the healing of external wounds[7] Outer bark and boughs/branches: • Dakelh use whole branch to help heal bone sprains[2] • Okanagan-Colville and Gitskan used boughs and bark as bedding[1,3] • Okanagan-Colville used outer bark to treat a bad cough[3] • Thompson boiled outer bark to treat bruises and sprains and to treat a bad cough[1] • Gitskan mixed bark with other medicines/plants for boils, ulcers, and hemorrhaging of the lungs[4] Inner bark: • Thompson used it to treat the early signs of TB[1] • Gitskan used it to treat constipation[4]

Juniperus communis Common Juniper (Cupressaceae)		Whole branch/bough: • Dakelh boiled branches (including berries) to treat kidney infections, is used as a diuretic and to help heal bone fractures[2] • Okanagan-Colville boiled it and used to wash the body to protect a person from evil influences[3] • Thompson boiled it and drunk as a stomach tonic, used to lower blood pressure, and used for aching muscles, kidney ailments and cold[1] • Wet'suwet'en used entire bough and berries to make a decoction that was used as a tonic to treat the flu and venereal disease[7] Entire plant: • Gitskan made decoction of entire plant and used as a purgative, to cleanse oneself, and makes one strong, entire plant also used to treat kidney troubles and hemorrhaging of the mouth[4] Twigs: • Thompson used them to treat sore eyes, a decoction also used as a body wash by hunters, warriors and widowers, presumably for good luck; this could also be drunk for purification[1]
Cornus stolonifera Red willow, Red-oiser dogwood (Cornaceae)	• Okanagan-Colville and Thompson use berries as a food source[1,3]	Inner bark: • Okanagan-Colville used to treat colds, and believed heart conditions could be cured by drinking an infusion of the inner cambium scraped from young branches[3] • Okanagan-Colville mashed the inner bark and used as poultice on the back and belly to heal a women's insides after childbirth, poultice also used to treat irritated skin, rashes, cuts, bruises, toothaches, and sore throats[3]

		• Wet'suwet'en boiled the bark and used it to treat coughs and respiratory ailments; a decoction was used to treat psoriasis by soaking the affected part in the solution; decoction also used internally to treat postpartum hemorrhage[7] Outer bark: • Dakelh soak bark shavings in hot water and pour the liquid onto a cloth and applied as a poultice to reduce swelling[2] Branches: • Dakelh chew on branches to relieve headaches[2] • Okanagan-Colville made tea with young branches to treat an upset stomach (Turner 1980) • Okanagan-Colville state that the whole branch is known to heal the body, clears the blood, help circulation, and heal sores and wounds[3] • Okanagan-Colville make a tea and after childbirth a women drinks this tea everyday for a year to clean out the womb and keep one from having children too frequently[3] • Okanagan-Colville boiled bark of branches to rinse skin, hair and scalp and used to eliminate dandruff and cure falling hair and itchy scalp[3] • Thompson boiled branches with wild rose and chokecherry branches to treat diarrhea or vomiting[1] • Thompson prepared a decoction of red willow with squaw current (*Abies cereum*) branches, and either Douglas fir (*Pseudotsuga menziesii*) or tamarack (*Larix occidentalis*) and used it to bathe a baby when it was four to six months old; this was done four to six times over a period of several weeks and was said to make the baby strong, bright, and good-natured[1]

		• Thompson made a decoction of branches drunk to treat colds[1] Whole plant: • Thompson used the wood, bark, leaves, or all three, and boiled a decoction that was drunk after childbirth[1]
Viburnum edule High-brush cranberry (Caprifoliaceae)	• Okanagan-Colville, Thompson, and Gitskan use berries as food[1,3,4]	• Gitskan boiled bark and twigs together to treat coughs and TB[4] • Gitskan mixed whole plant with devil's club and used it as a diuretic[4]
Shepherdia Canadensis Soapberry (Elaeagnaceae)	• Dakelh, Okanagan-Colville, Thompson, Gitskan and Wet'suwet'en use berries as a food source and make "Indian ice-cream" [1 3 4 7]	Branches: • Dakelh boil the stems and drink as a tea to treat cancer[2] • Okanagan-Colville make tea out of the branches and drink it as a laxative, a tonic, or a stomach medicine; branches could be mixed with Saskatoon berry branch and red willow branch and given to women after childbirth as a temporary contraceptive, and the branches could be boiled and the solution used as a shampoo[3] • Thompson boiled branches and leaves together to treat cancer of the stomach and high blood pressure[1] • Gitskan used the bark of branches as a chronic cough medicine (or whole branch including leaves boiled together)[4] • Wet'suwet'en make decoction using inner bark and use as a laxative or to treat a sore stomach Twigs: • Thompson boiled twigs and sticks together and used it as a laxative and used a cooled decoction of twigs to wash hair to treat dandruff[1] Berries: • Dakelh eat berries to clean out your system and to kill parasites in

		the system[2] • Thompson used berries and juice form berries used to treat a wide range of ailments from heart attacks to indigestion, juice also said to be a good cure for acne, boils, digestive problems, and gall stones[1] • Thompson ate berries to treat cancer of the stomach and high blood pressure[1] • Wet'suwet'en use berries to treat stomach ulcers Leaves: • Thompson made tea out of leaves and used it to treat ulcers and as a sedative[1] Roots: • Gitskan boiled roots with twigs of Sitka spruce and drank to treat rheumatism[4]
Ledum groenlandicum Labrador tea (Ericaceae)	• Okanagan-Colville, Thompson, and Gitskan drank leaves as a tea[1,3,4]	Leaves: • Dakelh made tea with leaves to clean out the system[2] • Okanagan-Colville made a tea that was good for the kidneys, could also boil twigs with leaves[3] • Thompson used an infusion as a mild stimulant[1] • Gitskan used infusion as a diuretic[4]
Rubus idaeus Wild Raspberry (Rosaceae)	• Okanagan-Colville, Thompson, and Gitskan used berries as a food source[1,3,4] • Okanagan-Colville made a juice out of	Branches: • Okanagan-Colville boiled branches to make tea which was drunk as a physic and for heart burn and diarrhea[3] Leaves: • Thompson made a decoction of the leaves to treat vomiting, or spitting or vomiting of blood[1]

	berries[3]	Roots: • Okanagan-Colville boiled roots to make tea to treat constipation[3] • Thompson made a decoction from roots and used it as a stomach medicine[1] Other: • Dakelh boil the stalks to make a tea to treat menstrual cramps, to encourage faster birth and prevent clots during childbirth, and to treat anemia[2]
Oplopanax horridus Devil's club (Araliaceae)		Stems: • Dakelh use stems to treat toothaches, arthritis, and is known to have antibacterial properties [5] • Okanagan-Colville use roots or stems (with thorns and bark removed) as medicine for dry coughs[3] • Thompson drink and infusion of stems (with bark and thorns removed) to treat flu or to help with weight loss (only drink small quantities), infusion of fresh, crushed stems used for indigestion and stomach troubles, decoction of small pieces of the stem drunk as a tonic and blood purifier, and is said to have laxative properties, ointment of the stem and grease used to treat swelling and running sores[1] Bark: • Dakelh use the bark as an analgesic and to treat tuberculosis[6] • Gitskan use a decoction of bark as a purgative, to treat gonorrhea, and to heal broken bones[4] • Wet'suwet'en use inner bark to treat colds, flu or tuberculosis[7] Roots:

		• Dakelh use the roots to treat diabetes, as a diuretic, and as a form of birth control[5] • Wet'suwet'en chewed the roots to treat a cough[7]
Arctostaphylos uva-ursi Kinnikinnick (Ericaceae)	• Okanagan-Colville, Thompson, and Gitskan use berries as a food source (high in Vitamin C) [1,4]	Leaves: • Okanagan-Colville used leaves or berries to treat diarrhea, decoction of the leaves and stems used as an eye wash and as a tonic for the kidneys and bladder[3] • Thompson chewed leaves to alleviate thirst, tea made form leaves is good for kidneys, valuable as a tonic, antiseptic and astringent, especially for disorders of the urinary passages, bladder, and kidneys, tea of leaves also good as a mouthwash to treat canker sores and weak gums decoction of stems and leaves used as an eye wash for sore eyes and drunk as a tonic and diuretic for the kidneys and bladder[1] Whole Plant: • Dakelh know it as "women's medicine" as it is used by women going through menopause and used to treat menstrual cramps [2] • Thompson made infusion of the whole plant and used it as an external wash for broken bones[1]
Achillea millefolium Yarrow (Asteraceae)	• **Note: Okanagan-Colville state that there are there are 2 varieties, one more fine-leaved than the other, both used for	Leaves and Stems: • Okanagan-Colville placed leaves and stems on hot coals as a smudge to keep away insects, a strong potion made by boiling leaves and stems was used to cause an abortion[3] • Thompson chewed leaves raw or made them into an infusion to treat dysentery, boiled leaves and roots was used for bathing • arthritic limbs, mashed basal leaves was used as a poultice for cuts[1] Flowers:

	same purposes[3] **	• Dakelh dry and crush flowers and apply them to skin as an insect repellant[2] Roots: • Dakelh dry the roots and use them on sore teeth or cavities[2] • Okanagan-Colville mashed the inside of the root and used it to relieve toothaches, roots were seeped and infusion drunk for a headache, stomach ache or cold, boiled roots could also be used as an eye wash, and for rashes and burns[3] • Thompson pounded roots used it as a poultice on the skin for sciatica, mashed roots used to treat toothaches, an infusion made of the roots or whole plant was used to treat diarrhea and stomach cramps[1] Whole Plant: • Okanagan-Colville boiled the whole plant and bathing in it was said to soothe arthritis or rheumatism[3] • Thompson believed that a decoction of the whole plant can be used to treat almost any sickness[1] • Gitskan boiled the whole plant, except the roots, to treat a sore throat; only young plants used[4] • Wet'suwet'en made decoction that was used as a skin wash to treat itching[7]

Alnus tenuifolia Mountain Alder (Betulaceae)		Bark: • Dakelh boil bark shavings to treat cancer, ulcers, sores in baby's mouths, and burns[2] • Okanagan-Colville boiled the bark and the liquid was used to wash sores, sap wood could also be dried and used on sores[3] • Gitskan boiled the bark and roots and the decoction was used as a cough medicine[4] Other: • Okanagan-Colville used young alders to make medicine for a woman at childbirth; boil the tops (leaves and all) and give to a woman the day her baby is due; helps clean her out after baby is born[3] • Gitskan ate pistillate catkins and bark shavings raw or boiled them and used them to treat gonorrhea[4]

Pinus contorta Jack pine, Lodgepole pine (Pinaceae)	• Dakelh, Okanagan-Colville, Thompson, Gitskan and Wet'suwet'en used inner bark/cambium as a food source[1, 2, 3, 4 7] • Dakelh dry and smoke bark shavings and use as a food source [2] • Thompson used young shoots as a food source[1]	Pitch/Sap: • Dakelh use pitch as a skin lotion and to treat sores[2] • Okanagan-Colville drank sap from the bark of young trees to treat ulcers, pitch swallowed to treat sore throat[3] • Thompson melted pitch melted with deer fat and used it as poultice for rheumatic and other pains, an ointment made with pitch and animal fat was used to relieve congestion, treat coughs, colds, and sore throats[1] • Gitskan mixed pitch with other ingredients and used as a medicine for boils and ulcers [4] Other • Dakelh add sugar to young leaf tips and use this to treat coughs[2] • Okanagan-Colville made a strong tea of needles to induce abortion[3] • Thompson made an infusion with twigs (needles attached) and drank it to treat influenza[1] • Gitskan used the inner bark as a blood purifier and purgative, resinous wood shavings and young needles were eaten and used as a purgative for gonorrhea and TB, and needles used as a diuretic in June[4] • Gitskan mixed pitch with other ingredients and used as a medicine for boils and ulcers [4]

Populus tremuloides Poplar, Trembling aspen (Saliaceae)	• Gitskan use inner bark as a food source[4]	Bark: • Dakelh chew bark and apply to wounds to stop bleeding, bark can also be made into a tea to get rid of worms or be used as a cough syrup[2] • Okanagan-Colville seeped inner bark of young trees in cold water and used to treat eye injuries [3] • Gitskan boiled bark of trunk and the decoction was used as a purgative [4] Other: • Okanagan-Colville bathed in brew made from aspen branches to treat rheumatism [3] • Thompson rubbed ashes of wood on running sores, or were mixed with grease and applied to swellings[1] • Gitskan chewed or mashed the bark of the roots and put onto cuts[4]
Vaccinium membranaceum Huckleberry (Ericaceae)	• Okanagan-Colville, Thompson, Gitskan and Wet'suwet'en use berries as a food source[1 3 4 7]	

[1]Turner et al. 1990, [2]Young and Hawley 2010, [3]Turner et al. 1980, [4]Smith 1997, [5]Johnson 2006, [6]Lantz 2001, [7] Johnson Gottesfeld 1993

Medicine plants are widely distributed and many different plant species are considered to have medicinal properties (Hamilton 2004). They can therefore be used as representative species for preserving biodiversity. This can especially be seen as not all medicine plants are used everywhere or are used by all cultures. In other words, a certain plant species can hold significance in one community and lack any special importance in another. The significance of medicine plants to people can be great enough that management efforts for the conservation and sustainability of medicine plants can lead to the conservation of entire natural habitats and other ecological services. Overall, it is not only the medicine plants themselves that can benefit from their conservation as other ecosystems and ecological functions would also be conserved (Hamilton 2004).

Globally, there are very few medicine plant species that have become extinct and as mentioned above, they are widely distributed (Hamilton 2004). However, the seriousness of local, national, or regional extinction should not be underestimated. Not only can local extinctions lead to issues regarding genetic conservation, but there can be serious consequences for local or regional livelihoods and economies (Hamilton 2004). The continuance of cultural traditions and lifestyles is dependent upon access to plant resources (Brown 2002, Shebitz and Kimmerer 2005). If the materials that are essential for traditional customs cannot be obtained in proper qualities and quantities, the traditions may die (Shebitz and Kimmerer 2005). Therefore, medicine plants contribute to many peoples' lives with respect to health support, financial income, cultural identity, and livelihood security (Hamilton 2004).

Many of the threats to the survival of medicine plants are similar to the threats to plant diversity in general. The most immediate threats include habitat loss, habitat degradation, and over-harvesting (Turner et al. 2000, Hamilton 2004). Medicine plants may also be harvested for purposes that are not medicinal in nature, and, therefore, the threats from over-harvesting may be due, at least partially, to collection for those other purposes (Hamilton 2004). Although many medicine plant species themselves are not endangered, the knowledge about these plants is rapidly being lost throughout the world (Turner et al. 2000, Hamilton 2004). Knowledge about the types, distribution, ecology, methods of management, and extraction of useful properties of medicine plants is declining rapidly (Hamilton 2004).

The dependence of humans on other life-forms in their environment is unquestioned, however, some species have a more direct relevance and recognition in peoples' everyday lives, and thus, are considered more important (Garibaldi and Turner 2004, Powell 2005). These significant species may play a direct role in shaping and characterizing the identities of the people who rely upon them. Ecological and social systems are conceptually linked, therefore, identifying and learning about these culturally significant species can lead to advancements in research on environmental, economic and cultural change, as well as in ecological restoration and conservation efforts (Garibaldi and Turner 2004).

The knowledge about plants and their cultural importance is a major component and expression of TEK (Turner et al. 2000). The identity of cultures, traditions, and lifestyles of many aboriginal people are often based on their use of plants (Shebitz and Kimmerer 2005). Medicine plants can be symbolically very important to people and may

be held in special religious, nationalistic, or ideological esteem (Hamilton 2004). The use and effects of a particular plant can often be linked to a spiritual place and to the manner in which it is collected, prepared, and used, emphasizing the interconnectedness between the land, natural resources and First Nations traditions (Powell 2005).

"Cultural keystone species" can be defined as prominent species that shape the cultural identity of people, as reflected in the fundamental roles they have in medicines, diet, materials, and/or spiritual practices (Garibaldi and Turner 2004). "Ecological keystone species" are species whose presence is crucial in maintaining the organization and diversity of their ecological system and it is implied that these species are exceptional, relative to the rest of the community, in their importance (Mills et al. 1993). The concepts of cultural and ecological keystone species are connected with regards to the defining influences a particular species has within its respective worldview. However, unlike ecological keystone species, a vast number of cultural keystone species are plants. An example of a cultural keystone species is red laver seaweed (Turner 2003). This algal species is an abundant primary producer and is an important component of the food web in coastal ecosystems. It is still gathered in large quantities today by the Tsimshian, Haida, Heiltsuk, Kwakwaka'wakw, and other coastal people. It is used for various foods and materials and is highly valued for its medicinal properties (Turner 2003). The harvesting and preparation of this seaweed is difficult and requires a strong understanding of weather patterns, tides, an appreciation of the growth and usable life stages of the seaweed, and knowledge of the optimum preparation techniques (Garibaldi and Turner 2004).

Another example of a cultural keystone species is the wapato, a stable traditional root vegetable (Garibaldi and Turner 2004). It has been extirpated and its habitat has been severely modified. In this kind of situation, a cultural keystone species may be needed for restoration, not conservation. The potato was introduced to the Fraser Valley by settlers which then replaced the wapato. This modified the harvesting, use, management, and trading of the wapato by the Katzie and other Sto:lo peoples of British Columbia. The removal of the wapato through wetland alteration and the replacement of a stable food source therefore altered the Katzie lifestyle. Many of the Fraser Valley wetlands were converted to agricultural fields and changes occurred on both a cultural level and an ecosystem level. By identifying the wapato as a cultural keystone species for the Katzie, the significant cultural role of this plant is recognized, which may aid in the preservation of culture and ecological wetland restoration (Garibaldi and Turner 2004).

Cultural keystone species, such as some food and medicine plants, may be useful in the identification of land use patterns, traditional ecological knowledge, and cultural values (Garibaldi and Turner 2004). The appreciation of cultural knowledge and practices may lead to a better understanding of ecological systems. This can then allow for the preservation or conservation of species in some areas, and restoration or reclamation in others (Garibaldi and Turner 2004).

Ecology

The functional definition of ecology states that ecology strives to characterize the patterns seen in nature, study the complex interactions among organisms and their

environments, and understand the mechanisms involved in biological diversity (Smith and Smith 2001). Ethnoecology can be defined as the extensive realm of local understanding of the environment, of the land, and of the entities that reside there, and of the relationships among them, including the relationships of people to other living things and the land (Johnson 2000). In consideration of the relationship of aboriginal people and their relationship to the landscape they inhabit, the following section presents two relevant concepts: Therapeutic Landscapes and Non-Timber Forest Products (NTFPs).

Therapeutic Landscapes

It has been shown that there is an elaborate link between land and health, confirming that land is of great importance for the health of First Nations people (Wilson 2002). Land, as place, makes up an integral part of First Nations peoples' identity and health. To many First Nations people, land is not just a physical space, but represents the interconnected physical, symbolic, spiritual and social aspects of their culture (Wilson 2002). Therapeutic landscapes can be defined as places with a continuing reputation for achieving physical, mental, and spiritual healing. Societies, through ideologies and the use of symbols, create therapeutic landscapes of healing (Gesler 1993). These healing places can symbolize ideals, values and beliefs (Wilson 2002).

The theory of therapeutic landscapes can be used to aid in the understanding of the interconnectedness between place, identity, and health (Wilson 2002). Health geographers often use therapeutic landscapes as a way to discard geometric and locational approaches to space and place, and use more meaningful perspectives that view places as symbolic systems of healing. There are some limitations to the current

research of therapeutic landscapes. It overlooks the culturally specific dimensions of the links between health and place and the research does not recognize that therapeutic landscapes represent more than just physical or symbolic sites of healing. Therapeutic landscapes, as a concept, is a 'Western' idea that does not allow for the incorporation of 'other' ways of viewing the link between health and place. It focuses on landscapes that are mainly important in western cultures, such as spas and baths, yet their healing benefits are presented as holding universal meaning. The cultural specificity of these landscapes in often unrecognized, and perhaps more importantly, much of the research overlooks therapeutic landscapes in peoples' everyday lives. The relationship between health and land has culturally specific dimensions, but these tend to be unseen, especially with regards to indigenous people. Within Canada, very few researchers have conducted in-depth studies of the cultural beliefs systems of Aboriginal people and how they shape health (Wilson 2002).

For many Aboriginal people, good health and healing requires an individual live in harmony with others, their community and the spiritual world (Malloch 1989). The land supports life on a daily basis through what it provides and this in turn supports health (Wilson 2002). It is by utilizing what the land provides that individuals are able to maintain the balance necessary for health. Historically, the relationship with the land has been an important component of First Nations groups in Canada (Wilson 2002). Before European contact, most First Nations in Canada could be described as subsistence cultures obtaining dietary and daily nourishment directly from the land (Dickason 1997). In a contemporary sense, many First Nations do not live off the land as they once did, however, they claim that the land is still an essential component of their culture. It has

been suggested that a common theme among First Nations cultures is a belief in the importance of the land and a life based on stewardship and harmony with the earth (RCAP 1996). Aboriginal people often assert that the relationship that they have with the land shapes all aspects of their lives: the cultural, spiritual, emotional, physical and social lives of individuals and communities (Akiwenzie-Damm 1996).

It is important to recognize that land represents more than just a physical location in which people carry out their daily activities (Wilson 2002). It has been stated that places influence personal identity (Gesler 1992). Many First Nations believe that the land does not shape or influence identity, but, is an actual part of it (Wilson 2002). Some First Nations believe that all things on Earth are alive and contain spirits, and as such, the land represents a site within which people can relate to other animate beings in their everyday lives, a connection which lends itself to positive emotional and mental health (Wilson 2002).

The land contributes to physical health by providing people with the foods and medicines necessary for well being (Wilson 2002). This sense of well being can also result from participating in certain activities, such as plant gathering, putting down tobacco, and hunting. When an individual is feeling ill, traditional medicines can be used to alleviate illness. In this sense, both the nutritional properties of food and healing benefits of medicines are necessary for health (Wilson 2002). Borré (1994) argues that it is necessary to acknowledge the important emotional healing benefits associated with the physical and spiritual aspects of plant harvesting, hunting, and fishing. In an interview by Wilson (2002), one woman stated the following: "I hunt, I camp, I fish and I have always done that and I always feel good when I'm out there in the bush. To me it's

almost like a cleansing. I can go out there and I just feel so good, like my mind gets so cleared. I love it" (Patricia *pers. comm.* to Wilson 2002).

Participation in certain activities in an individuals' everyday life are important for physical, emotional, mental and spiritual health (Wilson 2002). Activities such as plant gathering are not only for nutritional or medicinal benefit, which supports physical health; they also allow individuals to connect spiritually with Mother Earth, the Creator and spirits while being on the land. This allows individuals to pursue both physical and spiritual connections to the land that are important for emotional and mental health and helps people maintain a sense of balance (Wilson 2002).

Non-Timber Forest Products

Non-timber forest products (NTFPs) can be defined as non-timber products growing in forests that are derived from plants or animals in their natural habitats (Duchesne et al. 2001). NTFPs fall into four broad categories: materials for spiritual use, medicine/food use, ornamental use, and technical use (Turner 1998, Marles et al. 2000). For the purpose of this literature review, discussing NTFPs helps to demonstrate the importance of understanding the ecology and biology of traditionally used plants. NTFPs will refer to food and/or medicine plants.

Many NTFPs can be harvested successfully in the short term, however, their long-term sustainability depends on a thorough understanding of their ecology and biology (Duchesne et al. 2001). It is important for any indigenous gatherer to acquire and use verified knowledge that will enable them to select the most beneficial sites, harvest in an efficient and ecologically sound way, and handle the desired product so that value is

maintained (Duchesne et al. 2001). For example, practical hands-on experience teaches the gatherers that plants are not uniformly found through out the forests (McPhee 1989). The production and abundance of plants varies with a wide range of environmental conditions and characteristics of specific plant physiology such as soil conditions, climate, time of growing season, disturbance history, vegetation type, and plant age and condition. It is also important to recognize that within forest ecosystems, not all plant sources are equally desirable. For example, the quality of birch bark varies among trees in a stand and between birch stands, which affects their usefulness in basket construction (McPhee 1989). This demonstrates the importance of understanding the ecology and biology of NTFPs when predicting the abundance and quality of plants in order to efficiently gather (Duchesne et al. 2001).

It is also important to understand the effects of natural disturbance mechanisms on NTFPs. Forest ecosystems react variably to changes in climatic patterns and their effect on other biotic variables (Duchesne et al. 2001). These can occur at any landscape scale and has the potential to affect the quality and quantity of plants. Examples of this include frost and insects affecting individual buds and flowers; herbivory, disease, and wind affecting parts of or the entire plants; and wind, fire, and insects affecting entire stands and landscapes. The life cycles of many plants are associated with natural forest disturbance. Small fruit bearing species including raspberries, mulberries, and Saskatoon berries are early colonizers after a stand-replacing disturbance and they disappear as the time since the disturbances increases. These species tend to thrive on open sunlight, and the seeds of these species may survive in mature forest stands buried in the soil for many years. The occurrence of a disturbance activates the seeds, and without any competition

for light, these species will dominate the site. However, as time passes and ecosystems mature, plant growth creates competition for light and nutrients, and the seed-bearing species are once again displaced from the ecosystem (Duchesne et al. 2001).

Human originated disturbances also have the ability to influence plants. Forest harvesting, land development, mining, and other human activities can directly affect the land and may potentially alter the availability of certain plants (Duchesne et al. 2001, Moller et al. 2004). The effects from human disturbances may be of short duration or, in the case of conversion of forest land, certain species may be eliminated (Duchesne et al. 2001).

Traditional knowledge about NTFPs has been gleaned and "field tested" by countless generations of indigenous peoples and this information often exceeds the scientific knowledge available for a specific plant species (Duchesne et al. 2001). However, both traditional knowledge and western scientific knowledge play important roles in the sustainability of plants. When traditional knowledge is not available, the basic principles of plant reproduction and growth could provide a useful guide for the management of plants. Western scientific knowledge can be used to explain the biological basis for the success of well-tested traditional methods of NTFP harvest and utilization (Duchesne et al. 2001). Further, studying cultural patterns of land use, perception, and resource use in terms of possible adaptive functions is integral to TEK. Interest in subsistence systems and resource management is increasing as researches search globally for "sustainable development" (Johnson Gottesfeld 1993). Ethnobotanists, and others, have maintained that various traditional small scale societies can provide models of sustainable adaptations. These models need to be documented

before these cultures are overwhelmed by the global economy and western societies (Johnson Gottesfeld 1993).

Ethnomedicine

Athapaskan-speaking people are well known for their profound knowledge of the animals with which they share their homelands. They are skilled hunters and fishers, and knowledge of animals is of cultural and economic importance (Nelson 1983). Plants, however, are also vital for Athapaskan people as they constitute a significant feature of the environments used both by people and animals (Johnson 2008). They are extensively used for medicines and tonics (Marles et al. 2000), and form a vital, although relatively small part of the diet (Murray et al. 2005). Ethnomedicine can be defined as the totality of health knowledge, values, beliefs, skills and practices of members of a society including all the clinical and nonclinical activities that relate to their health needs (Foster and Anderson 1978). Although ethnomedicine can include the use of both plants and animals, this research will discuss the use of plants for food and medicine purposes only.

There are close links between ethnomedicine and ecology. The way people perceive and use the resources of their environment is influenced by culture (Cohn 1988). The practice of ethnomedicine is a fundamental part of the culture of indigenous people in many parts of the world and is closely related to local ecosystems (Anyinam 1995). Both ecology and culture evolve and change and each produces alterations in the other. In the last few decades, there have been significant changes occurring within several aspects of ethnomedicine (especially changes in availability and use of medicinal plants,

perceptions, and indigenous value systems) as a result of environmental degradation and changes in modern social and economic systems (Anyinam 1995).

Plants have always had an important role to play in medicine and public health (Anyinam 1995). The use of plants for healing by any cultural group is related to local concepts of the nature of the disease, the nature of the plant, and the worldview of the culture (Johnson 2006). The link between ethnomedicine and ecology is illustrated by a long tradition of healing powers associated with the earth's natural systems, whether this entails medicinal plants and animal species, the ambient salubrious air, spring water or the natural scenery (Anyinam 1995). Practitioners of ethnomedicine employ methods based on the ecological, socio-cultural and religious backgrounds of the people to provide health care (Gesler 1992).

The gathering of food plants also embodies a rich understanding of the environment, including all aspects of TEK, from practical strategies and management techniques, to belief systems that guide the sustainable use of resources, to ways of communicating and acquiring knowledge (Turner et al. 2000). Decreasing the use of traditional foods has direct impacts to health as well as a loss of cultural identity and cultural pride that are represented among food traditions (Turner and Turner 2008). The arrival of the colonial powers and European attitudes had an immense and complex impact on the Canadian First Peoples and their diets. Plant foods such a greens, inner bark, fruits, and root vegetables were among the most affected (Turner and Turner 2008).

Sustainable Resource Management – Best Management Practices

All over the world, resources managers are realizing that conservation and management measures are more effective when local interests are included (Borrini-Feyerabend 1996). In Canada, indigenous people have inherent and legal rights to use and manage land and resources, and an extensive history of building cultures, religions, and resources management systems founded on an intimate relationship with the land (Notzke 1994). As this way of life is based on TEK, it is founded on a distinct view of the world, culture, language, and value system (Karjala et al. 2002). TEK is based on a detailed understanding of the environment, customary authority, and communal management principles (Berkes 1999) and compliance to these principles is based on unwritten rules, ethics, community sanctions, and extensive teaching to reinforce expectations about wise resource use (Sherry and Myers 2001).

Over the years, there has been a renewed interest in TEK as a source of expert knowledge and the perception of Aboriginal people as peripheral players in natural resource decision-making has been altered (Smith 1998). Indigenous people expect several benefits from enhancing this relationship (Fast and Berkes 1994). The meaningful participation of Aboriginal people in resource management could confirm the legitimacy of Aboriginal title and rights to land and resources, by having influence over management decisions. This could help counteract the social and environmental degradation that plagues Aboriginal communities and reduce conflict between resource users. Incorporating TEK into management could provide alternate ecological interpretations and could compliment gaps in scientific knowledge of ecosystems (Fast and Berkes 1994).

In Western Canada, government funded traditional use studies (TUS) have enabled indigenous communities to develop technical and research capacity for collecting and documenting local culture, languages, values, and skills related to land and resource use (Robinson and Ross 1997). These efforts are often driven, in part, by the loss of TEK resulting from western influences on Aboriginal societies (Robinson et al. 1994).
In order to develop a system of forest management that combines indigenous and western approaches, a common framework for information sharing is necessary to overcome trust issues, as well as cultural and communication barriers (Karjala et al. 2002). For a planning process to be effective, it must meaningfully involve Aboriginals as participants in the decision-making process at the community level (Borrini-Feyerabend 1996), draw upon the strengths of both western and Aboriginal management practices (Western and Wright 1994), protect sensitive and confidential information (Sherry 2002), and must be adaptable to a diversity of cultures, ecosystems and resource management situations (Murphree 1993).

Local involvement in forest management decision making is driven by the desire to identify locally generated goals and objectives for forest management (Karjala and Dewhurst 2002). Individual worldviews, perceptions, identities, values and behaviours all influence, and are influenced by, community, culture, and the environment (Kusel 2001). Just as ecosystems differ between landscapes, so do social, economic and cultural systems (Karjala and Dewhurst 2002). Therefore, sustainable criteria should be defined and implemented differently across social, cultural and ecological boundaries. For that reason, local land uses, priorities, issues and concerns should provide the foundation for

developing appropriate sustainability indicators, and for directing planning processes (Williams and Matejko 1985).

Criteria and Indicators (C&I) can be used as a tool for monitoring sustainable forest management goals and provide a basis for producing innovative forest management approaches (CCFM 1998). Criteria are the essential elements that must be present to achieve a community's goals (Sherry et al. 2005) and can be defined as the concrete components that expand and link more abstract principles to more specific indicators that can be measured (Lammerts van Buerem and Blom 1997); components of the structure and function of ecological, social and economic systems (Wright et al. 2002); or priority elements that warrant full consideration in the management process (Sherry et al. 2005). Indicators can be defined as specific attributes that can be measured (Lammerts van Buerem and Blom 1997) or are a qualitative or quantitative parameter that can be addressed in relation to criterion. Indicators have no implied direction, measurement method, spatial or temporal scale or reference value (Wright et al. 2002) and are the signs or signals used to measure advancement towards attainment of criteria (Sherry et al. 2005).

C&I can be used to organize information for conceptualizing, implementing and evaluating sustainable forest management (Sherry et al. 2005). They are most commonly applied to assess, monitor and report on the state of forests and a secondary use is to guide forest management planning and decision-making (Karjala and Dewhurst 2002). C&I provide common language for delineating management goals and assessing progress towards these goals over time (Wright et al. 2002). Their frameworks are often used to

provide a clear, consistent representation of sustainability concepts and their relationships (Sherry et al. 2005).

Locally-defined C&I can be useful in cross-cultural forest planning exercises, especially in countries where the rights of indigenous people are prevalent (Karjala and Dewhurst 2002). In Canada, although First Nations' intrinsic and legal right to use and mange the land and resources are reflected in government policies, little progress has been made to develop an appropriate collaborative framework to incorporate Aboriginal ecological knowledge and social values into forest planning processes (Karjala and Dewhurst 2002). Multi-stakeholder processes and other conventional public participation approaches are insufficient for meeting the needs of First Nations communities (NAFA 1997). The protocols for consulting these communities on operational level forest plans usually occur at late stages forcing communities into a reactive, defensive position (Robinson and Ross 1997, Sherry et al. 2005). Developing local-level Aboriginal criteria of forest management would generate an understanding of their interests in the context of other local "communities"; overcome some challenges related to cross-cultural planning environments; and direct the necessary actions to properly implement Aboriginal ecological knowledge and values into forest management practice (Karjala and Dewhurst 2002).

There are several legal, political, ideological and cultural barriers that limit First Nations' participation in forest management planning in BC (Sherry et al. 2005). BC is the only province in Canada that has not settled land claims with most of its Aboriginal population. This can create difficulties when trying to engage First Nations communities in setting planning goals and objectives. These Aboriginal groups feel that participating

in processes would acknowledge the provincial government's authority to manage resources on lands where First Nations have a claim (Karjala and Dewhurst 2002). First Nations also want to negotiate on a government to government level and most multi-stakeholder processes assume that First Nations communities are stakeholders on equal footing with industrial, recreational and non-timber forest users. The differences between Aboriginal and western worldviews on land and resources and concerns over the control and ownership of Aboriginal knowledge also pose challenges to cross-cultural forest planning (Berkes 1999, Karjala and Dewhurst 2002).

Another key practice used in forestry planning is environmental monitoring (Colding et al. 2003). Monitoring often leads to the acquisition of ecological knowledge and is therefore a key attribute in sustainable ecosystem management. Monitoring may provide information about locations and timings of resource usage and provides the basis for spatial and temporal regulations for resource use in many local communities (Folke and Colding 2001). Community-based environmental monitoring (CBEM) is an approach by which Aboriginal communities can apply their traditional environmental knowledge, track the health of their environment, and implement locally relevant sustainability objectives (Yim 2009). Through active information collection and ownership, CBEM can build Aboriginal communities into the feedback loop that informs, directs, and evaluates adaptive natural resource management processes and decisions (Natcher and Hickey 2002).

Collaborative Research

Smith (1999) suggests that the word 'research' is one of the "dirtiest" words in the indigenous worlds' vocabulary. "When mentioned in many indigenous contexts, it [research] stirs up silence, it conjures up bad memories, it raises a smile that is knowing and distrustful. It is so powerful that indigenous people even write poetry about research. The ways in which scientific research is implicated in the worst excesses of colonialism remains a powerful remembered history for many of the world's colonized peoples. It is a history that still offends the deepest sense of our humanity" (Smith 1999, 1). Over the years, indigenous peoples have expressed a number of concerns about research in their lives, especially with regards to their control over, and participation in, the research process (Gibbs 2001). However, more recently, the demand for research has been made that addresses the concerns of indigenous people and that provides for power sharing in the research process. This can be termed *collaborative* research and defines social science research where the research participants and the researchers are equal partners throughout the research process (Gibbs 2001). One of the main goals of collaborative research is not simply to document knowledge, but to have researchers and indigenous people engage in dialogue about their respective understandings of diverse findings (Davidson-Hunt and O'Flaherty 2007). By collaborating with indigenous people, there is great potential to gain an understanding of the past composition of an area, to restore the native biodiversity that historically characterized the region, and to strengthen cultural traditions that are dependent upon the land (Shebitz and Kimmerer 2005).

Too often, indigenous people have witnessed the use of research carried out in their communities for many unexpected purposes and with a multitude of unforeseen

goals, not all to the communities benefit (Pidgeon and Hardy Cox 2002). Collaborative research proactively addresses issues of concern to indigenous peoples such as rights to intellectual property, control of the dissemination of traditional knowledge and information, input into the research agenda and questions (Gibbs 2001) and research methodologies (Ross 1990). This would include a negotiated understanding of how TEK will be used in the research, including the right to publish information after the research is completed. It should be clearly stated by the researchers that the intellectual property rights to traditional knowledge remain with the indigenous community. If the researchers do not work co-operatively with the community to decide upon methods and procedures, they cannot guarantee that they have spoken to the right people (experts), visited the appropriate sites, or gained all the available information. Researchers need to clarify the benefits they have to offer the community they are working with and indigenous research partners should have these benefits to the community clearly articulated before any research begins (Gibbs 2001). The research being conducted should act to serve the indigenous community, rather than be done on them (Ross 1990), and the results should make a practical contribution to the lives of the community members (Herman and Mattingly 1999).

Researchers should be instrumental in the process rather than being in the centre of the process (Kowalsky et al. 1996). Feedback to research participants needs to be incorporated into the research process and all project resources must be allocated to ensure benefits to the community (Gibbs 2001).

In other collaborative research studies, researchers have found that what is important is often not so much what the researchers did or did not do, but how they

conducted themselves with and in the community (Gibbs 2001). It is the relationships that are established and maintained that are important to many indigenous communities (Smith 1999, Gibbs 2001). Keeping this in mind, communication is extremely important (Gibbs 2001). Respectful, open, honest, and timely communication, leading to relationships of trust between the researcher and research participants, is the foundation of successful cross-cultural collaborative research. By doing this, the researcher is less likely to be impositional and therefore more productive (Gibbs 2001).

Santiago-Rivera et al. (1998) have suggested that a collaborative research project should follow the guiding principles of respect, equity, and empowerment. Community members need to be respected for their time, knowledge, and guidance, and, at the same time, the community can gain some understanding of the researchers' intent and commitment to the project. "Equity means that some of the support dollars from the grant go to the community, members of the community are supported on the grant, and others are trained through the program. Equity means that the design of the research protocol reflects the needs and concerns of the community and not limited only to what some investigator thinks is a fundable project" (Carpenter 1995, 130). The principle of equity should be evident in the projects design (Santiago-Rivera et al. 1998). Consistent with contemporary views of empowerment, a collaborative research project should emphasize knowledge as power in which both the individual and the community as a whole can benefit from, since the ultimate goal for any community is to have the means to make positive changes in the lives of its members (Santiago-Rivera et al. 1998).

Participatory Research

Community-based participatory research can be defined as "a research approach that involves community members/partners in all phases of research. It seeks a collaborative approach that is equitable for all participants engaged in the research process, from the inception of the proposed research to the dissemination and publication of research findings. It is grounded in the conscious recognition that historically, and particularly within ethnic minority communities, research has been done on (in contrast to with) communities of color predominantly white researchers" (Shiu-Thorton 2003: 1362). The intent of participatory research is to move from researcher-driven agendas to community-directed research, where local cultural concerns and practices direct research methods, processes and outcomes (Fondahl et al. 2009). In community-based research projects, the main goals of any participatory research methods should be to engage in research that is beneficial to both the community and researcher, to develop culturally appropriate and competent methodologies, to determine the roles and expectations of all partners involved in the research (community members and researchers), and to honor and respect both the process and the products (Shui-Thorton 2003).

Researchers now realize the importance of including local people in the management of natural resources. The knowledge and understanding local people have of their environment, from generations of living off of the land, have become more recognized and this knowledge can be greater than that of outsiders (Calheiros et al. 2000). Participatory research methods are designed to incorporate local knowledge and involve local people in all stages of research. This participation can be the key to success of research efforts and can aid in the local adoption of resulting recommendations that

may arise. The formal inclusion of local knowledge and people may improve environmental scientific research, as this knowledge may help to define research hypotheses more tightly and may raise locally important (and unimportant) variables, which can enhance both the quality and efficiency of research efforts (Calheiros et al. 2000).

Respect and Sensitivity to Knowledge

In the case of studying food and medicine plants, researchers may find themselves in positions of trust, or as confidants of private knowledge. When compiling information on medicine plants, it is crucial to consider for whom the information is intended, and the format in which it should be delivered in order to be most useful and appropriate (Hamilton 2004). There are concerns regarding the theft of indigenous or local intellectual property as new drugs may be developed from the traditional knowledge practices. It has been argued that traditional plant knowledge has been based on years of experimentation by indigenous practitioners, and it is therefore not western scientists nor pharmaceutical companies that can claim to be inventors (Holmstedt and Bruhn 1995). It has also been debated that local and indigenous communities have acted as the keepers and developers of biological diversity and, therefore, should be 'compensated' by those who benefit from their traditional care and labour. Overall, it is important to impose some sort of control on scientific research to ensure that biopiracy or theft of indigenous intellectual property does not occur (Hamilton 2004).

Working effectively with Aboriginal communities not only requires the appreciation of the biology and ecology of the plants themselves, but also needed is a

level of respect and appreciation for the various cultures, economies, and social structures found among the various communities (Hamilton 2004). Some non-aboriginal researchers who write on this subject may feel the need to promote an understanding and respect for Aboriginal knowledge and might believe that this knowledge should be accessible to all peoples (Brant-Castellano 2000). However, some researchers are distanced from the everyday practices of a verbal culture and rely heavily on the written word. Researchers, therefore, have to be cautious when studying in this area of research, as writing the knowledge learned gives power to the writers' particular views and biases (Brant-Castellano 2000).

Aboriginal people know that knowledge is power and that power can be used for good or evil (Brant-Castellano 2000). In the sharing of traditional knowledge, the 'educator', needs to consider whether the 'student' is ready to hear the knowledge and use it responsibly. The 'student' needs to remember that much of the shared information is sacred or culturally sensitive and should therefore be distributed appropriately. Most importantly, the requests and desires of the community should always be considered first and foremost (Brant-Castellano 2000).

Ethnobotanical Methodology

Building Community Relations

When working with a First Nations community as a researcher, it is important to build a strong working relationship and partnership and to be respectful, honest and sincere. It is also important to balance the cultural protocols of First Nations communities with the ethical protocols of the academic world (Thompson 2003). Participating in community activities facilitates mutual trust and communication

(Kowalsky et al. 1996), and trust requires transparency and dependability throughout all stages of the project (Fondahl et al. 2009). Communication is crucial and it depends on the development of a common language, which can be quite time consuming, especially when the researchers and community members come from different backgrounds (cultural, socio-economic, geographical, etc.) (Fondahl et al. 2009). Cultures differ in the ways that they gather, understand, and apply information (Struthers 2001), therefore, it is important to emphasize the need for researchers to gain an understanding of the culture of the community with which they intend to conduct research (Kowalsky et al. 1996). Creating opportunities to get to know each other is important when building relationships (Fondahl et al. 2009). This type of "informal" data collection technique provides a means for getting to know the participants as well as generating important insights that can be compared with results from the more structured/formal techniques (Vogl et al. 2004).

Before conducting any research, a researcher must "enter" a community successfully so that an effective working relationship with the community members may develop (Kowalsky et al. 1996). Johnson (1984) has identified four stages of entry into any community: stopping, waiting, transition, and entry. Stopping will occur if the researcher is prevented from entering a community through formal or informal means (Kowalsky et al. 1996). Going through the first stage, stopping, is crucial to moving into the consecutive stages as this movement is dependent on how the community views the activities and intentions of the researcher. The second stage, waiting, occurs as community members determine whether the researcher is trustworthy and whether the project is worth their time. The next stage, transition, is where the researcher becomes involved in some community activities. The final stage, entry, occurs only when trust is

established and knowledge is shared openly with the researcher. It is important to note that gaining entry into a community can move through different stages with different individuals within the same community, and that this process in not necessarily unidirectional and may move backwards (Kowalsky et al. 1996).

Data Collection

As with any study, it is important to define research goals and then select an approach that best suits the study's interests, budget, and schedule. Ethnobotanical studies often use a multidisciplinary approach combining botanical inventories; collection of plant specimens; structured, semistructured, and informal interviews; and participant observation (Vogl et al. 2004). These types of studies tend to be both expensive and time consuming (Kowalsky et al. 1996, Martin 2004). Local ecological knowledge is often quite complex, there is usually a large diversity of flora and fauna to be studied, and it is not uncommon to experience delays caused by weather, equipment failure, and other events that are beyond the researchers' control. It is almost always impractical to try to apply all methods in a single period of field work and many researchers divide their time between visits to the field with "office" days analyzing data and writing up results (Martin 2004).

When planning an ethnobotanical study, a researcher should always be prepared before commencing fieldwork. This includes obtaining maps of the study area, descriptions of flora and fauna in the area, and learning about the local people and cultures in the study area. It is important to form a multidisciplinary team, for example including individuals who know the language of the local people and also, individuals

who are familiar with the plants in the area (Martin 2004). As mentioned in sections above, it is extremely important to ensure community participation.

It is imperative to be selective when choosing research techniques and to choose methods of analysis that can be understood by all participants in the study (Ross 1990, Martin 2004, Davidson-Hunt and O'Flaherty 2007). As in any research study, the research should be conducted systematically. This will allow the study to be conducted again in the future and further results could be added to the data set. The names of all the participants involved in the study, the areas visited, and the plant species worked with should all be recorded (Martin 2004).

Focus Groups and Interviews

Focus groups and interviews are popular techniques used to gather qualitative data in a wide range of academic and applied research areas. The use of focus groups can be defined as a research technique that allows for the collection of data through group interaction on a topic predetermined by the researcher (Morgan 1996). Focus groups can be beneficial because they can empower participants by allowing them to discuss issues that are of high importance to them. The researchers' interests will direct the discussion, but it is important to note that these are interactive discussions among the multiple participants. The information gathered from focus groups can be affected by the group's composition, the topic, the relationship of the interviewer to the group, and the general context of the interview. Focus groups are often used in early stages of research and are an effective technique for idea generating (Morgan 1996).

In ethnobotanical studies, there are four basic interview types that are commonly used: open-ended interviews, semi-structured interviews, structured interviews, and questionnaires (Cotton 1997). Open-ended interviews are similar to more casual conversations and they often reveal detailed life histories. They may also benefit the researchers in a more practical manner as they are often encouraged to participate in traditional practices and are therefore obtaining more direct experience (Cotton 1997) and can help build trust between the researcher and participants. Quite often these open-ended conversations will cover issues not directly linked to the topic (i.e., ethnobotany), but a sense of what needs to be asked in a more structured interview (Martin 2004). Semi-structured interviews are based on a checklist of topics or questions and are not as flexible as open-ended interviews. This checklist should be based on questions that have arisen in previous encounters with the community (including both participant observations and open-ended conversations). The previous encounters will allow one to ask culturally appropriate questions, help understand the answers given, and allow the ability to improvise follow-up enquiries. It is common to hold more in-depth interviews with "local experts" or key informants, i.e., people who have been identified as possessing profound knowledge of a particular aspect of the local culture. It is most effective to conduct this type of interview with one participant at a time. This allows an individual to express personal viewpoints and speak freely without being contradicted or interrupted by others (Martin 2004). Structured interviews are based on a set of fixed questions that are presented to the participants (Alexiades and Sheldon 1996). These questions are often closed and direct, not allowing for natural conversations to occur. The weakness of a structured interview lies in vulnerability to the introduction of a

researchers' bias through the use of direct, inappropriate questions. However, data collected this way may be analyzed quantitatively and statistically. This type of interview should be used in later stages of research, once the researchers have a good understanding of the local culture and have learned how to ask meaningful questions. Questionnaires are also based on a set of fixed questions and are often used during a structured interview (Alexiades and Sheldon 1996). They may also replace a verbal interview and can be filled out by each individual participant (Cotton 1997).

In the open-ended and semi-structured interviews, the respondents are able to give the interviewer extensive responses to a series of general questions. Some of these questions will have been prepared before the interview takes place and some arise naturally in conversation (Martin 2004). Open-ended or semi-structured interviews are often preferred to more structured interviews, as they help reduce interviewer obtrusiveness in a cross-cultural setting (Bonnell and Koontz 2007). Structured interviews and questionnaires ask very specific questions and are commonly used if quantitative data are required (Cotton 1997). Qualitative methods, such as open-ended and semi-structured interviews, generally gather information which can be used to compile ethnographic accounts of a community and its culture. Quantitative methods yield data that can be used to calculate ranges of numerical indices, such as the relative usefulness of a given plant species (Cotton 1997). A combination of both qualitative and quantitative methods can assist in gathering data that is more accurate and complete (Martin 2004).

No matter which interview method is selected, it will be important to pre-test the interview questions (Fondahl et al. 2009). This will ensure that the questions will be both

comprehensible and seen as applicable by the participant. Pre-testing helps to make terminology clear and the questions understandable. Overall, it can aid the researcher in identifying any issues that may affect the data collected (Fondahl et al. 2009).

Aids can be used in interviews to help draw out information (Cotton 1997). They are usually types of visuals or other stimuli to help in information sharing about a particular plant. A visual could be a fresh sample, a dried specimen, a photograph, or an ethnobotanical artifact (Cotton 1997). In the field, the researcher can point to a specific plant species which may help trigger the participants' memory and help ensure that the same plant is being referred to (Miranda et al. 2007).

All interviews with the participants should be recorded in some way and the more methods that are employed the better. Interviews may be documented using audio recordings, video-recordings, and/or photographs as long as permission has been given by the participants ahead of time (Cotton 1997).

Another thing to consider is a compensation for the informants' time and knowledge (Alexiades and Sheldon 1996). Normally, it is best to discuss and agree upon some form of compensation before the study commences. In most cases, it is appropriate to compensate participants directly for their time, but sometimes gifts can be given at the end of the research. Common ways to compensate participants are by monetary payment or through gifts or services (Alexiades and Shledon 1996).

Plant Collection

As with any botanical field study, it is important to have accurately identified all plant species in an ethnobotanical study (Cotton 1997). This can be done by collecting

voucher specimens of each species in the study (Cotton 1997, Martin 2004). Ethnobotanical information without adequately vouchered specimens may have little scientific value, since vernacular names may vary widely among individuals, ethnic groups, and geographical area (Alexiades and Sheldon 1996). These specimens are representative samples of a given plant species and should exhibit both the main features required for identification and the range of variation of these features (Cotton 1997). They must be carefully selected and harvested and then preserved, mounted and stored in herbaria (Martin 2004). A good quality herbarium specimen should contain a representative sample of the plant including stems, leaves, roots, flowers, fruits, and other plant parts which are characteristic of the species. Whenever possible, entire plants or branches are included so that the overall architecture of the plant can be observed (Martin 2004). These herbarium, or voucher, specimens provide a permanent record of information that can be reviewed or reassessed at any time (Alexiades and Sheldon 1996).

Researcher Responsibilities

When working with First Nations, it is the researchers' responsibility to learn about their TEK, language and culture and to find ways of passing on this knowledge and wisdom to present and future generations. Documentation of knowledge needs to be both meaningful and relevant to that community (Thompson 2003). It is the researchers' responsibility to return the knowledge and results to the community. First Nations have often felt that academic researchers, especially those who are non-Aboriginal, have taken advantage of them by taking their knowledge and time and then leaving them without

giving anything back to the community (Thompson 2003, Fondahl et al. 2009) or perhaps returned something of minimal use to the community (e.g. thesis, dissertation, academic article) (Fondahl et al. 2009). Often a variety of products is the best way to meet community needs and can include, but is not limited to, booklets, DVD's, training sessions, Community Newsletters/Updates, and community meetings (Fondahl et al. 2009).

CHAPTER 2: METHODOLOGY

Before this research began, Tl'azt'en Nation had previously identified that it was important that research be conducted on traditionally important food and medicine plants in order to preserve TEK and cultural values, preserve and restore plant gathering sites, and to ensure future opportunities for subsistence/traditional harvesting and gathering (Karjala and Dewhurst 2002, Sherry et al. 2005).

In order to determine what type of research should be conducted, a meeting with Tl'azt'en community members (including future participants and community members who did not end up being interviewed) and CURA researchers was held. It was brought up that what would be useful to the community would be information that could guide land managers or provide Tl'azt'en Nation with a land use policy to protect and conserve their important plant resources. When the lead researcher introduced the project to the community in future meetings, these ideas were presented. This was a community-based research project and the participants were able to determine what they ultimately would like to see as research results. As the research progressed, the first three objectives became the main focus of the study as these were what the participants decided to focus on. Objective four, although still important, was met by the researcher by providing future recommendations in Chapter Three.

Introductory Period/Building Community Relations

When partaking in research with a First Nations community, the importance of building a strong working relationship and partnership, and being respectful, honest and sincere, cannot be over emphasized. In order to balance the cultural protocols of First

Nations communities with the ethical protocols of the academic world (Thompson 2003), before research began for the present project, an ethics proposal and package was submitted and accepted by both the Tl'azt'en Nation Band Council Resolution (BCR) and the UNBC Research Ethics Board (REB).

As cultures differ in the ways that they gather, understand, and apply information (Struthers 2001), it is important to emphasize the need for researchers to gain an understanding of the culture of the community they intend to conduct research with (Kowalsky et al. 1996). Creating opportunities to get to know each other is important when building relationships (Fondahl et al. 2009). This type of "informal" data collection technique provides a means for both getting to know the participants and generating important insights that can be compared with results from the more structured/formal techniques (Vogl et al. 2004). By participating in community activities researchers and community members can build mutual trust and facilitate communication (Kowalsky et al. 1996).

Before conducting any research a researcher must "enter" a community successfully so that an effective working relationship with the community members may develop (Kowalsky et al. 1996). As an outsider, or non-Aboriginal researcher, such as the lead researcher in this project, it was essential to try to be what Smith (1999) has termed the "'seen face', which conveys the sense that being seen by the people – showing your face, turning up at important cultural events – cements your membership within a community in an ongoing way and is part of how one's credibility is continually developed and maintained" (pg 15). It is important that trust is built up and sustained (Thompson 2003). Before conducting any research, the lead researcher attended

community events such as an Elders meeting, a Language and Culture meeting, a Chuntoh kids science camp[3] ("Yunk'ut whe ts'o dul'eh" – "We learn from our land"), and Elders retreat, an Annual General Assembly (AGA) meeting, and two community day meetings. In order to familiarize the community with the proposed research, project brochures were made and distributed throughout the community.

Tl'azt'en Nation also allowed the lead researcher access to community archives under conditions of confidentiality. The archives contained secondary information sources such as research interviews (consisting of transcripts), TUS documentation, Elder's interviews and secondary materials including reports and publications on local Aboriginal history, culture and Ethnobotany. The information was summarized and compiled into tables according to themes related to food and medicine plants and their gathering sites. By reading through previously conducted interviews, the lead researcher could determine who had already been interviewed about traditional plant use and decrease the chances of asking duplicate questions.

Information Session/Focus Groups

After the introductory period, all Tl'azt'en community members were invited to attend an information session meeting, during which the proposed research project and research team were introduced to the Tl'azt'en Nation community. The research team consisted of the Tl'azt'en Nation TEK stream leader, a Tl'azt'enne project assistant, the lead researcher from UNBC and the UNBC TEK stream leader. The lead researcher guided the meeting and asked the community about food and medicine plants, and the

[3]The Chuntoh kid's science camp is one of the programs from the Chuntoh Education Society It promotes the educational capacity building for Tl'azt'en youth by providing outdoor curriculum that emphasizes the linkages between Dakelh culture and the natural sciences

community generated a list of thirty-two plants that were considered to be important to Tl'azt'en Nation for these purposes. Both the English and Dakelh names were noted. It was important to document the Dakelh names of each plant is the first step towards dealing with indigenous classification of plants (Johnson Gottesfeld 1993). Community members were also asked to discuss other issues related to plants and their gathering sites that they felt would be important to study, and what kinds of community products they would like to see created from this project. All of this information was noted. During this information session, researchers explained that participants could not be compensated for the true value of their time, but they would receive honoraria and gifts in appreciation of their commitment and contributions to the project. A community lunch was provided after the session.

The next two meetings held by the researchers followed a focus group setting. Focus groups have been used to collect data through group interaction on a topic pre-determined by the researchers (Morgan 1996). They can be beneficial because they can allow participants to discuss issues that are of high importance to them. The interests of the researchers direct these interactive discussions (Morgan 1996). The first focus group involved the Tl'azt'enne nominated and selected by using a systematic, peer-reference method (Davis and Wagner 2003) who would participate in the rest of the project. In order to be eligible to participate, participants had to be a member of Tl'azt'en Nation, they had to demonstrate knowledge, through teaching and/or practice, about food and/or medicine plants and their gathering sites, and they had to be recognized as authorities or experts by a minimum of two other Tl'azt'en community members or other local resident resource users. As TEK is developed over generations of experiences and observations

within very specific settings, this knowledge is commonly associated with persons of advanced years and deep experiences, i.e., Elders within the community; however, younger community members may possess this knowledge as well. Before any information was gathered, each prospective participant (six women and four men) reviewed the project's written informed consent with the lead researcher (Stevenson 2005, Usher 2000, Yim 2009). The entire form was read aloud and then research team members assisted each participant in filling out the forms and a copy of each form was given to each participant.

During the second meeting, the project goals, objectives, methods and potential outcomes were clearly discussed with the participants and any questions or concerns were addressed. These were all presented again in the second meeting, as not all of the participants were able to attend the first information session. This meeting also served to reduce the number of plants listed to study in this project, generated in the first meeting (total of thirty-two plants), to make the project more manageable. A poster of each of the thirty-two plants was placed around the room, illustrating a picture of the plant and the plants' name in Dakelh and in English. The lead researcher went from poster to poster and stated each plants name. Not all participants can read/write in English, so by having the pictures and both the English and Dakelh names, the researchers hoped that each plant could be positively identified by each participant. The researchers were also circulating the room and available to help participants with any questions. Each participant was given ten stickers and asked to walk around the room and select the ten plants that they felt the project should focus on. The participants took their time with this task (they did not appear to just place the stickers on the first ten plants). Some knew

which plants they felt were important and asked to be directed specifically to that poster. Quite often during the previous group discussions, a few participants did most of the knowledge sharing. With the sticker method, the participants did not appear to be influenced by other people's "votes" as many of the selected plants had only one vote. Therefore, this method was successful as it gave each participant a "voice". Once the participants had selected their plants, the researchers totaled the number of votes for each plant. Originally the researchers planned to focus the study on the ten plants that received the most votes, but once the votes were totaled, fifteen of the thirty-two plants received one vote or more, and the researchers decided to include all fifteen plants in the study.

Interviews

Before the interviews began, a detailed "survey" was prepared. This survey acted as a template or type of questionnaire for the lead researcher to use when interviewing the participants. Questionnaires are based on a set of fixed questions and are often used during interviews (Alexiades and Sheldon 1996). Although the survey was prepared to ensure that the same information will be asked of each participant, there were no predetermined responses, allowing both researcher and participant to explore ideas within these predetermined areas of interest. The questionnaires also ensure efficient use of limited interview time, make interviewing multiple subjects more systematic and comprehensive, and helps to keep interactions focused (Hoepfl 1997). This type of interview questionnaire can be modified over time to focus attention on areas of particular importance, or to exclude questions the researcher has found to be unproductive for the goals of the research (Lofland and Lofland 1984).

Questions were related to the uses of plants for food and medicine, information about the plant gathering sites, and any concerns participants may have about traditional plant use and their gathering sites. Dakelh names were used first as a methodological consideration, as there may not be a one to one correspondence between scientific botanical names (common or Latin) and indigenous plant names (Johnson Gottesfeld 1993).

Before the interviews began, the "survey" questions were pre-tested. Pre-testing of the "survey"/interview questions was conducted by the lead researcher with two other researchers, one from Tl'azt'en Nation and the other from UNBC involved in the project (Yim 2009). It was assumed that during the pre-test, any problems with the questions would arise, for example, inability to answer questions and giving answers that were not intended (Presser et al. 2004). Pre-testing helps to make sure that all terminology is clear and the questions are understandable. Overall, this can help the researcher better identify any issues that may affect the data collected (Fondahl et al. 2009). During the pre-testing process, the researchers reviewed and suggested necessary modifications to research questions, methods, materials, and/or research event plans.

One-on-one interviews were held with each of the participants. The interview questions followed the "surveys" and were open-ended and informal, which are often preferred to more structured interviews, as they help reduce interviewer obtrusiveness in a cross-cultural setting (Bonnell and Koontz 2007). The researchers found some participants were more comfortable sharing knowledge about the plants in a less formal discussion format instead of following the survey questions directly. The researchers and methods were flexible enough to accommodate this and still gather important

information. All questions were asked in English by the lead researcher and the responses were given in either English or Dakelh, whichever was more comfortable for the participant. A researcher, who is fluent in Dakelh, attended each of the interviews. During the interviews, participants were shown pictures of each of the plants and two botanical books were also accessible to the participants if needed. These visual aids were used to help trigger the participant's memory and to ensure that both the researcher and participant were referring to the same plant species (Miranda et al. 2007).

Field Sessions

Two field sessions were held where researchers went out into Tl'azt'en territory with participants (six of ten were able to attend) and other interested community members. During the field sessions, participants spoke of uses of various plants in the area, including uses of those that were not part of the fifteen selected, and plant gathering techniques. They shared valuable information with the researcher as well as fellow participants and community members. Voucher specimens were collected for each plant and samples were gathered to distribute to community members who were no longer able to go out into the field themselves. Obtaining specimens verified the identification of each of the plants (Johnson Gottesfeld 1993).

Recording Methods

All focus groups and interviews were audio and video recorded. Researchers discussed the recording devices at each event, and asked participants if they were comfortable with the recording methods. The audio recordings were used to create

verbatim transcripts. As per Tl'azt'en community norms, team members expected research events to be recorded for archival and educational purposes. During the interviews, the researchers filled out the "survey" by hand and notes were taken. During the field sessions, the lead researcher took field notes. All audio and video recordings, and hand-written notes, are archived at the Tl'azt'en Nation and in UNBC archives.

Data Analysis

The research design involved the collection of taped interviews and focus groups, and the researchers decided that the analysis was best supported by transcriptions of each of the interviews. The researchers had to decide what to describe in the transcriptions, as it is important to note that despite all best intentions, the textual data will never fully encompass all that takes place during the actual interview (Emerson et al. 1995, Mishler 1986, Kvale 1996, Poland and Pederson 1998). Some researchers argue that what is not said is just as important as what is said, therefore, transcripts may require that researchers include contextual information regarding silences or pauses in conversation (Poland and Pederson 1998). In the present study, verbatim transcripts of each interview were transcribed manually by the lead researcher and a Tl'azt'en research assistant. The transcripts included contextual information such as pauses, interruptions (such as cell phones), and emotions (such as laughing, coughing, etc.). When Dakelh was spoken, the Dakelh words and English translations (by the research assistant who spoke Dakelh fluently) were included in the transcript. All transcripts were edited for accuracy by the lead researcher or Tl'azt'en research assistant before they were returned to each participant for verification.

Verification of the data by community members is necessary to ensure that the community's views are accurately represented (Fondahl et al. 2009). By giving participants the opportunity to review research findings and determine whether they feel their knowledge was accurately understood and interpreted, academic interpretations are enriched. This allowed participants to clarify, modify and confirm information. In order for verification to be successful, the data and/or analysis must be presented in a form that the verifiers can easily understand (Fondahl et al. 2009), therefore for this study the participants either reviewed their written transcripts independently or verbally with a research team member. This verification process gives participants the opportunity to modify and confirm their contributions prior to analysis and any changes were incorporated. It is important to note that when a taped interview was not actively being transcribed or reviewed, the audio and video tapes were, and still are, stored in a locked cabinet.

Once all of the transcripts had been verified, members of the research team, two from UNBC and one from Tl'azt'en Nation, each read though the interview transcripts and divided the information into categories, or themes. The three research team members, the two TEK stream leaders and lead researcher, then held a meeting at UNBC and discussed the categories/themes to focus on.

Community Products

As with any community-based research project, it is important to create products that are culturally important and useful for the community. The community products created during this research included a brochure, three community newsletters/updates,

herbarium specimens, and a booklet (See Appendix I-VI). The booklet titled, "The Ethnobotany of Tl'azt'en Nation", uses direct stories and quotes from the participants. The researchers hoped that by using the participants own words, there would be less chance of misinterpretations and information being taken out of context. The intent of the booklet was not to replace the verbal teachings of the Elders and knowledgeable community members, but to assist in the learning process and encourage community members and the younger generation to reconnect with their land and culture.

Once the project is complete, the lead researcher will return to Tache and hold a final community meeting. The results will be presented and any interested Tl'azt'enne community members will be invited to attend. The herbarium specimens will be presented to the participants at this final meeting.

What Makes this Research Unique?

Many Tl'azt'en community members had heard of UNBC and the CURA project and knew about research and research methods before this project even began. This enabled the researchers to more easily gain trust and gather information. As the research was a part of CURA and therefore used community-based collaborative research methods, Tl'azt'en community members were able to identify their own needs and use their own traditional knowledge and resources to provide for these needs. The methods empowered the participants and other community members, as they were able to discuss and focus on issues that were important to them and enabled each person to participate, or not participate in, each of the individual events (meetings, field trips, etc). Community members who were not participants for this research were given the opportunity to

participate in various stages of the project and were able to influence what was to be studied. For example, in the information meeting all Tl'azt'enne community members were invited and asked to share their thoughts about food/medicine plants and their gathering sites and these ideas shaped the discussion topics for the following participant meetings.

CHAPTER 3: RESULTS AND DISCUSSION

Plants and their Gathering Sites

All fifteen plants were considered to be important medicinally and ten of them were also considered important as a food source (Table 2). Fourteen of the plants found in Table 2 are currently being used in the community by at least one of the participants. The only plant which was not actively gathered during this study was Chunach'ulh, Black birch. When the lead researcher asked one participant "what plants were used for medicine?", they responded "Daja ts'iyawh yoo 'unt'oh." (Well, they are all medicine) (Anonymous *pers comm.* to L. Shaw).

Berries are one of the most significant food sources, which is consistent with other studies conducted in British Columbia. They served as an essential winter food source (Johnson Gottesfeld 1993, Turner 1995, Lantz and Turner 2003) and were also considered to be extremely important in trade and a food item in potlatch ceremonies (Turner 1995, Thornton 1999). Acquiring large enough quantities of berries for food and ceremony purposes requires knowledge about the habitat and the coordinated organization of harvesting and processing (Thornton 1999). Different berries occur in different ecosystems across the landscape, often far from where others are gathered. To efficiently gather, one must have knowledge of berry distribution and abundance across a given territory, and a prerequisite to such planning is precise knowledge of the temporal availability of the berries, which would ensure that gathering effort is not wasted (Lantz and Turner 2003).

Table 2: Plants of Tl'azt'en Nation: their uses, gathering characteristics and site characteristics.

Plant	Uses/Parts Used	Plant Characteristics	Site Characteristics	Time of year	Notes
Ts'ootsun *Abies lasiocarpa* (Pinaceae) Balsam, sub-alpine fir	Food – Sap can be eaten as an energizer Medicine – Sap/pitch used to treat lung ailments, colds, and as an antibiotic, bark boiled and used to treat lung ailments (coughs and tuberculosis) and itchy throats, branch tips (buds) used to treat pneumonia, needles used to heal sores or are burned to freshen the air and prevent colds	Small to medium sized younger trees with red bumps/blisters preferred (easy to peel), older trees with smooth bark are also selected	Preference to gather at higher elevations (where smaller trees found) or closer to water	Spring is best (bark peels more easily), but can gather all year round	Food source for animals, such as moose
Dats'an angut *Juniperus communis* (Cupressaceae) Juniper	Food – Female cones (bluish berries) can be used as a spice, similar to clove Medicine – Whole branch can be boiled and used to treat stomach ailments, coughs, ulcers, tuberculosis, bronchitis, lung disease, and chest infections	Most effective when branches and berries are used together; branches should be green, and red and brown branches should be avoided	Gathered on rock bluffs or hillsides at higher elevations in the mountains; often found with Dunih t'an (Kinnikinnick)	Spring is best for branches and fall for berries, but can be gathered all year round	
K'entsi *Cornus*	Medicine – Whole branch boiled and used as a pain killer,	Smaller plants with red bark	Best to gather on sunny	Spring is best, but can be	

stolonifera (Cornaceae) Red willow, red-oiser dogwood	aspirin, hair wash, to treat burns, open sores and cuts, arthritis, tuberculosis and chest infections; however, outer red bark peeling is most commonly used, branches can be placed over hot rocks to assist in healing broken bones, buds used to treat arthritis	are preferred for medicine and are the most effective The "cleaner" branches with the least limbs are also used; plants with old brown branches are avoided	hillsides near creeks	gathered all year round	
Tsalhtse' *Viburnum edule* (Caprifoliaceae) Cranberry	Food – Berries eaten raw and made into jam Medicine – Berries or branches can be used to treat stomach ailments, kidney infections, and the flu, berries can be used to treat constipation and clean out your stomach and kidneys	Best to gather branches when berries are present	Gathered along shores in lower elevations; often found among T'ughus (Poplar)	Best to gather branches in spring and berries in late summer	
Ningwus *Shepherdia Canadensis* (Elaegnaceae) Soapberry	Food – Berries can be eaten raw, dried, or made into Indian ice cream; Berries are a good source of Vitamin C Medicine – Berries can be eaten to treat heart conditions, heartburn, diarrhea, constipation, stomach ailments (such as ulcers and cancer), and to cleanse the blood and	Best to gather plants with red ripe berries; older branches should be avoided	Gathered in open areas in valleys or near water; often gathered among forests that have mix of pine and poplar	Best to gather berries in summer or late summer; best to gather branches in spring, but can be gathered all year round	

	kidneys; berries can be put into eyes to treat cataracts				
Ludi musjek *Ledum groenlandicum* (Ericaceae) Labrador tea	Food – Leaves boiled to make tea Medicine – Leaves boiled and used as a relaxant or sleeping aid and to treat high blood pressure and angina (chest pains)	Plant that have large green, fresh leaves are preferred	Gathered in swampy, mossy area at lower elevations	Best to gather in spring when plants are flowering, but can be gathered all year round	
'Ut'ankal *Rubus idaeus* (Rosaceae) Raspberry	Food – Berries are eaten raw and made into jam Medicine – Whole branch (including the leaves) can be boiled and used to treat diarrhea, stomach ailments, ulcers, the flu and to prevent hemorrhaging after child birth	Younger 'fresher' looking plants are preferred	Gathered in open areas	Best to gather the berries in summer; branches can be gathered all year round	
Hoolhghulh *Oplopanax horridus* (Araliaceae) Devil's club	Medicine – Outer bark or roots can be used as a pain killer and to heal broken bones, roots can be ground and used as a muscle rub ***Hoolhghulh is for external use only and should not be left on a person for too long***	Younger plants are preferred, as the older ones are too 'woody'	Gathered in cooler, damp areas of ridges that are close to water	Best to gather in spring, but can gather in summer or fall as well	
Dunih t'an *Arctostphylos uva-ursi*	Food – Berries can be eaten raw Medicine – Whole branch can	Green branches with ripe berries are preferred;	Gathered in rocky area on forest floor or	Best to gather in summer when the berries are ripe,	

(Ericaceae) kinnikinnick	be boiled and is good for the lungs and to clean out your system, and can treat colds, tuberculosis, stomach bleeding and the flu; whole branch with the roots can be boiled and used to treat menopausal symptoms (the change in life), such as hot flashes and cold sweats	plant is most potent with berries, but can be used without them	on mountain or hillsides; often gathered with Dats'an angut (Juniper)	but can be gathered in spring and fall as well	
Latalba *Achillea millefolium* (Asteraceae) Yarrow	Medicine – The whole plant can be boiled and used as a diuretic, to treat a sore throat, stomach ailments, and arthritis, and the plant can be rubbed directly onto the skin as a bug repellant	Plants with white flowers are selected and brownish ones are avoided; any plant that turns brown when boiled is removed from the pot	Gathered in any open area	Best to gather in summer when flowers are white	
K'us *Alnus tenuifolia* (Betulaceae) Alder	Medicine – Bark can be ground into a powder and used for stomach ailments, inner bark can be boiled and used to treat ulcers, all of bark can be boiled and used to treat sores, asthma, and chest colds, bark can also be chewed to treat the flu	Younger, medium-sized plants with catkins are preferred	Gathered in any open area	Best to gather in spring when bark is easier to peel, but can be gathered all year round	Food source for wildlife such as moose, rabbit, and deer
Chundoo *Pinus contorta* (Pinaceae) Jack	Food – pitch (Chun ts'a') can be eaten, black tree lichens found on chundoo are edible as well	Younger small or medium-sized trees are preferred	Gathered anywhere	Best to gather pitch in spring and bark in spring or summer	Severely damaged by the Mountain pine beetle infestation

pine/lodgepole pine	Medicine – Pitch can be used to treat burns and sores and a pain killer and cold rub, bark and buds can be boiled and used for stomach ailments or as an antibiotic				
T'ughus *Populus tremuloides* (Salicaceae) Poplar, Trembling aspen	Food – Sap can be eaten Medicine – Bark can be chewed and applied to open wounds to stop bleeding, bark can be boiled an used treat pinworms, eczema, and ulcers	Young, smaller trees are preferred	Best to gather in lower elevations, as bark tends to be too dry in higher elevations	Best to gather in spring or summer, but can be gathered all year round	Food source for beavers
Duje *Vaccinium membranaceum* (Ericaceae) Huckleberry	Food – Berries eaten raw and made into jams and jellies, berries can also be boiled with water and used as a syrup for pancakes, ice cream or cake Medicine – berries can be eaten as an energizer or used to clean out your system	Plants with green leaves and newer growth are preferred as berries tend to grow bigger on these	Best to gather in open areas on hillsides in higher elevations	Best to gathered in summer when berries are ripe	Food source for wildlife such a rabbit, deer, elk, and bear
Chunach'ulh *(latin name unknown)* Black Birch	Medicine – Bark boiled and used to treat pneumonia, bark chewed raw to relieve chest pains or to treat colds	unknown	unknown	unknown	Unable to find it in the field and positively identify it; not many people presently use it; very difficult to find and not many people can positively identify it

Berries were also found to be an important cultural indicator species for other traditional practices such as fishing for salmon.

"They say the more berry flowers you see in the bush then you know more salmon is going to come. But if you don't see very many white flowers in the bush, like blackberries [K'emai'/Saskatoon] always got real lots of nice white flowers, you just get a few here and there, that means the salmon is not going to be that great of a run...but now-a-days with the climate, everything is changing" (Paul Williams *pers. comm.* L. Shaw 2008).

Like the phenology and abundance of berry-producing shrubs, fish reproductive phenology, and thus availability, also varies considerably between years (Lantz and Turner 2003). Widespread indicator species, especially plants, which are easily observable, would have provided an important cue to the availability of fish, which are more difficult to observe than plants. Predicting the availability to harvest an important resource, such as salmon, would have been important because in many cases, a decision to begin harvesting would have involved traveling long distances away from areas where other foods were being collected (Lantz and Turner 2003).

Time of Year

Most of the plants can be gathered all year round, but are best gathered in the spring (Table 2).

"I think for most of the plants a good time is spring time. You can gather probably year round, most of the medicine is good year round. If a person really needs it they all go out in the bush and get some. Bring a shovel and like if it's a very sick person that really needs it, they'll go out in the bush until they find it." (Mary Lebrun *pers. comm.* to L. Shaw 2008).

Location

When asked where plants were selected from, many participants spoke about the importance of their traditional territory.

"If you want the medicine to work, it should come from your traditional territory (Keyoh). My father and grandfather always said, "If you want medicine to work, you have to believe in it, and the person that's making it has to believe it's going to help you". And I strongly believe in that and it's just like permission to go into another man's Keyoh, you know. They're the ones that make the medicine and help you out; they know their area more than you do." (Simon John *pers. comm.* to L. Shaw 2008).

"Long ago when we used to go out, the last day of school usually or the first weekend after school is done, out family and my Aunts and Uncles with their families would go up to Dzitl'ainli. Because we used to just go to our traditional territory (Keyoh) to pick whatever grows in our territory. I have never gone onto another persons' traditional territory to pick berries, unless we ask them for permission." (Theresa Austin *pers. comm.* to L. Shaw 2008).

Parlee et al. (2006) found similar results among the Teetl'it Gwich'in (who live in the Northwest Territories) and established that there tended to be extended family ownership developed around many berry patches, and community members stated that these areas can only be accessed if you are invited. They found that many women said that they pick cranberries where their grandmothers or mothers picked, and some have been picking in patches for more than three generations. They also found that berry species that tend to be more scattered in distribution, have more cyclical productivity or are more sensitive to drought and temperature extremes, therefore, making them more difficult to find and to have a "lack of property rights" associated with them. In the same study, they found that "rules" related to gathering site information sharing changed depending on local and regional ecological conditions. Ongoing knowledge about seasonal ecological conditions is therefore key to guarantee the relevance and legitimacy

of "rules-in-use". Other local traditions, including spiritual beliefs and practices may also be affected by ecological conditions (Parlee et al. 2006).

Tl'azt'enne also believe that it is important to gather plants where they are the least disturbed.

"The trails leading to all our lakes behind the village are all logged out and don't go there any more, we tend to stay away from where it's been logged out, we go further away, if we have to, where it hasn't been logged or sprayed or anything." (Simon John *pers. comm.* to L. Shaw 2008).

"If you are picking for medicine it has to be away from people, where they don't walk around or use the area. Most of the medicines are supposed to be like that; away from where people walk around. A few miles out of town of something like that." (Mary Lebrun *pers. comm.* to L. Shaw 2008).

"They usually say just where the creek, where the creek's running down on the hillside. And some they pick it up on the mountainside, where's there's nobody around, if you're gonna heal with it." (Helen Johnnie *pers. comm.* to L. Shaw 2008).

Tl'azt'enne are concerned about contamination of their gathering sites. If they are not comfortable gathering plants from certain areas or are avoiding areas, this can be seen as a reduction of life quality. It has been shown that there is an elaborate link between land and health, confirming that land is of great importance for the health of First Nations people (Wilson 2002). It is important to recognize that these sites can be considered therapeutic landscapes, and that the land represents more than just a physical location in which people carry out their daily activities (Wilson 2002).

Site Characteristics

When asked what type of site characteristics Tl'azt'enne select for when gathering food/medicine plants, two broad areas were mentioned, i.e., open areas and forested areas (Table 2). Similar results were found in research with several Dene

Nations who inhabit the Canadian northwestern boreal forests in British Columbia (Johnson 2008). Although much of the northern landscape below the treeline is dominated by forests, woodlands, or willow thickets, treeless environments are ecologically important. Such environments are significant in the ecology of key animal species, such as moose and beaver, and also present opportunities or barriers to travel, as well as providing plant resources. Wetlands are an example of a major treeless habitat and are often referred to as swamps and often grade into drier meadow openings. It was found that swamps may be sites for the harvesting of berries, diaper moss, and medicinal plants as well as be a seasonally important wildlife habitat, such as summer moose-feeding areas (Johnson 2008).

When talking about the various plants, Tl'atz'enne would often mention the animals and were aware of the animals needs as well.

"And it is not only us who are using it, it's the bears too. Every year there's bears there, and they pick right beside us and they don't bother us. Especially grizzly bears, they don't bother us, they just make funny noises but they don't bother us. We just stay on our own side and they stay on their own side" (Isaac Felix *pers. comm.* to L. Shaw 2008)

Johnson (2008) found that when speaking about habitats that Aboriginal people were highly attuned to the relationships of animals to plants and place. Some Dene described the significance of habitats to animals such as caribou, moose, rabbits and ptarmigan, knowing both the seasons of animal activity and which plants were food sources for the animals (Johnson 2008).

Participants often described the location of different plant species as: 'among [plant name]' (Table 2). Johnson (2008) found a common pattern occurring in more than one Athapaskan language. For example, a Kaska Elder is aware of the association of

berry species with other vegetation. Referring to a spruce forest as "among the trees", situates the speaker in the landscape as opposed to an abstracted classification that separates the environment from the speaker (Johnson 2008).

Other Themes

When interviewing the participants about the plants and their gathering sites, other important topics emerged. As mentioned earlier, TEK is recognized as holistic and not easily subject to fragmentation (Turner et al. 2000). The themes presented here are linked and interrelated.

Respect, Beliefs and Interconnectedness

A common theme that arose during the interviews was respect. Knowledgeable Tl'azt'en members that practice traditional medicine believe that you must respect the plant and believe in the plants powers. Even though no direct questions were asked about traditional rituals or prayers, the following statements were made:

"Everything that they [Elders] use to tell us is true. They tell us we have to be careful of what we're going to say when we're going out. Tell us not to say anything to hurt the animals or to hurt the Indian medicine, what we going to make. Just like a human being we talk to it, 'we want you for medicine and to heal who we are going to make it for'. We just talk to them and not laugh about anything like that" (Helen Johnnie *pers. comm.* to L. Shaw 2008).

"Before we gather our plants we have to make an offering and talk to it. Give [the plant] an offering of tobacco or if you don't have tobacco whatever you have that is handy. Some Elders say even a strand of your hair, you could use that to give to the plant as an offering of thanks for helping. '[I] believe that you are going to help me'. Talk to the plant. We tell the plant 'we are going to use you for medicine' and usually what we do is put tobacco on the East side of the plant" (Theresa Austin *pers. comm.* to L. Shaw 2008)

"First thing we got to do before they take [the plant], you got to say a little prayer and right at the bottom of it they offer tobacco. That's how you have to take it. Can't take it

without praying, because people believe that if you do not pray it won't help us. So that's how we pick berries or anything like food" (Anonymous *pers. comm.* to L. Shaw 2008).

"And wherever you get the medicine you always have to pay for it. Any medicine you take out of Mother Earth you have to pay; tobacco or snuff or something to pay Mother Earth back. That's when it's got the healing power" (Mary Lebrun *pers. comm.* to L. Shaw 2008).

"If I take it [a plant] I put tobacco there to pay for it. Just not to take the plants unless I have something to replace it with" (Doreen Austin *pers. comm.* to L. Shaw 2008).

More than any other single concept, it is the notion of respect for all life-forms and the land that distinguishes North American aboriginal belief systems (Turner et al. 2000). Various traditions within many indigenous societies have intricate relationships with nature which reflect a keen sense of the interdependence of human culture and nature and involve a holistic ethic of respect for nature (Anyinam 1995). Lack of respect was seen as resulting in spiritual sanctions from nature itself. Many believe that plants are entities with their own intrinsic power to help or heal, or to withhold help, therefore, attitude is important when collecting plants (Johnson 2006). Many aboriginal Elders recall being told to never "play with" (i.e. playful waste), animals or plants, which were perceived as giving themselves up for the benefit of humans (Turner et al. 2000). Tl'azt'enne believe in similar values.

"Well we like to respect all the plants and the little animals. Respect all animals, even if they see a frog them young kids they go fool around with it. Respect everything, then none of it will ever bother them" (Sophie Monk *pers. comm.* to L. Shaw 2008).

Ball and Simpkins (2004) found that the Elders they interviewed talked at length about respect for others as being a fundamental traditional value, and Elders stated that culture and spirituality cannot be separated. Brown and Brown (2009) assembled seven fundamental truths through interviewing Elders from three Coastal First Nations

(Heiltsuk, Namgis of the Kwakwaka'waka and Haida Nation). The Fundamental Truths (1-7) are as follows: Creation, Connection to Nature, Respect, Knowledge, Stewardship, Sharing, Adapting to Change. Turner (2009) stated that these truths reflect a common perspective or worldview among many First Nations across BC.

Through the stories and quotes, it is easy to see that these fundamental truths hold true for many of Tl'azt'en Nations beliefs. Like the other First Nations, Tl'azt'en Nation believes they are one with nature and that their lives are interconnected and that all life has equal value and they acknowledge and respect all the plants and animals. The traditional knowledge of resource use and management for both Tl'azt'en Nation and the Coastal First Nations can be seen in their intimate relationship with nature and they are both stewards of the land on which they live and their health (as people and a society) is intricately linked to the health of the land and waters. Both also possess strong beliefs that they have a responsibility to share knowledge and resources and provide strength and support to make others stronger in order to survive.

Traditional Learning/Communication and Exchange of Knowledge and Wisdom

The traditional way for a Tl'azt'enne to learn was through verbal stories and lessons from family, other community members and Elders out on the land. They believe that the only way to truly learn about Tl'azt'enne traditional knowledge is to connect with the land, know the Dakelh language and practice the culture of Tl'azt'en Nation in the forms that were passed down through generations of Ancestors.

"The first time I heard my dad talk about [medicine], he always said, "You never asked that's how come I don't talk to you about these things". People need to ask questions (Simon John *pers. comm.* to L. Shaw 2008).

"We need to reconnect ourselves and our people with the land. A lot of people forget about it and just don't do it anymore. Our Elders don't get around as much as they used to. It's harder for them to go out and teach us, but there's not enough young people willing to learn. If they don't learn now it's going to be forgotten. They need to get out there [on the land] and learn" (Simon John *pers. comm.* to L. Shaw 2008).

"It's accessibility too. The teaching, you know, like if they [Elders] were able to get out year round like they used to, they would be able to teach more kids. Even my dad, it's hard for him to get around but he still try to teach me as much as he can by word of mouth. Like now-a-days, it'll be easier for you to teach them in the school but they still need to learn from the Elders, like what it means and what it's for. A lot of them haven't been out in their own Keyoh (traditional territory). They don't know what it looks like, they don't know what to look for and they need to know these things in order to pass it on. There needs to be more teaching going on [on the land]" (Simon John *pers. comm.* to L. Shaw 2008).

"I suggest that the youth or whoever wants to learn about the medicines, to ask questions to people like my cousin, she makes medicines for anyone who asks her. The person who is sick has to ask the medicine man, or women, to make the medicine for them. I would suggest that if the younger generation wants to learn about medicine, [they need] to hang around the people who know how to make the medicine, and always ask questions" (Theresa Austin *pers. comm.* to L. Shaw 2008).

"I can only say what I learn and what I seen. You know like what my grandparents they taught me but they didn't live long enough to teach me more. So I only went so far and that was it; all the rest I had to learn it on my own" (Paul Williams *pers. comm.* to L. Shaw 2008).

"A lot of it I'm still learning on my own, we know as much as we watch them. I hear [Elders] talking about [medicine] but I haven't used it as much as I want. In order to pass it on, you have to believe in it and you have to know about it. Our Elders used to talk about dreaming about [medicines]. People, in order to be medicine men used to dream about these things, and in their dreams, they help these people, or that one certain person, who is in ailment and in need of medicine. Even if people do dream, there's some people that do, but they don't know that it's a vision. In our lifetime, people are not aware if they're having a vision or not because they forget their traditional values or they haven't studied it enough to know if it was a vision or not. But back then it was either handed down or you dreamt about helping somebody. And the person making it had to believe in it. To me it had to come from your traditional territory (Keyoh), where you were born and raised." (Simon John *pers. comm.* to L. Shaw 2008).

Through archival research, Sherry et al. (2005) found that social sustainability was one of the main principles to consider when practicing sustainable forest

management. They stated that community health and well-being deserved full consideration in resource management processes and this could be measured by cultural revitalization. They established that what was important to Tl'azt'enne was the transmission of traditional knowledge and cultural values, restoration of the role of Elders as teachers, increased observational/experiential learning opportunities, and respect for the oral tradition (Sherry et al. 2005).

Decreased rates of skill and knowledge transmission seen in many Aboriginal communities may be due to the fact that the traditional mode of education, learning by watching and apprenticeship, is not fully functioning in the current European-based educational environment (Ohmagari and Berkes 1997). It has been suggested that the elements in present social conditions that appear to be working against the traditional learning system are changes in the educational environment and peer influence, effects of the reduced time available in the bush due to formal schooling and wage employment, problems related to learning bush skills at later ages or delayed transmission, and effects of changes in value systems. Social changes caused by sedentarization, schooling, and the introduction of television have provoked a change of values among the younger generations (Ohmagari and Berkes 1997). Since most material needs are easily available from stores, it is difficult for the young people to see the necessity of learning traditional skills. People can now buy commercially manufactured clothing, goods, and foods from stores. Many are not interested in traditional skills because these skills are no longer necessary in their day-to-day lives. In some cases, there is value change and people may be self-conscious about eating traditional foods such as beaver and muskrat or may never have acquired the taste for traditional foods (Berkes and Farkas 1978).

Concerns: Loss of Knowledge, Changing Landscapes, and Disturbances

Tl'azt'enne have many concerns about plants, their gathering sites, and traditional knowledge about them. A large concern is that fewer people are spending time in their Keyoh (traditional territory) and less time learning from the Elders. The younger generations are losing this valuable knowledge about plants and Tl'atz'enne culture at a rapid pace.

"I don't know what it is but I know people are going to suffer, certain way. Bad time is coming, that's what makes me feel bad. I'm not worrying about the people, I am worried about the kids. Like me, I had my life but the younger kids- what are they going to do? They don't know how to set net, how to hunt, how to pick berries, and how to make Indian medicine." (Pierre John *pers. comm.* to L. Shaw 2008).

"Before it's too late we really need to get all these younger people to reconnect with the land and reconnect with the Elders. Half of it is doing research and the damage that has been done in our area. The new plants that are coming, what kind of effect do they have on ours? We don't know that as a Nation because it's new to us. Logging is new to us, Europeans are new to us, a lot of this stuff our people are getting sick on, we don't know about. It's only by trial and error that they know how to deal with certain things like ulcers and that. They overcome things like that, and another big one is arthritis. That's why they learn how to use Devil's club, it's a learning process even for me and some of our Elders. A lot of it has to do with alcoholism, you know. A lot of the damage was done to their stomach and they turn a lot of their attention to how to help their innards. There's no answer to it, not in the near future anyway. We need to learn from the Elders as fast as we can so we wouldn't lose touch with the land...we will never get it back." (Simon John *pers. comm.* to L. Shaw 2008).

It is believed that without the connections to Elders, people lacked guidance and the special knowledge that each individual possessed, as well as the support and encouragement that each contributing community member could provide (Ball and Simpkins 2004). This could be understood in part with reference to the disruption of traditional family roles and community structure during the one hundred years of intensive efforts by the colonial government in Canada to dislocate and destroy First

Nations cultural communities, including family ties and indigenous knowledge (Ball and Simpkins 2004).

Many people who want to learn or improve their traditional skills find that they must do so later in life (Ohmagari and Berkes 1997). Such delayed transmission may be considered an adaptive strategy, however, it has certain limitations. The first problem is the gap between the aging "expert generation" and the slow rise of interest in the younger generation. There is general concern among community leaders that the younger generations are not picking up the skills as quickly as the older generations are disappearing. Although many people do eventually become interested in learning by the time they reach their thirties or forties, many of the knowledgeable women in the family are inactive by that time, or too ill (or dead) before they can transmit their skills and knowledge. Moreover, the school system and other influences have caused reduction in the bush skill and knowledge base of the community, with the consequence that many skills that were once common no longer are. Some of the more specialized skills and knowledge may be held by only a few people in the community, and younger people interested in learning those have a limited pool of experts to whom they can turn (Ohmagari and Berkes 1997).

An example of lost traditional ecological knowledge can be directly seen in this project with Chunach'ulh, or Black birch (Table 2). The participants selected this plant as one of the most important medicine plants to focus this study on. It is known to be a powerful medicine, but not many people currently use it. Most participants recalled stories of the use of Chunach'ulh and it's strong medicinal properties, but did not actually use it themselves. This was because most of participants could not positively indentify

the plant in the field, or from pictures, and those that could were no longer able to go into the field. Even though the remaining fourteen plants are currently being used in the community, Tl'azt'enne stressed their concern that the knowledge about them is being lost. They stated that the younger generations do not possess the knowledge about traditional plant use and that they need to reconnect themselves with the land and the Elders or this valuable knowledge will be lost.

Just like other First Nations, this loss of knowledge could be the result of several factors including the influence of Western Societies, economic development, coersive educational systems, ecological destruction of traditional homelands, and the fragmentation of communities. As mentioned earlier, Western societies have had a negative impact on traditional learning methods used by aboriginal people (Brandt-Castellano 2000). In residential schools, in the workplace, in social relations, and in political forums, Aboriginal people have been subjected to criticism of their culture which diminishes their knowledge and worth. The transmission of traditional knowledge has been disrupted and the damage can be seen not only in the loss of past knowledge and wisdom, but also in the process of knowledge creation and the use of cultural resources to enhance knowledge in daily life (Brant-Castellano 2000). As indigenous cultures, such as Tl'azt'en Nation, become increasingly fragmented and threatened by modern development pressures, this knowledge may be lost forever. It has been stated that once the indigenous people have disappeared, their body of priceless thought and medicinal knowledge painstakingly acquired over thousands of years, will disappear forever (Knudtson and Suzuki 1992). With the disappearance of the human cultures that people

have developed in and around forests, gone also will be the habitats, traditions and knowledge concerning medicinally useful plants from these areas (Anyinam 1995).

Another concern among Tl'azt'enne deals with changing landscapes and the disturbances that have occurred in their traditional territory.

"The first thing is learning about the medicine and plants, and then protecting it. It's hard to say right now because of all the damage that's been done to the forest with the herbicides and everything. It hasn't been studied, to what extent and what kind of damage that's been done to our medicine and out plants out there." (Simon John *pers. comm.* to L. Shaw 2008).

"If they spray it, that's when we can't go in there for anything, medicines and berries. Last fall we went out and we pick a whole bunch of plants for medicine and coming back we see the sign it was sprayed, so we had to throw all out plants away. I don't know how many years after it is safe, that's why any medicine we pick we should go in the mountains and pick them, where they don't spray because it takes years for those pesticides to disappear. It stays there for life maybe." (Mary Lebrun *pers. comm.* to L. Shaw 2008).

"Especially if the mining is going to come, you have to fence everything off. Look at that Pinche Mine they had long time ago-the mercury mine. You can't make medicine anywhere near there. It is still going to affect us because the streams are coming from there. Look at Pinche Mine, all the streams they go down to the lake and look at all the people that are dying of cancer." (Mary Lebrun *pers. comm.* to L. Shaw 2008).

Traditional landscapes are changing due to disturbances, such as logging, and the effect this may have on the plants and their gathering site is unknown. Karjala and Dewhurst (2002) found that Tl'azt'en members perceive that forest management practices have had considerable and wide ranging impacts on the forest ecosystem over the past several decades. These concerns include cleanliness of drinking water and moose meat, and negative effects of clear-cut areas (Karjala and Dewhurst 2002).

In BC, specific forestry activities that may affect traditional landscapes include building access roads, silviculture (harvest and re-establishment) and fire suppression (Austin et al. 2008). These activities can result in ecosystem degradation and disturbance.

Forestry-related activities affect species and ecosystems in different ways, including fragmentation of habitat and disruption of movement corridors; simplification of forest communities; alteration of age-class distribution, tree species distribution and stand structure; and loss of key habitat elements such as wildlife trees. Changing a forest from a complex of multiple tree species of different ages to a monoculture simplifies ecological communities (Austin et al. 2008)

During the last century, the scale of human activities has been such that ecosystems have been degraded, resulting in several forms of ecological problems. Millions of distinct species and a variety of habitats and biotic communities are threatened (Anyinam 1995). When an ecosystem loses a component part (such as a plant species) or process, it loses its ecological resilience, or the ability to withstand and adapt to natural or human-caused disturbances (Austin et al. 2008). The integrity, diversity, and productivity of natural systems become damaged by forms of pollution over the years. Agriculture, lumbering and mining activities have particularly contributed to significant habitat loss (Anyinam 1995). Changing landscapes, due to selective logging (Martini et al. 1994) have caused accompanying changes in forest composition and structure (Gerwing 2002). These changes have affected the availability of medicinal plant species. In the Amazon, members of many forest-based communities relate that medicinal plants that have been extracted from the area are difficult to find (Shanley and Luz 2003). Slow-growing mature forest species that occur in low densities and have preferred habitats are particularly vulnerable (Cunningham 2001).

One participant stated "....The new plants that are coming, what kind of effect do they have on ours?... " (Simon John *pers comm.* to L. Shaw). Many plant, and animal,

invasions are reflections of other changes (Vitousek et al. 1997). Invading plants that can occupy roadside areas can be a consequence of land-use change, which may itself threaten biodiversity. Some invading species negatively affect human health and/or wealth directly, while others affect the structure and functioning of ecosystems, and/or the maintenance or restoration of native biological diversity. Non-native plants that alter ecosystem processes such as primary productivity, decomposition, hydrology, geomorphology, nutrient cycling and/or disturbance regimes do not just compete with or wipe out native species, they change the rules of existence for all species. There is good evidence that invasions contribute substantially to extinction. Invasions (like extinctions) have always been here, however, there is now an increased rate of invasions (Vitousek et al. 1997). Although there were no documented invasive species affecting the chosen fifteen plants and their gathering sites, Tl'azt'enne are aware that invasive, or alien, species exist in the area and that these species can seriously impact their traditional territory's biodiversity and landscapes. It will be important to identify possible invasive species and minimize the introduction and spread of the species (plants and animals) that could disrupt ecological resilience and population variability in Tl'azt'en Nations traditional territory.

Another concern that was brought up by the participants was climate change. Canada has recognized that Aboriginals face unique challenges, when it comes to climate change, and that it is necessary to expand the assessment of vulnerabilities to effects of climate change to all areas of Canada (Government of Canada 2003). Indigenous populations of Canada are often more vulnerable to climate changes because of their close relationship with the environment, their reliance on the land and water for

subsistence purposes, and the fact that they are more likely to inhabit areas of more severe impact, such as coastal and northern regions (Furgal and Seguin 2006). It has been suggested that community-based assessments and systematic research must be conducted on the issues of climate change in Canada. There needs to be integrated, interdisciplinary, and multidisciplinary approaches for assessment. Assessments that take a multidisciplinary approach bringing together health scientists, climatologists, biologists, ecologists, social and behavioural scientists, and policy researchers and include demographic, socioeconomic, and health and environmental data are required to develop an adequate understanding of impacts, vulnerabilities, and capabilities in Aboriginal communities (Furgal and Seguin 2006). This work would also be more valuable with the inclusion of Elders and Aboriginal community members. Climate change is already seriously impacting BC and it is the foremost threat to biodiversity (Austin et al. 2008). Most of BC's ecosystems are at high risk from impacts due to climate change. Some of the most vulnerable ecosystems that are well represented in the province include boreal forests and mountain ecosystems (Austin et al. 2008), which make up a significant part of Tl'azt'en Nations' traditional territory.

As mentioned earlier, the industrial development affecting traditional Tl'azt'en Territory includes the establishment of a mercury mine, the construction of a railroad line, and the development of the forestry industry (Morris and Fondahl 2002). Most medicinal plants, as well as animals, have restricted habitats, usually confined to geographic sites like seasides, riversides, highlands and forest zones (Anyinam 1995). Transformation of local ecosystems brought about by human activities has resulted in severe constraints on the availability and accessibility of plant and animal species used

for medicinal purposes (Anyinam 1995). It is important to remember that most pharmaceutical drugs were originally derived from plants or animals (Austin et al. 2008). Many drugs owe their invention to traditional uses for many years by Aboriginals, who developed a very detailed understanding of medicinal properties of plants and animals in their communities and carefully conserved them for future generations. The knowledge that there are still species which may yield important cures is a powerful incentive to conserve biodiversity as well as to respect, conserve, and learn from the teachings of BC's First Nations (Austin et al. 2008).

Declines and losses of traditional resources from berries and root vegetables, to salmon and abalone are of great concern (Austin et al. 2008). Major changes to traditional food systems have occurred partly as a result of environmental deterioration, and this in turn has resulted in health problems and cultural loss in many communities. First Peoples' ways of life have been directly and consistently impacted by declining populations of game, salmon and other fish, loss of forest cover and loss of access to their traditional land base. It is difficult to assess the extent of their loss in quantitative terms. Only a handful of the 400 to 500 species that were used directly have been assessed as being of provincial conservation concern. Nevertheless, according to the testimony of many Elders who have witnessed tremendous change in B.C. landscapes over their lifetimes, most of these species are not as productive or as common as they once were (Austin et al. 2008).

Recommendations for Protection of Traditionally Important Plants and Their Gathering Sites

Knowledgeable Tl'azt'enne who use plants for food and medicine purposes do not seem to have specific sites where plants must be gathered for these purposes. As long as the plant is available in an undisturbed area, away from people and in Tl'azt'en Territory, it can be gathered. However, there are a few plants that are gathered in preferred areas and it is important that these plants and sites are protected. Table 3 outlines recommendations, which may provide guidance to foresters when deciding upon best management practices for these plants and gathering sites, or more importantly, may provide Tl'azt'en Nation with a set of directives that they could provide to licensees that operate in their territory, so that Tl'azt'enne values are protected.

Table 3: Recommendations for best forestry management practices in Tl'azt'en Nation Traditional Territory.

Plant	Recommendations for Preservation
Ts'ootsun Balsam *Abies lasiocarpa*	▪ Plants and sites found close to water in higher elevations be preserved
Dats'an angut Juniper *Juniperis communis*	▪ Plants and sites found on hillsides or rock-bluffs in higher elevations be preserved
K'entsi Red willow *Cornus stolonifera*	▪ Plants and sites that grow on sunny hillsides near a water source be preserved
Tsalhtse' Cranberry *Viburnum edule*	▪ Plants and sites along water shores in lower elevations be preserved
Ningwus Soapberry *Shepherdia canadensis*	▪ Plants and sites in open areas or valleys near water be preserved
Hoolhghulh Devil's club *Oplopanax horridus*	▪ Plants and sites in cooler, damp areas that are close to water be preserved
Dunih t'an Kinnikinnick *Arctostaphylos uva-ursi*	▪ Plants and sites found on hillsides or rock-bluffs in higher elevations be preserved

T'ughus Poplar *Populus tremunloides*	▪ Plants and sites in lower elevations be preserved
Duje Huckleberry *Vaccinium membranaceum*	▪ Plants and sites found on hillsides in higher elevations be preserved

The fifteen plants that were focused on in this study are all considered to be culturally important and could be used in future studies. These plants could be used as landscape-level or site-level criteria for Tl'azt'en Criteria and Indicators (C&I). These could then be measured using indicators of health, abundance and habitat. Tl'azt'en C&I could be applied in an evaluation of existing or future management practices in order to develop management scenarios, analytical forest plans, or for conflict management by articulating and incorporating alternative perspectives (Sherry et al. 2005). Local level C&I (such as Tl'azt'en Nations) have the potential to effectively account for community pluralism, to foster inclusiveness, and to enhance sustainability (Natcher and Hickey 2002). The fifteen plants could also be used for the values in community-based environmental monitoring studies (CBEM). They could be monitored in an effort to maintain Tl'azt'en Nations' traditional territory's botanical biodiversity. Overall, forest management activities should be planned and implemented so as to protect or enhance sites of ecological, cultural and social significance to Tl'azt'en Nation.

CHAPTER 4: CONCLUSION

Lessons Learned

When conducting community-based research, it is important for the researchers to be flexible with time, methodologies, and outcomes. Not all partners involved in the project have the same needs or commitments, and the researchers must keep this in mind while conducting research. Not all planned interviews, meetings or trips will be on schedule and researchers are required to be flexible with their time and accommodate for this. While working with a community, unforeseen events can arise, and the researchers need to be understanding and be able to shift their schedules in order to reorganize events such as interviews or meetings. It is essential to remember that the participants of the project are generously sharing their time and knowledge and often have demanding schedules themselves.

The methods also need to be flexible, because what may work for one participant may not work with another. For example, using the survey as a template worked for most of the participants, but there were a few who wanted to share information in a more informal discussion. In these instances, knowledge about the fifteen plants still needed to be gathered, but instead of following the survey directly, the lead researcher laid out pictures of the plants for the participant and allowed them to choose the plants they wished to discuss and in the order they wished to discuss them. The participants were able to speak freely, and often very open-ended questions with broad flexibility were used to ensure the required information was obtained. It is crucial to remember that each participant is unique in many ways, and a researcher must understand and respect this. Some are more shy and reserved, while others are more open and could share knowledge

more easily; some are comfortable around a camera and some are not; and some can read and write English, and some cannot. Using a mixture of methods throughout this research (meetings, interviews, and field trips) proved to be extremely valuable and allowed researchers to collect as much information as possible, as not all participants preferred to share their knowledge the same way.

It is also important to remember that objectives and goals may change throughout research. In this study, a group of researchers from Tl'azt'ten Nation and UNBC discussed possible objectives and outcomes before the project was introduced to the community. These ideas and objectives guided the project, but in the end, the community members and project participants were able to determine what they would most like to focus the research on. Researchers need to be flexible with project outcomes and allow community members to determine what is most important and relevant to their community and needs. In this particular study, the loss of TEK was a major concern and was a key point of focus.

Possible Improvements

Some form of evaluation of the research methods and researchers themselves would have been helpful. This has been used effectively in other community-based research studies (Yim 2009). It would have been useful to receive feedback throughout the research process, to help improve the methodology as it took place. For example, were group meetings or interviews preferred? Of course this would probably vary between participants, but it could help future studies, especially involving Tl'azt'en Nation, by demonstrating the most effective ways to conduct research. That being said, just as each individual is unique, so would be each community. Evaluations of the

research project would empower the participants further, as they would be able to voice their opinions and concerns; if there are issues or problems, a future researcher would learn from these evaluations.

Final Thoughts

By identifying and recognizing these fifteen plants as culturally important or as cultural keystone species, researchers and foresters may gain a better understanding and identification of land use patterns, TEK and cultural values. Cultural knowledge and practices may lead to a better appreciation of ecological systems and may lead to the preservation, conservation or restoration of various species. The fifteen plants can also be used as representative species to aid in the preservation of biodiversity in Tl'azt'en Nations' traditional territory and by protecting these species genetic diversity will be conserved. Protecting the gathering sites of these plants plays a fundamental role in conserving these plants as well. The knowledge gathered and documented throughout this study can also be used to promote the preservation of Tl'azt'en Nations culture and language. These culturally important plants could be used in future research studies.

Knowledgeable Tl'azt'enne who use plants for food and medicine purposes do not seem to have specific sites where plants must be gathered for these purposes. As long as the plant is available in an undisturbed area, away from people and in Tl'azt'en Territory, it can be gathered. Some kinds of sites are more productive than others and it is imperative to know what types of places to check to see whether the plant is abundant enough to pick in any given season. Therefore, it is important that Tl'azt'enne plant

gatherers have a deep understanding of the plants and are able to read their environments in order to find the plants for their use.

Like most First Nations, Tl'azt'enne believe one must respect the plants that they gather for food and medicine. Unlike some worldviews which encourage attitudes of conquest and exploitation in relation to nature (Omaghari and Berkes 1997), the spiritual aspects of the practice of ethnomedicine/ethnobotany generally encourage indigenous people to relate to natural phenomena with respect and dignity.

The traditional way for a Tl'azt'enne to learn was through verbal stories and lessons from family, other community members, and Elders out on the land. The influences of Western societies have had a negative impact on these traditional learning methods and many Tl'azt'enne feel that the younger generations need to reconnect with their Elders and land.

Tl'azt'enne plant gatherers have a deep understanding of plants and are able to read their environments in order to find and use plants. They possess a profound understanding and connection with their environment and all the plant and animal species that share their traditional territory. They have many concerns about plants, their gathering sites, and the traditional knowledge about them. Perhaps the greatest concern is that of the loss of Tl'azt'en Nations TEK. As indigenous cultures, such as Tl'azt'en Nation, become increasingly fragmented and threatened by modern development pressures, this knowledge may be lost forever. It is important to note that although Tl'azt'enne community members are concerned about the loss of TEK, they realize that TEK, like other knowledge systems, is adaptable. By having TEK recorded in "non-

traditional" methods, such as in research projects like this, Tl'azt'enne are controlling the future and the preservation of their knowledge.

The close interrelationship between Tl'azt'en Nation and their land must not be overlooked, and researchers must respect indigenous people as keepers of TEK. It is crucial to undertake further studies, such as this one, to help preserve and perpetuate this important knowledge. It is also imperative to include the community members at all stages of the research to ensure that appropriate knowledge is being documented, and in a form that is presentable and acceptable to all involved. Researchers must acknowledge that the Aboriginal knowledge holders are the authorities and the specialists, and that they have the right to determine what their TEK means to them and how it will be used. In order for Western science researchers to work effectively with Aboriginal people and TEK, they must not only accept TEK for its biological and ecological components, but for the holistic approach it utilizes, including the spiritual basis of knowledge, morals, worldview, cultural importance and dynamic nature.

REFERENCES

Agrawal, A. 2004. Indigenous and scientific knowledge: Some critical comments. IK Monitor 3(3): 1-9.

Akiwenzie-Damm, K. 1996. We belong to this land: A view of cultural difference. Journal of Canadian Studies 31(3): 21-28.

Alexiades, M.N. and J.W. Sheldon (Eds). 1996. Selected guidelines for ethnobotanical research: A field manual. The New York Botanical Garden, New York, USA.

Anyinam, C. 1995. Ecology and ethnomedicine: Exploring links between current environmental crisis and indigenous medical practices. Social Science Medicine 40(3): 321-329.

Austin, M.A., D.A. Buffett, D.J. Nicolson, G.G.E. Scudder and V. Stevens (eds.). 2008. Taking Nature's Pulse: The Status of Biodiversity in British Columbia. Biodiversity BC, Victoria, BC. 268 pp. Available at: www.biodiversitybc.org.

Ball, J. and M. Simpkins. 2004. The community within the child: Integration of indigenous knowledge into First Nations childcare process and practice. American Indian Quarterly 38(3&4): 480-498.

Barman, J., Y. Heber and D. McCaskill. 1987. The challenge of Indian education: An overview. In: Barman, J., Y. Hebert and D. McCaskill (Eds), Indian education in Canada, Volume 2: The challenge. University of British Columbia Press, Vancouver, Canada.

Battiste, M. and J.S.Y. Henderson. 2000. Protecting indigenous knowledge and heritage. Purich Publishing, Saskatoon, Canada.

Berkes, F. 1999. Sacred ecology – traditional ecological knowledge and resource management. Taylor & Francis, Philadelphia, PA.

Berkes, F. and C.S. Farkas. 1978. Eastern James Bay Cree Indians: Changing patterns of wild food use and nutrition. Ecology of Food and Nutrition 7: 155-172.

Berkes, F., J. Colding and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. Ecological Applications 10: 1251-1262.

Bonnell, J.E. and T.M. Koontz. 2007. Stumbling forward: The organizational challenges of building and sustaining collaborative watershed management. Society of Natural Resources 20(2): 153-167.

Borré, K. 1994. The healing power of the seal: The meaning of Inuit healing practice and belief. Arctic Anthropology 31(1): 1-15.

Borrini-Feyerabend, G. 1996. Collaborative management of protected natural areas: Tailoring the approach to the context. IUCN, Gland, Switzerland.

Brant-Castellano, M. 2000. Updating Aboriginal traditions of knowledge. In: G.J.S. Dei, B.L. Hall and D.G. Rosenberg (Eds), Indigenous knowledge in global contexts: Multiple readings of our world. University of Toronto Press. Toronto, ON, Canada. Pp. 1-36.

Brown, D. 2002. Carrier Sekani self-government in context: Land and resources. Western Geography 12: 21-67.

Brown, F. and Y. K. Brown. 2009. Staying the course, staying alive. Coastal First Nations fundamental truths: Biodiversity, stewardship and sustainability. Biodiversity BC, BC, Canada.

Calheiros, D.F., A.F. Seidl and C.J.A. Ferreira. 2000. Participatory research methods in environmental science: Local and scientific knowledge of limnological phenomenon in the Pantanal wetland of Brazil. Journal of Applied Ecology 37: 684-696.

Carpenter, D. 1995. Communicating with the public on issues of science and public health. Environmental Health Perspectives 103: 127-130.

CCFM (Canadian Council of Forest Ministers). 1998. National forest strategy 1998-2003. Canadian Council of Forest Ministers, Ottawa, ON.

Cohn, J.P. 1988. Culture and Conservation. Bioscience 38: 450-452.

Colding, J., C. Folke and T. Elmqvist. 2003. Social institutions in ecosystem management and biodiversity conservation. Tropical Ecology 44(1): 25-41.

Cotton, C.M. 1997. Ethnobotany: Principles and applications. John Wiley and Sons, West Sussex, UK.

CSTC (Carrier Sekani Tribal Council). 2007. A CSTC Background. Pp 1-14. [online] at: http://www.cstc.bc.ca/cstc/7/about+cstc

Cunningham, A.B. 2001. Applied ethnobotany: People, wild plant use, and conservation. Earthscan, London, UK.

Davidson-Hunt, I.J. and R.M. O'Flaherty. 2007. Researchers, indigenous peoples, and place-based learning communities. Society and Natural Resources 20: 291-305.

Davis, A. and J.R. Wagner. 2003. Who knows? On the importance of identifying "Experts" when researching local ecological knowledge. Human Ecology 31(3): 463-488.

Deur D. 2002. Rethinking precolonial plant cultivation on the north-west coast of North America. The Professional Geographer 54: 140-157.

Dickason, O.P. 1997. Canada's First Nations: A history of found peoples from earliest times. Oxford University Press, Toronto, Canada.

Donovan, D.G. and R.K. Puri. 2004. Learning from traditional knowledge of non-timber forest products: Penan Benalui and the auteocology of *Aquilaria* in Indonesia Borneo. Ecology and Society 9(3): 3. [online] URL: http://www.ecologyandsociety.org/vol9/iss3/art3.

Duchesne, L.C., J.C. Zasada and I. Davidson-Hunt. 2001. Ecological and biological considerations for sustainable management of non-timber forest products in northern forests. NTFP Conference Proceedings. Pp. 102-109.

Emerson, R., R. Fretz and L. Shaw. 1995. Writing ethnographic fieldnotes. University of Chicago Press, Chicago, Illinois, USA.

Fast, H. and F. Berkes. 1994. Native land use, traditional knowledge, and the subsistence economy in the Hudson Bay bioregion. Technical paper prepared for the Hudson Bay Programme. University of Manitoba, Natural Resources Institute, Winnipeg, MB.

Folke, C. and J. Colding. 2001. Traditional conservation practices. Encyclopedia of Biodiversity. Volume 5, Academic Press.

Fondahl, G., P. Wright, D. Yim, E. Sherry, B. Leon, W. Bulmer, S. Grainger and J. Young. 2009. Co-managing research: Building and sustaining a First Nation-University partnership. The Community Development Institute at UNBC. Prince George, BC, Canada.

Fort St. James LRMP (Land Resource Management Plan). 1999. Online at: http://www.ilmb.gov.bc.ca/sites/default/files/resources/public/PDF/LRMP/Fort%20St%20James_LRMP.pdf

Foster, G.M. and B.G. Anderson. 1978. Medical Anthropology. John Wiley and Sons, New York, USA.

Furgal, C. and J. Seguin. 2006. Climate change, health, and the vulnerability in Canadian northern Aboriginal communities. Environmental Health Perspectives 11(12): 1964-1970.

Gadgil, M., F. Berkes and C. Folke. 1993. Indigenous knowledge for biodiversity conservation. Ambio 22(2-3): 151-156.

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.

Gerwing, J.J. 2002. Degradation of forests through logging and fire in the eastern Brazilian Amazon. Forest Ecology and Management 157: 131-141.

Gesler, W.M. 1992. Therapeutic landscapes: Medical issues in light of the new cultural geography. Social Science Medicine 34: 735-745

Gesler, W.M. 1993. Therapeutic landscapes: Theory and a case study of Epidauros, Greece. Environment and Planning: Society and Space 11: 171-189.

Gibbs, M. 2001. Toward a strategy for undertaking cross-cultural collaborative research. Society and Natural Resources 14: 63-687.

Government of Canada. 2003. Climate change impacts and adaptation: A Canadian perspective. [online] URL: www.adaptation.nrcan.gc.ca/perspective_e.asp

Grainger, S., E. Sherry and G. Fondahl. 2006. The John Prince Research Forest: Evolution of a co-management partnership in northern British Columbia. The Forestry Chronicle 86(2): 1-12.

Hamilton, A.C. 2004. Medicinal plants, conservation and livelihoods. Biodiversity and Conservation 13: 1477-1517.

Herman, T. and D. Mattingly. 1999. Community, justice, and the ethics of research. Negotiating reciprocal research relations. Geography and ethics. Journey in a Moral Terrain. Proctor, J.D. and D.M. Smith (Eds), London & New York.

Hoepfl M. C. 1997. Choosing qualitative research: A primer for technology education researchers. Journal of Technology Education 9(1) [online] URL: http://scholar.lib.vt.edu/ejournals/JTE/v9n1/hoepfl.html

Holmstedt, B.R., and J.G. Bruhn. 1995. Ethnopharmacology – a challenge. In: Schultes R.E.S. von Reis (Eds), Ethnobotany: Evolution of a discipline. Chapman & Hall, London, UK, Pp. 338-342.

Huntington, H.P. 2000. Using traditional ecological knowledge in science: Methods and applications. Ecological Applications 10(5): 1270-1274.

INAC (Indian and Northern Affairs Canada). 2010. Available at: http://www.ainc-inac.gc.ca/index-eng.asp.

Johnson, L.M. 2000. "A place that's good" Gitksan landscape perception and ethnoecology. Human Ecology 28(2): 301-325.

Johnson, L.M. 2006. Gitksan medicinal plants-cultural choice and efficacy. Journal of Ethnobiology and Ethnomedicine 2:29.

Johnson, L.M. 2008. Plants and habitats – a consideration of Dene ethnoecology in northwestern Canada. Botany 86: 146-156.

Johnson, N.B. 1984. Sex, colour, and rites of passage in ethnographic research. Human Organization 43(2): 108-120.

Johnson Gottesfeld, L.M. 1993. Plants, land and people, a study of Wet'suwet'en ethnobotany. MA Thesis, University of Alberta, Alberta, Canada.

Karjala, M.K. 2001. Integrating aboriginal values into strategic-level forest planning on the John Prince Research Forest, Central Interior, British Columbia. MA Thesis. University of Northern British Columbia, Prince George BC, Canada.

Karjala, M. K. and S.M. Dewhurst. 2002. Including Aboriginal issues in forest planning: A case study in central interior British Columbia, Canada. Landscape and Urban Planning 64(2003): 1-17.

Karjala, M.K., E.E. Sherry and S.M. Dewhurst. 2002. Criteria and indicators for sustainable forest planning: A framework for recording Aboriginal resource and social values. Forest Policy and Economics 6(2004): 95-110.

Kimmerer, R.W. 2002. Weaving traditional ecological knowledge into biological education: A call to action. Bioscience 52: 432-438.

Kowalsky, L.O., W.E. Thurstson, M.J. Vernhoef and G.E. Rutherford. 1996. Guidelines for entering into and aboriginal community. Canadian Journal of Native Studies 16(2): 267-282.

Knudtson, P. and D. Suzuki. 1992. Wisdom of the Elders. Stoddart Publishing Company, Vancouver, Canada.

Kusel, J. 2001. Assessing well-being in forest dependent communities. Journal of Sustainable Forestry 13(1/2): 359-384.

Kvale, S. 1996. Interviews: An introduction to qualitative research interviewing. Sage Publications, London, UK.

Lammerts van Buerem, E.M.L and E.M. Blom. 1997. Hierarchal framework for the formulation of sustainable forest management standards. Tropenbos Foundation, Leiden, Netherlands.

Lantz, T.C. 2001. Examining the potential role of co-operatives in the ethical commercialization of medicinal plants: Plant conservation, intellectual property rights, ethics, and Devil's club (*Oplopanax horridus)*. British Columbia Institute for Co-operative Studies. Occasional Paper 2, Canada.

Lantz, T.C. and N.J. Turner. 2003. Traditional phenological knowledge of aboriginal peoples in British Columbia. Journal of Ethnobiology 23(2): 263-286.

Lofland, J. and L.H. Lofland. 1984. Analyzing social settings. Wadsworth Publishing Company, Inc, Belmont, CA, USA.

Malloch, L. 1989. Indian medicine, Indian health: Study between red and white medicine. Canadian Women Studies 10(2-3): 105-112.

Marles, R.J., C. Clavelle, L. Monteleone, N. Tays and D. Burns. 2000. Aboriginal plant use in Canada's Northwest Boreal Forest. UBC Press, Vancouver, BC.

Martin, G.J. 2004. Ethnobotany: A methods manual. Earthscan, London, UK.

Martini, A., N. Rosa and C. Uhl. 1994. An attempt to predict which Amazonian tree species may be threatened by logging activities. Environmental Conservation 21:152-162.

McMillan, A.D. 1995. Native peoples and cultures of Canada. Douglas & McIntyre Ltd., Vancouver, BC, Canada.

McPhee, J. 1989. The survival of the bark canoe. Noonday Press, Canada.

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests. 330 pp. Accessed May 19th, 2007. http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/SRseries.htm

Miller, J. R. 1987. The irony of residential schooling. Canadian Journal of Native Education 14(2): 3-14

Mills, L.S., M.E. Soule and D.F. Doak. 1993. Management and policy must explicitly consider the complexity of interaction in natural systems. Bioscience 43(4): 219-224.

Miranda, T.M., M.C. Amorozo, J.S. Govone and D.M. Miranda. 2007. The influence of visual stimuli in ethnobotanical data collection using the listing task method. Field Methods 9(1): 76-86.

Mishler, E. 1986. The analysis of interview-narratives. In T. Sarbin (Ed.), Narrative psychology: The storied nature of human conduct. Praeger Publishers, New York, USA. Pp. 233-255.

Moller H., F. Berkes, P. O'Brian Lyver 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.ecologyndsociety.org/vol9/iss3/art2.

Morgan, D.L. 1996. Focus groups. Annual Review of Sociology 22: 129-152

Morris, P.K. 1999. Negotiating the production of space in Tl'azt'en territory, 1969-1984. MA Thesis. University of Northern British Columbia, Prince George, BC.

Morris, P. and G. Fondahl. 2002. Negotiating the production of space in Tl'azt'en territory, Northern British Columbia. The Canadian Geographer 46(2): 108-125

Murphree, M.W. 1993. Communities as institutions for resource management. University of Zimbabwe. Centre for Applied Social Sciences Harare, Zimbabwe.

Murray, G., P.C. Boxall and R.W. Wein. 2005. Distribution, abundance, and utilization of wild berries by the Gwich'in People in the Mackenzie river delts region. Economic Botany 59: 174-184.

Naidoo, R. and K. Hill. 2006. Emergence of Indigenous vegetation classifications through integration of traditional ecological knowledge and remote sensing analyses. Environmental Management 38(3): 377-387.

Natcher, D.C. and C.G. Hickey. 2002. A criteria and indicators approach to community development. SFMN Working Paper 2002-2. Sustainable Forest Management Network, Edmonton, AB.

NAFA (National Aboriginal Forestry Association). 1997. Aboriginal participation in forest management: Not just another stakeholder. NAFA Position Paper. National Aboriginal Forestry Associaiton, Ottawa, ON.

Nelson, R. 1983. Make prayers to the raven: A Koyukon view of the Northern forest. University of Chicago Press, Chicago, Illinois, USA.

Nock, D. 1988. A Victorian missionary and Canadian Indian policy: Cultural synthesis vs cultural replacement. Wilfrid Laurier University Press, Waterloo, Canada.

Notzke, C. 1994. Aboriginal peoples and natural resources in Canada. Captus University, North York, ON.

Ohmagari, K. and F. Berkes. 1997. Transmission of indigenous knowledge and bush skills among the western James Bay Cree women of subarctic Canada. Human Ecology 5(2): 197-222.

Parlee, B., F. Berkes and Teetl'it Gwich'in Renewal Resource Council. 2006. Indigenous knowledge of ecological variability and commons management: A case study on berry harvesting from northern Canada. Human ecology 34: 515-528.

Pidgeon, M. and D. Hardy Cox. 2002. Researching with aboriginal peoples: Practices and principles. Canadian Journal of Native Education 26(2): 96-106.

Pojar, J., R. Love, D. Meidinger and R. Scagel. 1982. Common plants of the sub-boreal spruce zone. Province of British Columbia, Ministry of Forests Research Branch, Canada.

Poland, B. and A. Pederson. 1998. Reading between the lines: Interpreting silences in qualitative research. Qualitative Inquiry 4:293–312.

Powell, G.W. 2005. A regional profile of non-timber forest products being harvested from the Cariboo-Chlcotin, British Columbia area. Royal Roads University, University of Victoria, BC, Canada.

Presser, S., M.C. Couper, J.T. Lessler, E. Martin, J. Martin, J.M. Rothgeb and E. Singer. 2004. Methods for testing and evaluating survey questions. Public Opinion Quarterly 68(1): 109-130.

Ramstad, K.M., N.J. Nelson, G. Paine, D. Beech, A. Paul, S. Paul, F.W. Allendorf and C.H. Daughterty. 2007. Species and cultural conservation in New Zealand: Maori traditional ecological knowledge of tuatara. Conservation Biology 21(2): 455-464.

RCAP (Royal Commission on Aboriginal People). 1996. Restructuring the relationship, Part 1, Volume 2. Ministry of Supply and Services, Ottawa, Canada.

Robinson, M.P. and M.M. Ross. 1997. Traditional land use studies and their impact on forest planning on management in Alberta. Forestry Chronicle 73:596-605.

Robinson, M.P., T. Garvin and G. Hodgson. 1994. Mapping how we use our land: Using participatory action research. Arctic Institute of North America, Calgary, AB.

Ross, H. 1990. Community social impact assessment: A framework for indigenous peoples. Environmental Impact Assessment Review 10: 185-193.

Santiago-Rivera, A.L., G. Skawennio Morse, A. Hunt and H. Lickers. 1998. Building a community-based research partnership: Lessons from the Mohawk Nation of Akwesasne. Journal of Community Psychology 26(2): 163-174.

Shanley, P. and L. Luz. 2003. The impacts of forest degradation on medicinal plant use and implications for health care in Eastern Amazonia. Bioscience 53(6): 573-584.

Shebitz, D.J. and R.W. Kimmerer. 2005. Reestablishing roots of Mohawk community and a culturally significant plant: Sweetgrass. Restoration Ecology 13(2): 257-264.

Sherry, E.E. 2002. Constructing partnership: A Delphi study of shared resource management in the North Yukon. Ph.D. dissertation, University of Northern British Columbia, Faculty of Natural Resources and Environmental Studies, Prince George, BC.

Sherry, E.E. and H.M. Myers. 2001. Traditional environmental knowledge in practice. Society and Natural resources 15: 345-358.

Sherry, E., R. Halseth, G. Fondahl, M. Karjala and B. Leon. 2005. Local-level criteria and indicators: An Aboriginal perspective on sustainable forest management. Forestry 78(4): 1-27.

Shui-Thorton, S. 2003. Addressing cultural competency in research: Integrating a community-based participatory research approach. Alcoholism – Clinical and Experimental Research 27(8): 1361-1364.

Simpson, L.R. 1999. The construction of traditional ecological knowledge: Issues, implications and insights. Doctoral Thesis, University of Manitoba, Winnipeg, Canada.

Smith, H.I. 1997. Ethnobotany of the Gitskan Indians of British Columbia. Compton, B.D., B. Rigsby and M-L. Tarpent (Eds), Canadian Museum of Civilization. Hull, Quebec, Canada.

Smith, L.T. 1999. Decolonizing Methodologies: Research and indigenous peoples. Zed Books, London & New York

Smith, P. 1998. Aboriginal treaty rights and Aboriginal participation: Essential elements of sustainable forest management. Forestry Chronicle 74: 327-333.

Smith R.L. and T.M. Smith. 2001. Ecology and field biology. Sixth edition. Benjamin Cummings, New York, New York, USA.

Stevenson, M. 2005. Traditional Knowledge and Sustainable Forest Management. Sustainable Forest Management Network, Edmonton, Alberta.

Struthers, R. 2001. Conducting sacred research: An indigenous experience. Wicazo SA Review 16(1): 125-133.

Thompson, C. 2003. Traditional plant knowledge of the Tsimshian curriculum: Keeping knowledge in the community. Canadian Journal of Native Education 28(1&2): 61-65.

Thornton, T.F. 1999. Tleikw aani, the "berried" landscape: The structure of Tlinglit edible fruit resources at Glacier Bay, Alaska. Journal of Ethnobiology 19: 27-48.

Titley, E. B. 1986. A narrow vision: Duncan Campbell Scott and the Administration of Indian Affairs in Canada. University of British Columbia Press, Vancouver, Canada.

Tl'azt'en Nation. 2009. Retrieved August 25, 2009 at: http://www.tlc.baremetal.com/About%20Us.htm

Tl'azt'en Nation and the University of Northern British Columbia CURA. 2009. Study Area: John Prince Research Forest. [online] at http://cura.unbc.ca/jprf.htm.

Turner, N.J. 1992. "The Earth's blanket": Traditional aboriginal attitudes towards nature. Canadian Biodiversity 2(4): 5-7.

Turner, N.J. 1995. Food Plants of Coastal First Peoples. UBC Press, Vancouver, BC and the Royal British Columbia Museum, Victoria, BC

Turner, N.J. 1998. Plant technology of first peoples in British Columbia. UBC Press. Vancouver, Canada.

Turner, N.J. 2003. Ethnobotany of "edible seaweed" (*Porphyra abbottiae* Krishnamurthy and related species; Rhodophyta: Bangiales) and its uses by First Nations on the Pacific coast of Canada. Canadian Journal of Botany 81(2): 283-293.

Turner, N.J. 2009. Preface. In: Staying the course, staying alive. Coastal First Nations fundamental truths: Biodiversity, stewardship and sustainability. Biodiversity BC, BC, Canada.

Turner, N.J. and K.L. Turner. 2008. "Where our women used to get the food": Cumulative effects and loss of ethnobotanical knowledge and practice; case study from coastal British Columbia. Botany 86: 103-115.

Turner, N.J., R. Bouchard and D.I.D. Kennedy. 1980. Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington. British Columbia Provincial Museum, Victoria, BC, Canada.

Turner, N.J., M.B. Ignace and R. Ignace. 2000. Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. Ecological Applications 10(5): 1275-1287.

Turner, N.J., L.C. Thompson, M.T. Thompson and A.Z. York. 1990. Thompson Ethnobotany: Knowledge and usage of plants by the Thompson Indians of British Columbia. Royal British Columbia Museum, Victoria, BC, Canada.

Usher, P. J. 2000. Traditional Ecological Knowledge in Environmental Assessment and Management. Arctic 53(2): 183-193.

Vitousek, P.M., C.M. D'Antonio, L.L. Loope, M. Reimanek and R. Westbrooks. 1997. Introduced species: A significant component of human-cased global change. New Zealand Journal of Ecology 21(1): 1-16.

Vogl, C.R., B. Vogl-Lukasser and R.K. Puri. 2004. Tools and methods for data collection in ethnobotanical studies of homegardens. Field Methods 16(3): 285-306.

Western, D. and M. Wright. 1994. Natural connections: Perspectives in community-based conservation. Island Press, Washington, DC.

Williams, R.J. and A. Matejko. 1985. Building a forest plan using issues to structure the process. Journal of Forestry 83: 28-32.

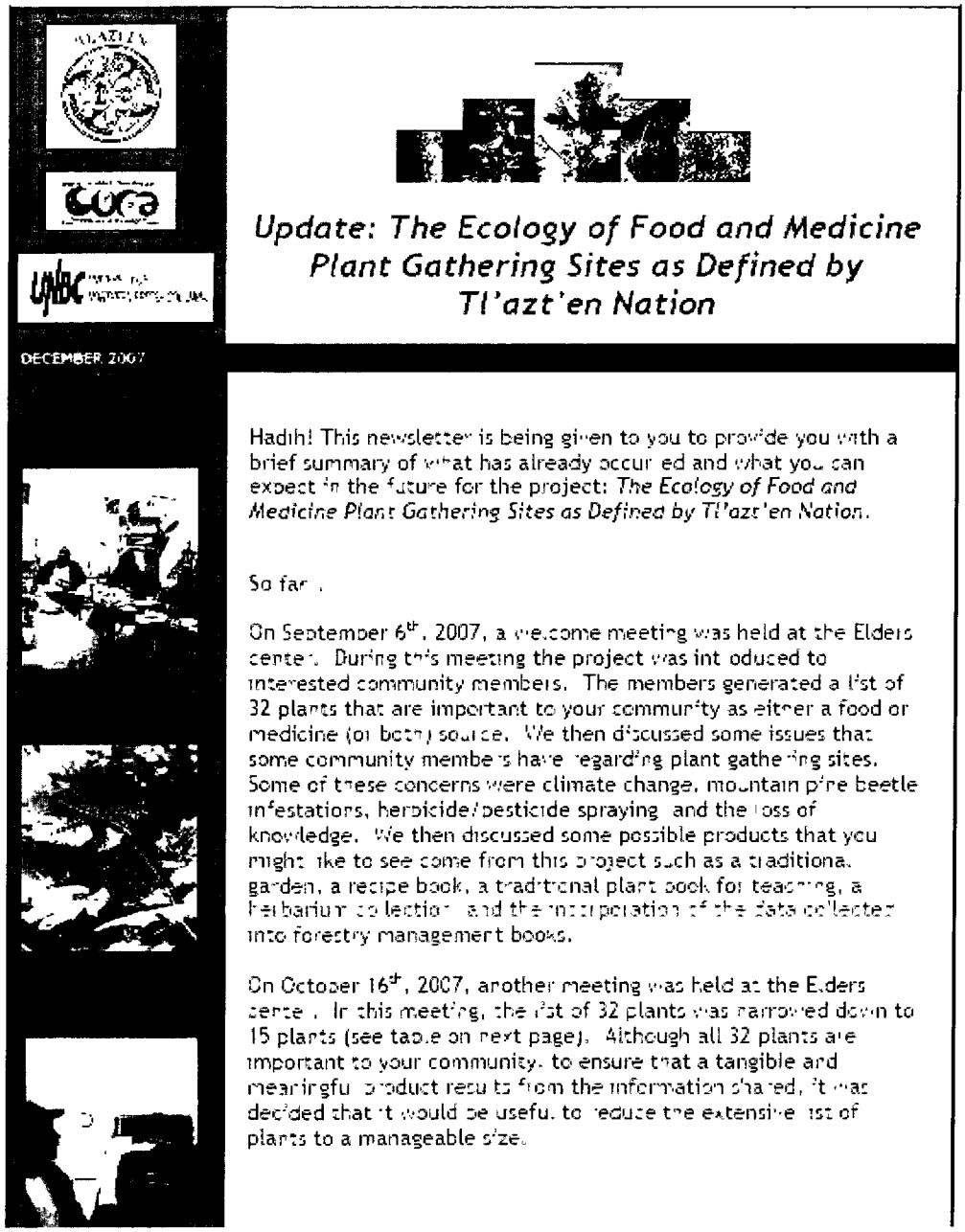
Wilson, K. 2002. Therapeutic landscapes and First Nations peoples: An exploration of culture, health and place. Health and Place 9(2003): 83-93.

Wright, P.A., G. Alward, J.L. Colby, T.W. Hoekstra, B. Telger and M. Turner. 2002. Monitoring for forest management unit scale sustainability: The local unit criteria and indicators development (LUCID) test (Management edition). USDA Forest Service Inventory and Monitoring report, Fort Collins.

Yim, D. 2009. Evolving co-management practice: Developing a community-based environmental monitoring framework with Tl'azt'en Nation on the John Prince Research Forest. MNRES Thesis. University of Northern British Columbia, Prince George, Canada.

Young, J. and A. Hawley. 2010. Plants and medicines of Sophie Thomas: Based on the traditional knowledge of Sophie Thomas, Sai' Kuz Elder and healer, 3rd ed.

APPENDIX I: Update Newsletter, December 2007 (Front page)



Update: The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation

DECEMBER 2007

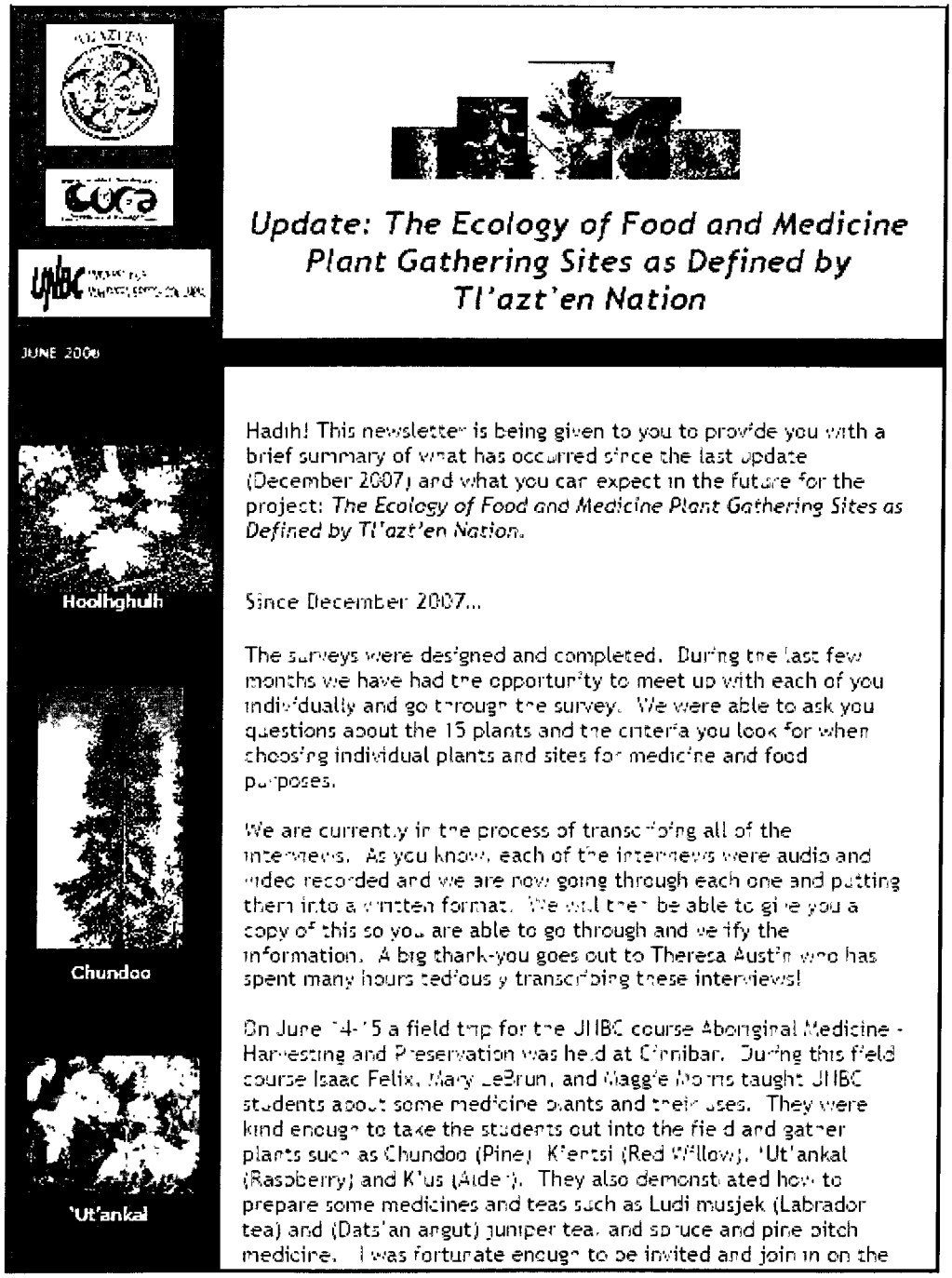
Hadih! This newsletter is being given to you to provide you with a brief summary of what has already occurred and what you can expect in the future for the project: *The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation.*

So far...

On September 6th, 2007, a welcome meeting was held at the Elders center. During this meeting the project was introduced to interested community members. The members generated a list of 32 plants that are important to your community as either a food or medicine (or both) source. We then discussed some issues that some community members have regarding plant gathering sites. Some of these concerns were climate change, mountain pine beetle infestations, herbicide/pesticide spraying and the loss of knowledge. We then discussed some possible products that you might like to see come from this project such as a traditional garden, a recipe book, a traditional plant book for teaching, a herbarium collection and the incorporation of the data collected into forestry management books.

On October 16th, 2007, another meeting was held at the Elders center. In this meeting, the list of 32 plants was narrowed down to 15 plants (see table on next page). Although all 32 plants are important to your community, to ensure that a tangible and meaningful product results from the information shared, it was decided that it would be useful to reduce the extensive list of plants to a manageable size.

APPENDIX II: Update Newsletter, June 2008 (Front page)



Update: The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation

JUNE 2008

Hoolhghuh

Chundoo

'Ut'ankal

Hadih! This newsletter is being given to you to provide you with a brief summary of what has occurred since the last update (December 2007) and what you can expect in the future for the project: *The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation.*

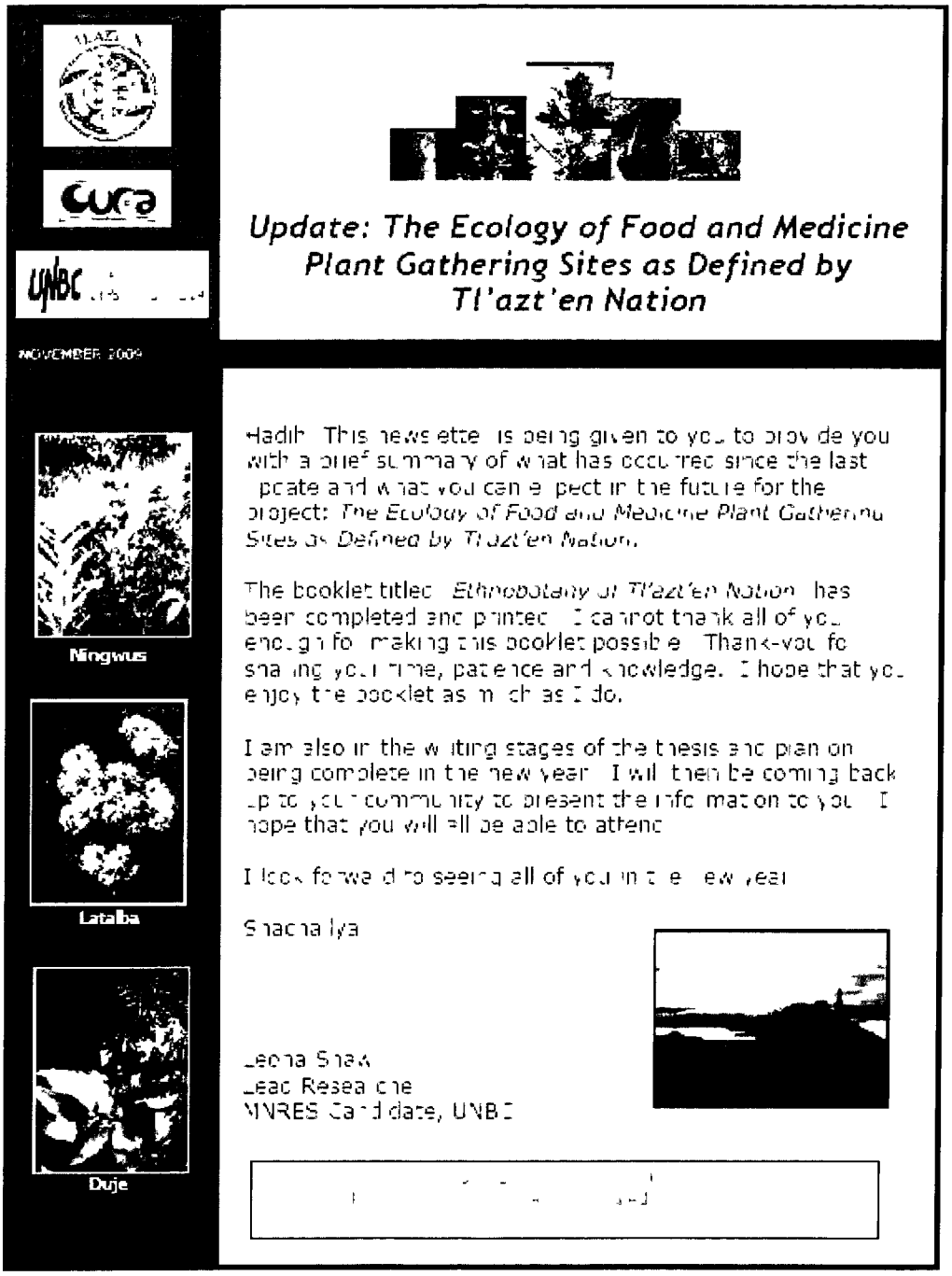
Since December 2007...

The surveys were designed and completed. During the last few months we have had the opportunity to meet up with each of you individually and go through the survey. We were able to ask you questions about the 15 plants and the criteria you look for when choosing individual plants and sites for medicine and food purposes.

We are currently in the process of transcribing all of the interviews. As you know, each of the interviews were audio and video recorded and we are now going through each one and putting them into a written format. We will then be able to give you a copy of this so you are able to go through and verify the information. A big thank-you goes out to Theresa Austin who has spent many hours tediously transcribing these interviews!

On June 14-15 a field trip for the JIIBC course Aboriginal Medicine - Harvesting and Preservation was held at Cinnibar. During this field course Isaac Felix, Mary LeBrun, and Maggie Morris taught JIIBC students about some medicine plants and their uses. They were kind enough to take the students out into the field and gather plants such as Chundoo (Pine), K'entsi (Red Willow), 'Ut'ankal (Raspberry) and K'us (Alder). They also demonstrated how to prepare some medicines and teas such as Ludi musjek (Labrador tea) and (Dats'an angut) juniper tea, and spruce and pine pitch medicine. I was fortunate enough to be invited and join in on the

APPENDIX III: Update Newsletter, November 2009 (Front page)



Update: The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation

NOVEMBER 2009

Ningwus

Latalba

Duje

Hadih This newsletter is being given to you to provide you with a brief summary of what has occurred since the last update and what you can expect in the future for the project: *The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation.*

The booklet titled *Ethnobotany of Tl'azt'en Nation* has been completed and printed. I cannot thank all of you enough for making this booklet possible. Thank-you for sharing your time, patience and knowledge. I hope that you enjoy the booklet as much as I do.

I am also in the writing stages of the thesis and plan on being complete in the new year. I will then be coming back up to your community to present the information to you. I hope that you will all be able to attend.

I look forward to seeing all of you in the new year.

Shachalya

Leona Shea
Lead Researcher
MNRES Candidate, UNBC

APPENDIX IV: Community booklet "Ethnobotany of Tl'azt'en Nation" (Title page)

Ethnobotany of Tl'azt'en Nation

Written by:
Tl'azt'en Nation and Leona Shaw

From the Community-University Research Alliance Project
The Ecology of Food and Medicine Plant Gathering Sites as Defined by Tl'azt'en Nation

APPENDIX V: Sample Poster (Most recent: March 2009)