

"Connecting Our Roots" –

Holistic Health Research with Boston Bar First Nation Revitalizing Traditional  
Plant Knowledge and Building Education Capacity using an Integrated  
Community-based Participatory Action Research Approach

by

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## **Abstract**

Connecting Our Roots (COR) is based within a collaborative research partnership between Boston Bar First Nation (BBFN) and UBC Institute for Aboriginal Health (UBC IAH) and the Faculty of Land and Food Systems (FLFS). It was Boston Bar First Nation who approached UBC IAH and wanted to address their community health concerns holistically through revitalizing traditional plant knowledge and usage. As a graduate student I started working with BBFN in fall of 2003 and lived on the BBFN reserve for 3 summers from 2004 to 2006. During this time the participatory research process unfolded summarized as three main parts: process, plant research and transformation. Process involved building a culturally appropriate research environment (CARE) through an integrated Indigenous and academic research approach and the development of a local code of research ethics. This was the foundation for community and university-based plant research that included documenting local plant knowledge and inspired laboratory analysis on the chemistry, biological activity and nutritional analysis of Tseweta (*Lomatium nudicaule*), a traditionally used plant with contemporary importance in Nlaka'pamux and other Indigenous communities. Over the three years the transformative element of the research evolved resulting in local actions, including culturally contextual summer youth programs. These summer programs supported the revitalization of local plant knowledge and usage and intergenerational knowledge transmission. They also facilitated building cultural, social, economic and health capacity, as well as local research expertise. Tangible outcomes of the plant research combined with the youth education programs included the creation of an interpretive traditional plant trail, a community herbarium, a greenhouse initiative, and several community publications. Overall, the Connecting Our Roots research initiative was successful in supporting BBFN's self-determination, built local research capacity, created new knowledge on Tseweta, and through its transdisciplinary and participatory research approach created meaningful and transformative research outcomes.

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## List of Acronyms

AFN	Assembly of First Nations
BBFN	Boston Bar First Nation
BC	British Columbia
BREB	Behaviour Research Ethics Board
CBD	Convention on Biological Diversity
BC ACADRE	BC Aboriginal Capacity and Developmental Research Environments
CARE	Culturally Appropriate Research Environment
CINE	Centre for Indigenous Peoples' Nutrition and Environment
COR	Connecting Our Roots
CPAR	Community-based Participatory Action Research
FAO	Food and Agriculture Organization of the United Nations
FLFS	Faculty of Land and Food Systems
FNHL	First Nation House of Learning
IP	Indigenous Peoples
IPR	Intellectual Property Rights
IAH	Institute for Aboriginal Health
NEAR BC	Network Environments for Aboriginal Research BC
NGO	Non-governmental Organization
RI	Research Institution
TFS	Traditional Food Systems
TPKU	Traditional Plant Knowledge and Usage
TRIPS	Trade-Related Aspects of Intellectual Property Rights (WTO)
UBC	University of British Columbia
UN	United Nations
WHO	World Health Organization
WIPO	World Intellectual Property Organization

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Tamara Campbell was intimately involved with most of the research activities as a research assistant, cultural advisor, and became like a sister to me.

The late Elders Hilda Isabel Isaac (nee Oates) and Deanna Marina Thiessen shared their depth of knowledge and enthusiasm for life. They both were my mentors and adopted grandmothers. Elders Herman and the late Marie Phillips, Julie Grafinger, and Jimmy Jones, as well as community members Gary 'Kachels' Florence and Hugh Senior Florence shared their wisdom and time.

The BBFN youth co-developed the education part of this research initiative and are the motivation for the research so that the traditional wisdom of their ancestors may continue and that the youth are more prepared for the challenges of today while being connected with their roots.

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All my relations!

## Dedication

*Connecting Our Roots is dedicated in memory to Nlaka'pamux Elders **Isabel Hilda Isaac** and **Deanna Marina Thiessen**, and the late BBFN Band Manager **John Warren** who believed, supported, and guided this initiative.*



Picture Left: Elder Hilda Isaac (middle), her sister Margo (left), granddaughter Tamara (centre right), and Sarah Martz (right) (2005); Picture Right: Elder Deanna Thiessen and grandson Aaron Connar (2005)

*In Memory of Quayome my Loyal Companion*



## **Co-Authorship Statement**

I conducted the majority of the research and wrote this thesis. I want to recognize that this was part of a large collaborative effort of the Boston Bar First Nation and research collaborators at UBC, namely the Institute for Aboriginal Health and the Faculty of Land and Food Systems.

This thesis was produced under the ethical framework of the BBFN-UBC Code of Research Ethics (Chapter II, Section C.1.b – Appendix III). The CRE regards Boston Bar First Nation as the guardians and interpreters of their culture and knowledge and recognizes their rights and obligations. This follows “Good Practices” in the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans – Section 6: Research Involving Aboriginal Peoples (Canadian Institutes of Health Research (CIHR, 1998; CIHR, 2005).

This project was initiated by discussions between Dr. E.M. Jovel (supervisor) and Chief Dolores O’Donaghey (Boston Bar First Nation). Chief Dolores O’Donaghey also participated on the academic research committee. The Boston Bar First Nation Band Council administrated the community-based research, which community research mentors and participants supported and co-developed. In particular, Band Councilor Roy Campbell’s mentorship was key to the community-based documentation of traditional plant knowledge, with support of Elder Hilda Isaac. Elder Deanna Thiessen and Band Councilor Christine Grafinger helped organize and support the Youth Summer Programs focused on traditional plant research and capacity-building.

Boston Bar First Nation, Dr. E.M. Jovel, Dr. S. Cowan, and Dr. A. Rojas assisted in the study approach and design. Dr. E.M. Jovel, Dr. S. Cowan, and Dr. J. Bohlmann provided mentorship for the field and laboratory plant research and analysis. Dr. A. Rojas provided his expertise and ongoing mentorship for the integrated community-based participatory action research approach.



## **Chapter I. Introduction**

Connecting Our Roots (COR) provides a foundation for this thesis describing the relationship between people, plants and place. Strengthening cultural roots was seen by the Boston Bar First Nation (BBFN) as means to holistically address health concerns in their community. The Boston Bar First Nation belong to the Nlaka’pamux or Thompson People in southwestern British Columbia where they are situated in the ecologically diverse coastal - interior biogeoclimatic transition area of the Fraser Canyon (Turner, Thompson, Thompson & York, 1990). The Boston Bar First Nation have approximately 100 members living on reserve, and a total registered population of 238 as of May 2008 (Department of Indian and Northern Development, 2008: Registered Pop.). The original Nlaka’pamux village site at Boston Bar was named Quayome, which has the meaning of “place to pick berries” (Akrigg & Akrigg, 1997).

For the Boston Bar First Nation traditional foods represent “a cornerstone for the health of aboriginal people” (Boston Bar First Nation, 2002). Similar to other cultural heritages like language, local Indigenous and traditional plant knowledge reflect interrelationships with the land and the wisdom of their ancestors. The focus of Connecting Our Roots was on revitalizing traditional plant knowledge and usage (TPKU) as part of an ecological approach to health. An integrated participatory methodology was used to facilitate a collaborative research process. The resulting outcomes from the traditional plant research and community-based education initiatives addressed the research needs identified by the Boston Bar First Nation community.

## **A. BBFN-UBC Health Research Partnership**

The research collaboration was initiated by Boston Bar First Nation by contacting the University of British Columbia (UBC) Institute for Aboriginal Health (UBC IAH). Boston Bar First Nation wanted to address two major issues: 1) the “loss of traditional knowledge and ways of life”, and 2) the health of their people was “suffering” and continued to “worsen” (Boston Bar First Nation, 2002). Primary health concerns of the community included diabetes, arthritis, as well as drug and alcohol abuse (Boston Bar First Nation, 2002). The Boston Bar First Nation Chief and Council recognized that a significant loss of knowledge on their traditional food system was contributing to the suffering health status of their community (Boston Bar First Nation, 2002). For this reason, BBFN engaged in developing a research partnership with UBC to address their health needs by reconnecting to their traditional wisdom, as part of a strategy to promote healthier lifestyles in their community and to encourage the use of natural resources available in their traditional territories. The purpose of the Indigenous – academic research partnership was to combine knowledge and expertise to address community concerns.

### **1. Research Focus and Objectives**

A major research goal of Connecting Our Roots was to develop a research approach and process to produce outcomes that could address the Boston Bar First Nation’s identified research needs. It was imperative for BBFN that the research process and principles were not simply designed to empirically analyze issues such as declining health, low academic achievements, or marginalized socio economic status, but more importantly to promote the healing process in a culturally sensitive manner. To explore such diverse and yet interconnected issues resulting from the cultural fragmentation and loss of traditional knowledge, Connecting Our Roots utilized an integrated community-based participatory action research approach. The belief was that this holistic research methodology would help to restore the loss of cultural heritage and to revitalize traditional plant knowledge and cultural practices unique to BBFN.

### **a) Research Focus**

To conduct respectful, meaningful, and culturally relevant academic research serving the community's identified need to revitalize traditional plant knowledge using a holistic approach.

### **b) Research Objectives**

- 1.) Develop a respectful and culturally appropriate research environment,
- 2.) Research and document BBFN ethnobotanical uses of local plant resources,
- 3.) Assess nutritional and therapeutic properties of selected plant resources, and
- 4.) Support traditional plant use revitalization efforts to increase community education capacity.

## **B. Culturally Appropriate Research Approach and Methodology**

The first research objective of Connecting Our Roots was to develop a respectful and culturally appropriate research environment (CARE) in order to establish a mutually-beneficial research relationship between Indigenous and academic research partners. Connecting Our Roots utilized an integrated research approach that included Indigenous and academic research methodologies, where methodology describes the research framework and method the techniques used within the research process (information gathering, data collection, analysis, report styles) (Smith 1999, p. 143). This approach provided the foundation for the research process.

### **1. Academic Research Approach**

The academic research approach of Connecting Our Roots primarily involved transdisciplinary, transformative and community-based participatory action research frameworks to help develop and foster a culturally appropriate research environment. **Transdisciplinary** embraces holistic thinking and research (See Appendix IV for the Charter of Transdisciplinarity). Its strength is on being borderless, "whereby culturally constructed boundaries of single disciplines are transcended in order to address problems from multiple perspectives to

generate emergent knowledge” (Kim, 1998, p.24). This approach is non-hierarchical and inclusive of all cultures and ways of knowing. **Transformative research** necessitates action and change (G. H. Smith, 2005). It calls for research to be applied and emphasizes the need for the research process to be transformative, where “the journey itself is as important as arriving” (Smith, G.H., 2004, Address to Post –Graduate Conference, UBC). **Community-based participatory action research** incorporates both transdisciplinary and transformative principles and has become a well established research methodology with clearly delineated principles and methods guiding research from inception to completion (Guba & Lincoln, 1994; Stringer, 2007). Together these holistic research paradigms provided the integrated research approach for Connecting Our Roots.

Community-based participatory action research (CPAR) provided the overarching research framework. This is an interpretive approach that views the researcher as involved and integral in the research process and interaction. In CPAR, the researcher has multiple roles, including being a participant, catalyst, facilitator (Guba & Lincoln, 1994; Stringer, 2007), and storyteller (Dr. Alejandro Rojas, personal communication, 2008). Interpretive research recognizes and values unique historical and social contexts. This research framework champions research principles that build respectful, culturally relevant and mutually empowering research relationships. Author of Decolonizing Methodologies Linda T. Smith (1999) sees community action research as enabling communities’ self-determination and community members to participate directly in the research process. Today, an ever growing compendium of authors in Canada and internationally are publishing on participatory research, among them in areas related to Indigenous, health and education research (Gittelsohn et al., 1998; Israel, Schulz, Parker, & Becker, 1998; Israel, Eugenia Eng, Schulz, & Parker, 2005; Kimmerer, 2002; Kruger & Sturtevant, 2003; Macaulay et al., 1997; Macaulay et al., 1999; O’Toole, Aaron, Chin, Horowitz, & Tyson, 2003; Ritas, 2003; RTI International-University of North Carolina (RTI - UNC), 2004; G. H. Smith, 2000a; L. T. Smith, 1999; Stringer, 2007; Wallerstein & Duran, 2006).

In summary, community-based participatory action research is a framework “enacting local, action-oriented approaches to inquiry” (Stringer, 2007). ‘Community-based’ describes the involvement of communities in academic research where the research is done in the context or set of circumstances of the participating community. The inquiry focuses on specific issue or problem relevant to the community (Stringer, 1999). ‘Participatory’ research involves communities as full partners to work in collaboration in all phases of the research process. ‘Action’ refers for the research itself becoming a tool for positive transformation and empowerment.

The integrated academic research approach used by Connecting Our Roots was contextual to Boston Bar First Nation’s unique research environment and focused on their research needs. As part of a participatory approach Boston Bar First Nation were recognized as a full research partner and engaged BBFN community members of diverse ages as active participants throughout the entire research process. This integrated approach utilized quantitative and qualitative research methodologies and methods from across disciplines. In this way, the strengths of multiple perspectives could be coordinated to pursue research questions relevant to Boston Bar First Nation for produce meaningful outcomes. This allowed for a collaborative BBFN-UBC “systematic inquiry and investigation”, underlined as a primary purpose of CPAR (Stringer, 2007 p.6), where the research itself became a tool for positive transformation and empowerment, while fulfilling academic standards.

## **2. Indigenous Research Principles and Ethics**

An Indigenous framework is one in which the direction of research objectives, methods and distribution and/or publication of outcomes follows local custom, and as much as possible includes local researchers (Battiste & Henderson, 2000; Kirkness & Barnhardt, 1991; Macaulay et al., 1997; Mihesuah, 1998; Ratima, 2008; Rojas, Richer, & Wagner, 2005; G. H. Smith, 2000a; L. T. Smith, 1999). Through the community-based participatory approach of Connecting Our Roots, a community-directed process was established whereby the objectives, methods and results/actions were co-directed by the BBFN Band Council and research participants. The

BBFN Chief and Band Manager were also included as part of the academic research committee, while the Band Council directly administered the community-based research and resulting actions. In addition, the development of a BBFN-UBC Code of Research Ethics provided local protocol and guidance, and complemented the UBC Behavioural Ethics Research Board (BREB) and CIHR Guidelines (CIHR, 1998; CIHR, 2005).

#### **a) 4 R Guiding Indigenous Principles**

Guiding the research process of Connecting Our Roots were the 4 R principles of **respect, relevance, reciprocity, and responsibility**. These principles were originally conceptualized by Indigenous scholars Verna J. Kirkness and Ray Barnhardt (1991), and have been advocated by the BC Aboriginal Capacity and Developmental Research Environments (BC ACADRE) as guiding principles for Indigenous research. As found on their website, BC ACADRE described the 4 R principles as:

1. **Respect** is demonstrated toward Aboriginal Peoples' cultures and communities by valuing their diverse knowledge of health matters and toward health science knowledge that contributes to Aboriginal community health and wellness.
2. **Relevance** to culture and community is critical for the success of Aboriginal health training and research.
3. **Reciprocity** is accomplished through a two-way process of learning and research exchange. Both community and university benefit from effective training and research relationships.
4. **Responsibility** is empowerment and is fostered through active and rigorous engagement and participation

#### **b) Indigenous – Academic Research Ethics**

Fundamental to developing a culturally appropriate research environment was the establishment of research ethics protocols. For this purpose, UBC procedure was followed by applying and receiving approval from UBC's Behaviour Research Ethics Board (BREB) for a community-based action research study with BBFN (See Appendix II: BREB Certificate of Approval). Going beyond standard institutional procedures, a 'sui generis' or unique Boston Bar First Nation and UBC Institute for Aboriginal Health **Code of Research Ethics** (BBFN – UBC

IAH CRE) was established (Appendix III). Principally, the CRE recognized BBFN and UBC IAH as full collaborating research partners and was signed in October 2004.

An important aspect in the development of the Connecting Our Roots research ethics was the engagement of Boston Bar First Nation in the draft and approval process for the BREB application and the Code of Research Ethics. I drafted the Code of Research Ethics while living on the BBFN reserve, allowing me to work directly with the BBFN Band Manager while receiving mentorship from UBC IAH through email correspondence. Both ethics documents were discussed with the BBFN Council and received approval before being submitted to either the UBC IAH or BREB.

The BBFN – UBC IAH CRE was necessary to establish a set of mutually agreed principles and protocols to guide the research process. Code of research ethics of this type emphasize and confer the right to self-determination, collective and traditional protocols, as well as ownership and control of community-based research information (Schnarch, 2004). This agreement aimed to foster clear understanding between research partners ensuring the research to be culturally appropriate, academically sound, and respectful of the concerns and needs of each research partner. To provide clear understanding the CRE defined overall guiding principles and research protocol outlining the expectations and obligations of research partners and their researchers in all phases of research from research design to communication of results. Protecting Indigenous knowledge and intellectual property rights was also an important aspect of the CRE.

The BBFN-UBC CRE was primarily modeled after the Kahnawake Schools Diabetes Prevention Project Code of Research Ethics (Kateri Memorial Hospital Center (KMHC), 1997), for which permission was given to UBC IAH by the Kateri Memorial Hospital Center (KMHC). The Mi'kmaq Research Principles and Protocols (Mi'kmaw Ethics Watch) was also an important guiding document. Both of these had been well established by the time the BBFN-UBC CRE was developed. Key to these documents was the recognition of the Indigenous community as full

research partners engaged in all parts of research and the need for research to benefit the community contributing to capacity building and overall health and wellbeing.

### **C. Research Storytelling**

In the conception of thesis, my role as the researcher was especially that of a storyteller – capturing in writing the participatory research process, outcomes and reflection. In the process and write up of this thesis I struggled as a community-based academic researcher in presenting the findings of this research. There was a tension between conventional academic “formalistic” writing and sharing the “lived experience” of the research (Stringer, 1999, p. 179). To ameliorate tensions Stringer offers the suggestion for researchers presenting interpretive research to “experiment with genre, voice, and narrative style” to “reveal the meaning of events given by interacting individuals, focusing on experience that is deeply embedded in and derived from local cultural contexts” (Stringer, 2007). I followed this advice when preparing this thesis to honour the participatory process of all those involved.

To serve a diverse audience, special considerations were made to make the information presented relevant and accessible, particularly for the primary participants of the community-based research, the Boston Bar First Nation community. For this purpose, a more personal narrative mode, viewpoint and presentation style are used, particularly in reporting on community-based research in Chapter II and Research Discussion and Reflection in Chapter IV. Chapter III reporting the research methods and results of the Tseweta research follow more conventional objective academic writing style. As well, I have chosen to bring forth my personal experience through sharing reflections noted throughout the research in five journal volumes that I kept from the beginning of the community-based research journey in 2003 until the end of 2006. With these I wish to share with the readers captured moments and reflections as they emerged in the research process and relate to the writing.



## **D. Overview of Thesis Structure**

Following this introductory chapter are Chapters II and III, which report the methodology and results of the community-based and the laboratory research on traditional plants. Chapter IV provides an overview and discussion of the research as a whole. Specifically, Chapter II describes the results of the two objectives focused on documenting and revitalizing traditional plant knowledge as part of the community-based research. Chapter III is focused on the objective to analyze the nutritional and therapeutic aspects of select traditional food plants, specifically the chemistry, biological activity, and nutrition of Tseweta (*Lomatium nudicaule*). Chapter VI brings together the research outcomes and discusses the research process, traditional plant research, education initiatives and research challenges. All together, Connecting Our Roots created multiple research outcomes using an integrated Indigenous academic collaborative research approach centred on traditional plant research.

## **Chapter II. Community-based Action Research**

### **A. Introduction**

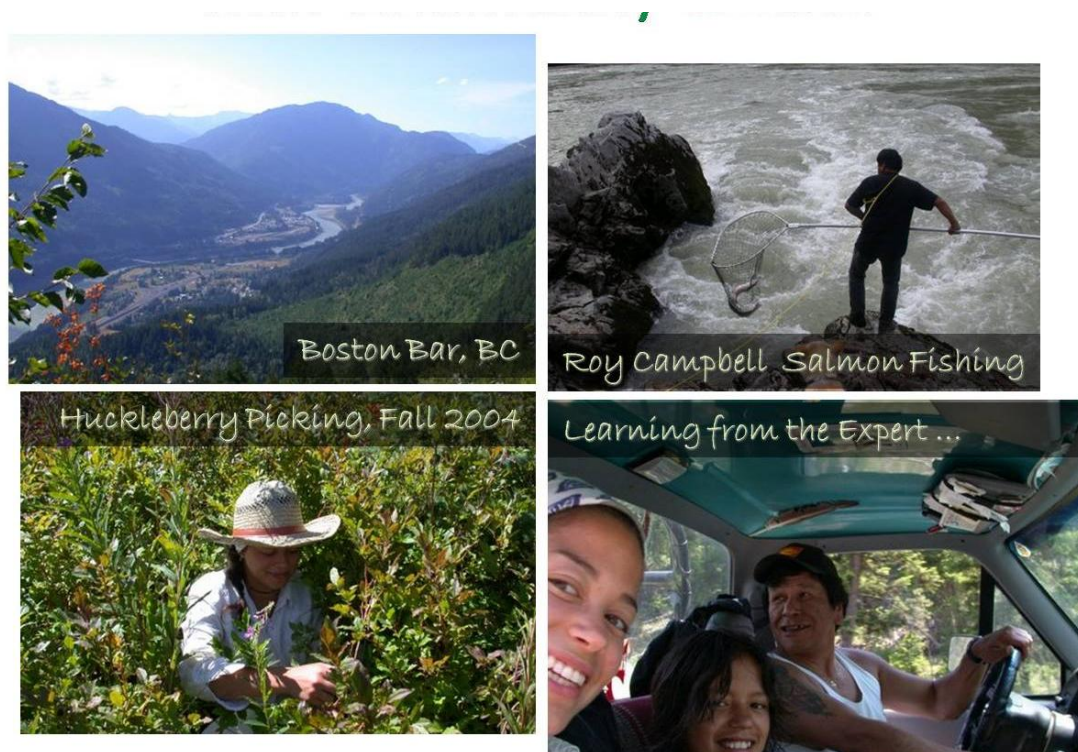
The community-based participatory action research process and outcomes are described in this chapter. These are captured in two main sections: the first focuses on the traditional plant research, and the second on the education component of COR. These were especially guided by two of the four initial research objectives which were to research and document BBFN ethnobotanical uses of local plant resources, and support traditional plant use revitalization efforts through being actively engaged in increasing the community's education and research capacity (See Chapter I: Research Objectives). An integrated indigenous-academic research approach guided the community-based participatory research process and report presentation.

#### **1. Community-based Research Process: 2003 - 2006**

This chapter describes the research process taken as a UBC researcher working in a community-based setting in collaboration with Boston Bar First Nation. The process began in 2003 when I was first introduced to the BBFN Band Council by my co-supervisors Dr. Eduardo Jovel and Dr. Shannon Cowan. Following the introduction Boston Bar First Nation invited me to stay on the reserve and provided me with a place that became my 'home' over the next three years. The initial year of 2003 was a time for making contacts, develop new relationships, and for BBFN to share with me their research vision and needs. My challenge was to fit into BBFN's research vision and find my 'participatory' role. People on the BBFN reserve also commonly got to know me and refer to me as Zarah, instead of Sarah, which is seen in community publications and feedback. Over the winter months of 2003 into 2004 I worked with mentors at UBC gathering insights, skills, and tools for developing a 'participatory action research' (PAR) approach grounded in an Indigenous research context.

The research process itself was co-created through the involvement of participants and stakeholders, and it was based on the interactions and influences of those involved. I lived on the BBFN reserve every summer from May to September, 2004 until 2006. Living in the community-based setting of BBFN was essential for building relationships with the people, plants and land (Figure II-1), including participating in traditional activities such as plant gathering and fishing and becoming knowledgeable of the area. In reflection, each additional year provided the time and experience that resulted in the continuous development and improvement of relationships, communication, participation and inclusion – key elements of participatory research. The participatory research process facilitated a continuous flow and exchange of knowledge between participants bringing new understanding and providing the basis of synergistic actions. Since I lived on the reserve for several months there were ample opportunities for interactions and for the participatory process to unfold and flourish.

**Figure II-1 Building Connections to Community and Land**



## **2. Key Community Research Participants**

The community-based research was a direct result of community's involvement, in particular certain participants who were core mentors for this research initiative. The BBFN Band Administration was instrumental in directing, coordinating and supporting the community-based initiatives. Local mentors and Elders shared their time, stories and expertise and many of youth were active research participants. BBFN youth were community researchers and co-developed the education initiatives. Among the community key participants were: Chief Dolores O'Donaghey, Band Manager John Warren, Band Councilor Roy Campbell, community researcher Tamara Campbell, Elder Hilda Isaac, Elder Deanna Thiessen, and Band Councilor Christine Grafinger. The intention of sharing the specific role of key community research participants is to highlight their contributions to the research process and outcomes.

### **a) Band Administration**

The BBFN Band Administration, including the Chief and Council, was instrumental in directing, coordinating and supporting the community-based initiatives. Chief Dolores O'Donaghey participated on the academic committee, and oversaw the research activities on and off reserve from the beginning of the research process until completion. The late, John Warren who was the BBFN Band Manager, was especially instrumental in supporting this research project. He believed in the significance of this research, and secured the funding from the Fraser Health Authority for the BBFN Band to independently investigate the research. John worked tirelessly and compassionately for the Band, and he really took care of my needs as a visiting researcher. In many ways John's diligence as a Band Manager made my work on the reserve possible by providing the ongoing necessary support.

**b) Roy Campbell – On the Land Traditional Food Systems Expert and Mentor**

Since the inception of this collaborative research initiative, multiple-term BBFN Band Councilor Roy Campbell was essential for local the traditional plant research, as well as supporting other initiatives on revitalizing local indigenous knowledge. Roy was my principal mentor on BBFN traditional food system knowledge. Roy Campbell takes great pride in traditional knowledge and continues to apply his traditional teachings in a contemporary setting. Throughout the seasons Roy fished, hunted and gathered traditional foods with in-depth knowledge of the land and resources (See Figure II-2). His passion for traditional ways and commitment to his community contribute to him being a well respected leader in the BBFN community.

**Figure II-2 Roy Campbell: BBFN Traditional Food Systems Expert**

## Roy Campbell





**c) Tamara Lee Campbell – Community Researcher, Cultural Advisor**

From the beginning of the research in 2003, Tamara Lee Campbell was a key participant in Connecting Our Roots. Tamara was 14 when we first connected and she became my cultural consultant and community anchor, which supported me in building cultural competency and integrating with the Boston Bar First Nation community. Tamara also actively participated in local traditional plant research, collaborated on local food security initiatives and networked major support for the sustainability for this research's activities over the years (See Figure Figure II-3). Whether it was for traditional plant research, working in the greenhouse, or developing and facilitating education initiatives Tamara was dependable for her dedication and pro-action. Today, Tamara continues her studies at the college level.

**Figure II-3 Tamara Campbell Key Research Support**

## Tamara Campbell: Research Assistant, Cultural Advisor, Support and Dear Friend



**2004 Summer: Tamara Campbell and I spent days exploring traditional harvesting areas of the Boston Bar First Nation, documenting and collecting local plants for the BBFN community herbarium, and visiting with Elders and mentors knowledgeable on traditional knowledge.**

**d) Grandma Hilda: Nlaka’pamux Cultural Expert, Community Elder**

Hilda’s full name was Isabel Hilda Oats Isaac, although she preferred to be called Hilda, or Grandma Hilda to those close to her. Born in 1930 to Angelina Oats and Isaac Oats, Hilda grew up near Lytton, across the Thomson River in a place she called xquepiamt? (Interview Transcript, 2004, 28:35). Hilda passed on in October 3rd, 2005, loved by her extensive family and community (Figure II-4).

**Figure II-4 Hilda Isaac (centre), her sister Margo, grand-daughter Tamara, and UBC researcher Sarah Martz (May 2004)**



Hilda was regarded as a cultural expert, particularly a language expert by her community. She taught the Nlaka’pamux language and shared her knowledge in ceremony at public functions. Hilda valued traditional ways of life and knowledge which she had gained through her Elders and her own rich life experiences. For Connecting Our Roots Hilda shared her wisdom and in-depth knowledge. She saw the strength in traditional cultural practices and was passionate to maintain cultural continuity. It was an honour for me to get to know Hilda, and learn from her.

*Sarah: "What are some things you would like to see your grandchildren carry on? You know in terms of tradition." Hilda: "Well, one thing is the language which is not very strong right now. It's fading and fading and we're losing the language. There's not too many that can speak it now a day. And it's such a shame." (Interview transcript, 2004, 37:30 min)*

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**e) Deanna Thiessen: Community Elder, Food Plant Expertise, Education Support**

Deanna Thiessen, was a respected Elder in the BBFN community, with expertise in traditional food systems and major supporter of COR's community education initiatives. Deanna was an expert in transforming traditional foods into delicious dishes, or preserves for future use. Initially, I would go to Deanna's house to learn from her about how she processed traditional foods in her kitchen, which was the beginning of a wonderful relationship. Deanna and I spent much time gathering and discussing traditional foods. She was enthusiastic about traditional foods and revitalizing traditional food system knowledge. She was also a great supporter and mentor to BBFN youth education initiatives, which her own three grandchildren Aaron, Dillon and Chrissi-Ann were participants in. Deanna passed on in September of 2007, and her memory lives on.

**Figure II-5 Elder Deanna Thiessen huckleberry gathering with grandson (2005)**





**f) Christine Grafinger: BBFN Councilor, Education Support**

BBFN Band Councilor Christine Grafinger has been a strong advocate for education initiatives supporting the Band's youth. Christine works through the Boston Bar school system to provide special programming for First Nation youth. She was also major supporter of Connecting Our Roots's education initiatives. I could always depend on Christine to advocate for BBFN youth's education initiatives and gaining support from the BBFN Band Council. When we needed anything, such as help organizing an event, providing food, or special learning activities or workshops for COR's youth component Christine supported whole-heartedly. In the picture below (Figure II-6) she invited the BBFN youth researchers to her home for a very successful jam-making workshop. Christine is much respected amongst the youth, because of her passion for supporting them in reaching their educational goals.



**Figure II-6 Christine Grafinger with BBFN Youth Community Researchers (2006)**

## **B. Traditional Plant Research and Food Security Initiatives**

### **1. Introduction**

Tradition lies at the heart of local indigenous plant knowledge and usage. The terms traditional and local indigenous knowledge are both used to describe historical continuity within a certain cultural context that is grounded in language, traditions, practices and philosophical worldview. For example, Turner, Ignace and Ignace (2000) described 'traditional ecological knowledge and wisdom' (TEKW) as "derived from generations of experimentation and observation, leading to an understanding of complex ecological and physical principles." Indigenous knowledge in this view is developed through a "close and long-standing environmental relationship" that views the world as whole with all parts being "inextricably linked and interrelated" (2000).

Traditional plant knowledge and usage (TPKU) is based within a web of interconnections. This includes the ecological role of plants, and their connections with humans who value them for food, medicine, technological and spiritual purposes. It is also incorporated into traditional food systems. Traditional food systems (TFS) include all foods within a culture that are "from local natural resources and culturally accepted", and are interwoven in a cultural process that provides the framework for use, including harvesting and processing techniques, food composition, and nutritional consequences of using the food (H. V. Kuhnlein & Receveur, 1996). Traditional food system are linked to ancestral territory, resources and resource management (H. Kuhnlein et al., 2006; Turner, 2005; Turner, 2007).

Before contact, traditional food systems supported the good health documented for Aboriginal peoples (Health Council of Canada, 2005; H. V. Kuhnlein & Receveur, 1996). In the Nlaka'pamux territory fishing, hunting and gathering of plant foods were part of year-round activities and part of a complex traditional food system (Turner, Thompson, Thompson, & York, 1990). Their traditional food gathering and hunting grounds existed within a diverse ecosystem situated in an ecological transitional zone between coastal and interior forests.

While fishing was the dominant economic activity, plant gathering and hunting also contributed significantly to traditional diets (Turner et al., 1990). The ecologically diverse plateau and mountainous region of south central British Columbia supported a great diversity of plant foods that were recognized by the Interior Salish Nlaka’pamux (Thompson) people “who used no less than 120 plant species as sources of foods, flavouring or beverages” (Turner et al., 1990).

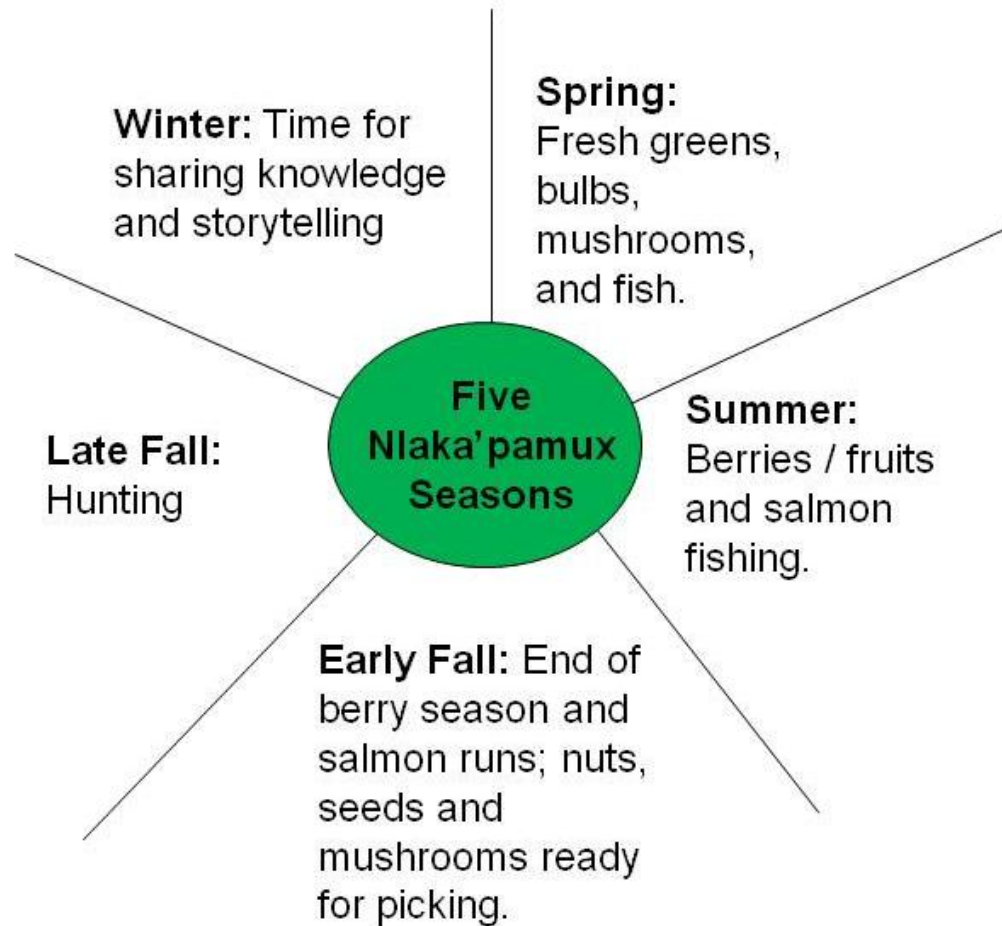
## **2. Traditional Food Gathering Activities**

Traditional food gathering activities with Boston Bar First Nation followed the season. Figure 3-8 shows the 5 Nlaka’pamux seasons of spring, summer, early fall, late fall and winter as they relate to traditional food activities. From the fall of 2003 until 2006 I participated in traditional food gathering activities throughout the seasons, with Roy Campbell as my principal guide. This meant collecting and/or learning about vegetables in the spring time and early summer, berries in the summer to fall, and mushrooms in the fall. Other major food activities that Roy cherished and practised were fishing throughout the summer and hunting in the fall to early winter. Traditional food activity areas in the vicinity of the Boston Bar First Nation reserve included Scuzzy and Nahatlatch, as well going up the Fraser Canyon to Botanie Valley near Lytton. On or near the BBFN reserves a variety of food plants were gathered throughout the see Table II-1.

*It [gathering traditional foods] is very time consuming ... I will need time for this project (i.e. following the seasons). But I think I can build every season on lessons learned from the previous ones’. (Research Diary, July 5th, 2004)*

# “Following the Seasons”

Traditional Nlaka'pamux Activities



## a) Following the Seasons

In spring and early summer was the time of collecting fresh green shoots as spring vegetables. On the North Bend reserve Roy took us to the creek by the pre-school to collect the tips of stinging nettle (*Urtica dioica* L.). He handed the group of gatherers scissors and bags and instructed us how to gather the green tops and minimize getting stung. The nettle greens would be blanched and eaten as a vegetable. Roy would also tell us how they used to pick the young shoots, what Roy called 'briars' of the 'salmonberry' plant, commonly known as thimbleberry (*Rubus parviflorum* Nutt.). 'Salmonberry' is also the common name for *Rubus spectabilis* Pursh, which is more common in coastal areas of BC.

Elder Hugh Florence Sr. shared that fiddleheads were collected in spring, as well as a variety of mushrooms, such as morels, shaggy mane, chanterelle, and king boletus. He also spoke of bitterroot, which Elder Hilda Isaac said she used to collect to make pudding she called 'n-kauch' (2004). As well, Tamara Campbell and I were told of 'tetuwens', or western springbeauty (*Claytonia lanceolata* Pursh), by Hilda and other community members who also called them 'tu-tus'. Herman Phillip said that he used to collect the root vegetables, such as tetuwens and the bulbs of yellow glacier lily (*Erythronium grandiflorum* Pursh.), around a lake above North Bend.

Growing in moist places is 'Heko', or Cow's parsnip (*Heracleum lanatum* Michx.) (See Figure II-8 and Figure II-9). The tender stem of this plant is consumed before the plant forms flowers. Once Heko forms flowers it produces compounds that can produce light-sensitivity and blistering of the skin (Berenbaum, 2001). For this reason Roy used gloves to work with the plant in general. To eat the young and tender stems, they are cut and the rough, fibrous outer layer peeled off.



**Figure II-8 Tamara Campbell picking `Heko` (2003)**

Travelling to further away areas, such as Botanie Valley near Lytton, B.C., this was also the time to collect what is locally known as Tseweta (*Lomatium nudicaule* (Pursh) Coult. & Rose). Tseweta grows in abundance as a fragrant plant on dry hillsides that Roy called Medicine Mountain in the Botanie Valley. The leaves are picked in the early summer, and continue to be an important traditional food plant still highly valued as a vegetable. Nlaka'pamux from different places come to Botanie Valley to collect Tseweta and other important traditional food plants there (Turner et al., 1990). Chapter 3 provides a case study of Tseweta on this plant's nutritional and therapeutic properties.

**Figure II-9 BBFN Traditional Food Plants**



**Tsal Tsala**  
Black Huckleberry  
*V. membranaceum*



**sq'woq'wy'ép**  
Wild Strawberry  
*Fragaria* spp.



**Heko - hek'wú**  
Cow's Parsnip  
*H. lanatum*



**Cteweta - cewete**  
Indian Celery  
*L. nudicaule*

**In the summer**, large quantities of berries were collected. For example, Saskatoon (*Amelanchier alnifolia* (Nutt.) Nutt) shrubs were loaded with berries, and grew all throughout BBFN reserve lands. Collecting saskatoons with BBFN youth was an enjoyable and memorable activity. The youth called saskatoons 'chuck-ums'. When I asked about the name they started 'chucking' saskatoons at me and we all laughed. I understood then what it meant to "chuk-um" to them. The linguistic notation provided for chukums is "s/cáqw-m" (Turner et al., 1990) Tamara, Tonya and I, and sometimes other youth, would pick buckets of them. Later we often brought gathered saskatoons to an Elder. Frequently, we also enjoyed indulging in the fruits straight from the bush.

Early to mid summer was also a time to collect wild strawberries, *Fragaria vesca* L.. The berries were so small, yet their taste was fresh and very sweet. They grew mostly along roadsides in partially shaded areas. In midsummer we were always on the look-out for native raspberries – red and black ones. The black raspberry, (*Rubus leucodermis* Dougl. ex T. & G.), was commonly called black-cap and in Nlaka`pamuxcin `mitchuck`. The red raspberry (*Rubus idaeus* (Michx.) Focke L.) was just referred to as a raspberry. Both grew in disturbed sites all over the territory, and were easy to find because of their growth habitats near roads. We often collected a



couple of small buckets full at a time to distribute to Elders. Tonya lead me to wild asparagus (*Asparagus officinalis* L.), a springtime delicacy, which grew on the North Bend reserve (See Figure II-10). Later, in a conversation with Grandma Hilda, she noted that wild asparagus was not eaten traditionally, though it is often enjoyed by today's community members.

**Figure II-10 Tony Campbell and BBFN Summer Food Plant Collections**



Collecting wild food plants on the BBFN reserve: Tonya Campbell collecting saskatoons, wild growing asparagus, and hazelnuts. (July 2004)

**From late summer** into fall, local hazelnut (*Corylus cornuta* Marsh) shrubs were loaded, as well as elderberry (*Sambucus sp*). Elder Deanna Thiessen shared how she liked to collect blue elderberries for making jam and jellies (personal communication, August 2006). This was also the time to collect soapberries (*Shepherdia canadensis* (L.) Nutt.) and mountain huckleberries (latin, *nlakapamux* name), which were part of the community traditional food activities.

**In the fall time** the Nahatlatch Valley and other areas around North Bend are famous for their mushroom habitats, particularly the pine mushroom (*Tricholoma magnivelare* (Peck) Redhead)



(personal communication, Paul Kruger 2004). The pine mushroom, is also known as American Matsutake, is held in high esteem in Japan and other Asian countries that will pay high prices for it (De Geus & Berch, 1997; Pollon, 2006). Pine mushrooms are recognized as a very valuable non-timber commercial forest product contributing to the B.C. economy which has annual revenues of US \$25-40 million in the wild mushroom industry (Kranabetter, Trowbridge, Macadam, McLennan, & Friesen, 2002). For the BBFN community this can be an important source of annual income depending on the season and market fluctuations.

## (1) BBFN Traditional Food Plants: Summarized Table

**Table II-1 Boston Bar First Nation: Traditional Food Plants - Community Notes**

Name  Common / Nlaka’pamux / Latin	Community Mentors: notes
<b>Nlaka’pamux names:</b> <sup>1</sup> (Turner et al., 1990), <sup>2</sup> (First Peoples’ Cultural Foundation., 2008)	<b>Community Mentors:</b> Roy Campbell (RC), Tamara Lee Campbell (TC), Isabel Hilda Isaac (HI), Deanna Thiessen (DT), Julie Grafinger (JG), Herman Philip (HP), Hugh Sr. Florence (HF), and Simon Peters (SP) Personal Observation: Sarah Martz (SM)

## Spring

Name	Community Mentors: notes
<b>Stinging Nettle</b> s-w Ɂl’wl’ íqt <sup>1</sup>	Young shoots harvested, blanched and eaten. (RC, HI, HF) <sup>2</sup>
<i>Urtica dioica</i>	Collected in spring time near North Bend. (RC) “good with fish and rice – green and rough” (HI, 2004)

## Spring (continued)

Name	Community Mentors: notes
<b>Thimbleberry</b> s/ ɪ ʊk-m' - ɛ ɪ p <sup>1</sup> <i>Rubus parviflorus</i>	The young shoots eaten as spring vegetable. Called 'bryers' by RC (2004). Grows abundantly near BBFN reserves and throughout the area.
<b>Cow's parsnip</b> 'heko' (RC) hekʷú? <sup>1</sup> <i>Heracleum lanatum</i>	Stem peeled and eaten before flowers develop (SP). Harvested on road leading to Botanie Valley (RC, SP)
<b>Fiddleheads</b>	HF (2004)
<b>Indian potato</b> 'tetuwens' (RC, HI, HP) tetúwn' <sup>1</sup> <i>Claytonia lanceolata</i>	Recalled harvesting near North Bend Lake above North Bend reserve (HP, 2004) Collected in Botanie Valley (SP, HI)
<b>Bitterroot</b> / ɪk'w- ɛ p-n <i>Lewisia rediviva</i>	"make Indian pudding called "n-kauch"(HI, 2004)
<b>Indian Celery</b> 'tseweta' (RC) cewete? <sup>1</sup> <i>Lomatium nudicaule</i>	Young leaves collected for food (RC, HI, DT, JG, SP) Pull off the leaves that grow in clusters of 3. Don't pick ones seeds are forming. (SP); "Best eaten when very young and tender" (JG) Interest in revitalizing use within the community. Elders particularly fond of the taste. Remember their grandparents preparing it. (DT, JG)

## Summer

Name	Community Mentors: notes
<b>Wild Asparagus</b> <i>Asparagus officinale</i>	Stalks collected on and around North Bend reserve (TC) “Didn’t pick when younger. Not considered native food” (HI, 2004)
<b>Saskatoons</b> ‘cha-qum’ (TC) scaq <sup>w</sup> m <sup>1</sup> <i>Amelanchier alnifolia</i>	Berry harvested. Grows in abundance on North Bend and at Anderson Creek reserve; Collected with youth. (TC)
<b>Strawberry</b> s-q’ <sup>w</sup> o/q’ <sup>w</sup> y’=ep-= é t̥p <sup>1</sup> <i>Fragaria vesca</i>	Berry harvested. Grow abundantly near BBFN reserves. (RC)
<b>Blackcaps</b> ‘mitchuk’ (TC) /m ɛc ɛk <sup>w</sup> <sup>1</sup> <i>Rubus leucodermis</i>	Berry harvested. Dry areas of western Botanie Valley called 14 mile (RC, TC, HI); Collected with (RC, TLC, TC) and shared with Elder (HI)
<b>Red Raspberry</b> sʔeyɪcq <sup>w</sup> <sup>1</sup> <i>Rubus ideaus</i>	Berry harvested. Dry areas of western Botanie Valley (RC, TC, HI) and near North Bend (RC); Collected with (RC, TLC, TC) and shared with Elder (HI)

## Summer (continued)

Name	Community Mentors: notes
<b>Thimbleberry</b> s/ ʔək-m' = é ʔp <sup>1</sup> <i>Rubus parviflorus</i>	Berry harvested. Abundant in area, along roadsides. Called 'salmon berry' by RC Eaten fresh (RC)
<b>Gooseberries</b> <i>Ribes ssp.</i>	Berry harvested. Various locations. Example, western side of Botanie Valley (RC, DT); Made into jam (DT)
<b>Soapberry</b> 'hoo-sh-um' (DT) 'suish-um' (HI) sɣwúsm <sup>1</sup> <i>Shepherdia canadensis</i>	Berry harvested. Various locations. Example, western side of Botanie Valley (RC, DT); 'old airport' Chamoux Rd (RC); HP shared a story of his grandmother whipping up small bathtubs full for the children in the community. 'Indian icecream' served at community functions. Very much enjoyed by Elders (DT)
<b>Huckleberry</b> 'tsal tsala' (HI) c' ɛl/c' ɛle <sup>1</sup> <i>Vaccinium membranaceum</i>	Berry harvested in abundance in late summer / fall time. Mountain side above North Bend. (RC, DT); Huckleberries distributed to Elders in community (RC) When berries are ripe community members harvest for days. Interest in creating community camps for all generations, including Elders and youth. BBFN youth enjoyed huckleberry collections (SM)

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## Autumn łwéy'-s-t <sup>2</sup>

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Name	Community Mentors: notes
<b>Elderberry</b> /c'ikwukw (fruit) <sup>1</sup> <i>Sambucus cerulean</i>	Made juice, jelly, jam; picked in fall (HI, 2004)
<b>Hazelnuts</b> 'q'apúx <sup>w</sup> (nut) <sup>1</sup> <i>Corylus cornuta</i>	Nut harvested. (RC, TLC, TC) Abundant North Bend reserve, especially around houses.
<b>Yellow avalanche lily</b> s'k' ém'ec <sup>1</sup> <i>Erythronium grandiflorum</i>	Recalled collections near Boston Bar Lake above North Bend reserve (HP) Harvested in Botanie Valley (SP)
<b>Pine Mushroom</b> qám'és <sup>2</sup> <i>Tricholoma magnivelare</i>	Cap and stalk harvested. Collected around North Bend. (RC) Fungi important economic species in the area (RC) Pine mushroom 'buttons' are carefully removed from the soil, taking care not to disturb the area. Best pine mushroom growing areas are known and cherished by community members (RC) The knowledge of these areas past down generationally (RC)

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**b) Soapberry Gathering**



**Figure II-11 `Hooshum` (*Shepherdia canadensis*)**

The plant called hooshum by Deanna or squish-um by Hilda, and noted as *sx<sup>w</sup>úsm* by Turner et al. 1990, is a popular berry picked by BBFN community members. It is commonly known as soapberry (*Shepherdia canadensis*) due to its ability to be whipped up into a thick foam commonly referred to as 'indian icecream' (See Figure II-11). Hooshum bushes are found in dry areas of the Fraser Canyon. To collect hooshum BBFN community members go in particular to 14 mile road leading to Botanie Valley in late summer every year, especially those guided there by Roy Campbell. This was usually an intergenerational endeavour, as in the pictures above showing Elder Deanna with her grandchildren Aaron and Chrissi-Ann (See Figure II-12).

## Hooshum Picking (July 2005)



(L) Elder Deanna Thiessen. (R) Deanna's grandchildren: Aaron and Chrissi-Ann. And Sarah Martz.

### Figure II-12 Intergenerational Traditional Food Gathering

After the berries were picked, Deanna, for example, would use a cheese-cloth to press the berries and collect the juice. The juice could then be canned for storage, or used directly to whip up. I have a fond memory of sitting at Deanna's kitchen table enjoying a bowl of whipped up hooshum. I like 'hooshum' though I can only enjoy a small bowl due to its unique and bitter taste. Deanna would enjoy at least two or more bowls reminiscing how her Elders would prepare hooshum and serve to the community.



Elder, Herman Phillips also shared a hooshum related story with me while we were 'chinwagging' (talking) in front of his house (2004) (See Figure II-13). Herman told of his grandmother preparing Indian ice cream. He explained how she put berries into a tub the size of Herman's arm reach. Then, she would use a whisk made of branches to whip up the hooshum berries and juice into a thick foam enjoyed by all those around, especially children.



**Figure II-13 BBFN Elder Herman Phillip (2005)**



### c) Huckleberry Gathering

The huckleberries grew up in the high altitude areas near the North Bend reserve. Mountain huckleberries (*Vaccinium membranaceum*) are shiny dark berries with a red sheen (See Figure II-14). Their leaves are pointed and most often already turning into bright red fall colours when the berries are ready to pick. I often saw round-leaved blueberry (*Vaccinium ovalifolium*) growing among the huckleberry and observed what looked like hybrids between the two.

**Figure II-14 `Tsal tsala` Black Mountain Huckleberry**



Gathering huckleberries was usually a whole day experience beginning early in the morning before the sun got too hot, and ending in the late afternoon before dinner. Typically, this was an intergenerational activity led by Councilor Roy Campbell, with Elders to youngsters joining in the experience and feast (See Figure II-15). People from other Bands would also come to the areas around North Bend to collect huckleberries. The huckleberry areas were bountiful. In clearings high up in the mountain areas, the huckleberry bushes grew among the bright pink flowers of fireweed, and provided a great vista of the Fraser Canyon.

*It takes about 4 to 5 hours to pick about 10 lbs or 5-8 kg of huckleberries. The process requires diligence, but is amazing opportunity to let your mind flow. (Research Journal, August 8th, 2004)*

**Figure II-15 Roy Campbell collecting Tsal tsala (2004)**



In an informal conversation with Elder Marie Phillips, she shared with me how she remembered her Elders going huckleberry picking when she was young. They would take large baskets to huckleberry picking areas on horseback, and camp in huckleberry areas for the entire time the berries were ripe. The men would make trips back and forth, between the gathering areas and home, transporting the gathered huckleberries.

#### **d) Distributing Traditional Foods**

Roy and his daughters introduced me to the custom of picking traditional foods mostly to distribute them in the community, particularly to Elders. Typically, this was a special exchange. Elders gladly received traditional plant foods such as stinging nettle, tseweta, blackcaps, raspberries, hooshum, and huckleberries. Other traditional foods included pine mushrooms, fish and hunted game. This was really appreciated and often returned with favours like huckleberry pie or jam, strings of dried pine mushroom, stories, or simply a smile in thanks.

***When I brought huckleberries to Elder Mary James she was very pleased – a huge smile as a reward. (Research Journal, August 11<sup>th</sup>, 2004)***

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### **3. Interviews with Elders**

In Nlaka'pamux culture there is a lot of respect for Elders in the community. At community feasts, Elders are typically served first, and the children and grandchildren of Elders look after their needs. It was a great honour to share time with Nlaka'pamux Elders and listen to their stories. During this research process, there were several Elders who shared their stories on traditional plant knowledge and beyond. This was usually in an informal setting with stories emerging in casual conversations, such as with Deanna Thiessen, Hilda Isaac, and Herman and Marie Phillips. On two occasions more structured interviews were held, one with Hilda Isaac and the other with Jimmy Jones.

#### **a) Interview with "Grandma Hilda"**

On July 25th, 2004 Elder Hilda Isaac participated in a formal interview (See Figure II-16 Interview with Hilda Isaac (26 July 2004)). In the interview Hilda shared stories about her family, Nlaka'pamux words and meanings, experiences of residential school, and her traditional food system knowledge. This interview was almost one hour long and recorded using a Sony minidisk recorder and professional bi-directional microphone. The interview method was semi-structured with the intended focus on traditional food system knowledge. As such, the interview was generally open ended and directed through the natural conversation that arose. Hilda agreed for this interview to be part of the formal process of this research, and signed a consent form found in Hilda Isaac Interview Consent Form. Excerpts from the interview transcript are found below. Hilda's family will be the guardians of the recording and transcript.



**Figure II-16 Interview with Hilda Isaac (26 July 2004)**

Before this interview, Hilda and I had already established a very close friendship. In 2004, Hilda was moved to an Elderly care facility near Lytton from her long-term home in Boothroyd. Hilda's grandchildren, especially Tamara and Tonya, and I would go there to visit with her often. And every time we went to collect or survey traditional plants in Botanie Valley, we would stop to visit with Hilda, and to bring her traditional food that she loved so much. The formal interview was very special for me; Hilda shared so passionately about her background and connection to her Nlaka'pamux culture. Tamara was present for almost all the visits I had with Hilda, and always eager to see her grandmother.

Regarding traditional plants, Hilda shared that she learned once she married and needed to provide for her family. She took her children to gather berries as soon as they were able. She would gather at a place she called xquepiamt or schquepee'emt meaning "covered in flowers", across from Lytton and the Thompson River where her parents had their house as well. While she was growing up her family "lived off the land". Hilda described how her family "had orchards, and all kinds of fruit and vegetables," as well as "horses, cows, chickens, and pigs" (Hilda Isaac, Interview transcript, 2004).

During the depression, she did not sense an economic difference, as her family was wealthy because they lived off the land that they had stewarded for generations. Her mother dried almost all their crop, such as cherries, plums, apricots, apples, and even green beans “by the sack full,” which was then stored in the cellar (Hilda Isaac, Interview transcript, 2004). Traditional spring vegetable foods that she mentioned were stinging nettle, lambsquarter, and Tseweta – “all those kind of greens”. Berries that they picked, such as saskatoons, black berries, and elderberries, were dried. As Hilda explained about using picked elderberries: “If you dry them, you can always boil them and make juice or jam, whenever you get lots of sugar. But usually we didn’t do too much of that, because it took too much sugar. And we didn’t have that much sugar, but lots of fruit. We had lots of fruit” (Hilda Isaac, Interview transcript, 2004). Later in the season, Hilda shared that they picked wild hazelnuts and mushrooms. Hilda also described traditional land management practices, such as burning.

Hilda shared her experience of being forced to attend the St. George’s residential school for 10 years, only going home for 2 months of each year. “They went around from house to house. They got your birthdate, and the minute you turned six you were asked to go to the school” (Hilda Isaac, Interview transcript, 15:45). Her school was only three miles from her parent’s home, yet she was not allowed to go home for visits. Her parents could only visit her by permission and did that two to three times per year. She attributed residential school to breaking cultural continuance. Hilda: “So we never got to do Indian crafts or read Indian stories. Things like that. So gradually when we went home we were doing less and less Indian crafts and culture and all that. You know we were losing it. In ten years it was gone. I wasn’t even speaking Indian anymore. I was speaking English to my parents” (Hilda Isaac, Interview transcript, 2004).

## **b) Interview with Elders Jimmy Jones**

Another interview happened through the motivation of two young women Sara Andrews and Roxanne Jones. I had an open door policy for BBFN youth and they knew that I was interested in initiatives on traditional knowledge. Sara (17) and Roxanne (21) approached me late summer in 2005. They were “interested in interviewing their Elders, talking and learning from them; They want to know their culture, their language, etc...” (Research Diary, September 05, 2005). I had given them some guidance on potential questions to ask, and a day later Sara and Roxanne were on my doorstep with “amazing thought out questions” (Research Diary, September 05, 2005).

Roxanne had arranged for her ‘pép pép’ or grandfather Jimmy Jones to come to her great-aunt Mary James’ house. Elder Jimmy Jones was going to translate for Mary who primarily speaks Nlaka’pamux and was said to be very knowledgeable on traditional knowledge. At Mary’s house Jimmy had not come. Sarah and Roxanne tried to communicate with Mary, though the language barrier, English / Nlaka’pamux, was too challenging for both parties. Mary was also a bit reluctant to share freely, and Roxanne thought Mary would feel a lot more comfortable were her mother Sylvia or aunt Yvonne there. So Sara and Roxanne decided to head to Jimmy’s house.

Roxanne and Sara were much more comfortable around their grandfather. For the interview they sat in front of him on the ground while he sat content in his comfortable chair. Both had their notebooks open and asked their previously composed questions on traditional knowledge. Their questions included: What were your favorite traditional food and medicinal plants? Did you use plants for spiritual or other cultural uses? What food plants did you pick in spring? “Jimmy Jones would respond at his own pace. He did not respond to questions on food plants, though he did talk about medicinal plants explaining with hand gestures: “this purple plant it’s good for ...”. The descriptions of plants given in the interview were too vague to follow up on.

All of us, Sara, Roxanne and I learned quite a bit through the process. For one it was a wonderful experience for Sara and Roxanne to connect with their grandfather and realize the special knowledge he had. I realized how cultural barriers, such as language differences, can make the sharing of knowledge very challenging. It was an honour to be in Jimmy Jones' presence.

#### **4. Community Herbarium**

Contributing to researching and documenting traditional plant use, as well other local plant resources was the creation of a community herbarium (plant library). The Boston Bar First Nation community herbarium had several functions, including education, conservation, and political purposes. The final collection included over 100 plants collected during local plant surveys. Local BBFN youth were involved in collecting these plants and setting up the BBFN herbarium.

The herbarium functioned as an educational medium, providing an opportunity for capacity building for youth. Youth that participated in the herbarium initiative learned academic research skills, as well as provided a valuable service to their community. In particular, Tamara Campbell was involved in collecting over a 100 local plant specimens around Boston Bar. Areas represented in the herbarium were Anderson Creek, North and South Ainsley, Nahatlatch, Scuzzy Creek, North Bend and Botanie Valley. Tamara learned many field botany skills harvesting plant specimens for herbarium purposes including: harvesting whole plants with roots and preferably flowers or fruit present, noting important information, such as collection number, date of collection, location using GPS, as well as doing preliminary identification, storing plants for transport, and drying at final destination.

Youth community researchers from 2003 to 2006, as young as ten (See Figure II-17), participated in the BBFN community herbarium initiative, doing field research, adding information to the database and mounting plant specimens. The botanical surveying skills and the herbarium collection have the potential to be used to document traditional and currently

active collection sites. This information can be useful for the community to share information on collection sites, as well has the capacity to be used in protecting certain areas from uses that would impede or destruct traditional plant uses.

**Figure II-17 YCR Community Herbarium Development**



**Herbarium**

10 year old BBFN youth community researcher Chrissi-Ann Connor works on preparing specimens for the BBFN herbarium.

**5. Greenhouse and Garden Initiative**

In addition to traditional plant research I was engaged in exploring local food security with Boston Bar First Nation through cultivating plants on the reserve. This included a greenhouse initiative in 2004 and garden initiative in 2005. The greenhouse operation was the idea of the Band Administration and set-up and managed by BBFN youth Tamara Campbell and myself. Through hard work and diligence the greenhouse flourished producing fruits including tomatoes, peppers, cucumbers and beans. As well, garden patches outside of the greenhouse produced various types of squashes and vegetable greens such as chard and kale. In the following year of 2005 I brought seeds donated by West Coast Seeds to promote and support gardening. These were made available at the local BBFN gas bar, where community members



could take them for free and use them in their own gardening projects. Over the summer I would hear from community members how the planted seeds were coming along. Overall, the greenhouse and garden initiatives were successful with great potential to be improved and expanded contributing to local food security.

**Figure II-18 BBFN Greenhouse 2004 August**



**2004 Aug BBFN Greenhouse:**  
Lush growth including tomatoes, cucumbers, peppers, and beans. Outside beds with squash, chard, and kale.

## **C. Community-based Education Initiatives**

### **1. Introduction**

Alongside the active research on traditional food systems and local food security a natural phenomenon emerged, a growing relationship with the younger generations of BBFN. After my first summer of living on the reserve, in 2004, I had established a role as ‘youth coordinator’ and ‘learning support’ in the community. This occurred through youth being involved in the traditional plant research, as well as opening the doors of my home when youth asked for learning help and working as a tutor and learning facilitator in the community. The result was developing a youth-researcher relationship based on respect and trust. In turn, this fostered the possibility of creating a positive and culturally appropriate learning environment in which community-based transformative education initiatives flourished.

The following sections describe the development of a community-based education focus as a result of the participatory research process. Beginning in 2003 important initial community connections with the people, land and plants were made that facilitated the development of an educational role in 2004. In the following years of 2005 and 2006 youth education Summer Programs were created focusing on revitalizing traditional plant usage and knowledge. Most of the youth age 8 to 17 living on the BBFN reserve participated in developing and were engaged in the Summer Programs. In August of 2007, BBFN youth expanded their community-based learning experience when they came to UBC to discover and explore future educational opportunities. The educational experience and journey of “Connecting Our Roots” with Boston Bar First Nation provides an example of a community-directed, locally developed and culturally relevant education initiatives. Within a larger context these education initiatives contributed toward holistically addressing BBFN’s health concerns and furthering the community’s well-being.

## **2. 2004 Developing a Learning Environment and Relationship with BBFN Youth**

### **a) Establishing the Learning Lodge**

To support local research activities the Boston Bar First Nation offered a house for me to stay while working and living on reserve. Before I started staying on reserve this house was the V.I.P (Very Important Person) house and was a multi-use facility, including hosting guests and workers from out of town, as well as occasionally as a community meeting place. The upstairs has two bedrooms and bathrooms, as well as an open lay-out for a kitchen and living room. The downstairs is unfinished, though it has its own entrance, offers a large open space, a bathroom and storage spaces. Over the 4 years, including 3 whole summers, I lived on the BBFN reserve the V.I.P house was transformed into a “Learning Lodge” as it developed into a special learning space for BBFN youth. This process began in the spring of 2004.

### **b) After School Tutoring Program**

In May 2004 I moved to the North Bend section of the BBFN reserve to research and live throughout the plant growing season – spring to late summer. Since I made memorable connections with community members in the previous year, and particularly youth, I soon had many youth over to stop in for a visit. My open door policy and natural inclination to support youth in their education made my house a popular meeting place, especially for completing homework. The BBFN Band Council recognized me as a valuable education support and asked if I would accept a formal position to act as an after-school learning facilitator and tutor, which I did. They also welcomed the V.I.P house functioning as learning space.

Over the summer, BBFN youth and I worked on transforming the common spaces at the V.I.P house into learning spaces giving rise to the “Learning Lodge”. For the after-school tutoring program, long tables stored in the basement for social functions, were brought upstairs and set up in the living room. These provided large working spaces perfect for learning and completing homework. This learning environment was important for youth who did now have the learning space or support at home. For all the “Learning Lodge” provided an after-school place

to receive extra help, as well to complete homework in collaboration with peers. Youth naturally helped one another and I supported their efforts. One memorable night I and an older sibling of one student helped finish a school project late into the night. This was significant as this student had been struggling with school, and the “Learning Lodge” facilitated the opportunity, space and motivation to complete homework. The after-school tutoring program and the learning space that was developed set the foundation for future community learning endeavours that were hosted through the rest of the 2004 summer, and future years.

**c) BBFN – BCIT Forest Technology Initiative**

Another local initiative of 2004 was the BCIT Forest Technology Certificate (FTC) program offered by the BBFN Band. BCIT instructors came to the BBFN reserve to run the courses, and this gave youth from the BBFN and nearby First Nation communities the opportunity to gain training locally. My role as community education support expanded from tutor to also include being a teaching assistant for the BBFN-BCIT FTC course. Participating FTC youth were about 10 youth ages 16 to 25, which was my own age cohort at the time (See Figure II-19).

Throughout the course I supported the youth in succeeding in the program often helping bridge knowledge between academic and local ways of knowing.

Actively participating in the BCIT Forest Technology course had a positive effect on my ability to conduct research in the community. For example, I gained field skills, such as surveying, local ecosystems classification, and having access to remote areas around the BBFN reserve that added useful methodology for conducting traditional plant research. The interaction with youth was important to build relationships and rapport with youth from BBFN and the neighbouring Boothroyd Band. I wrote in my research journal “I got to know a majority of the boys in the community aged 16 and up. As well as gain their respect, and this is a challenge proud to overcome” (July 25<sup>th</sup>, 2004). I achieved rapport among youth through being dedicated in supporting them in the course materials, advocating on their behalf if necessary, acting as a communication liaison between them and instructors, and building positive working

relationships with them. This rapport created with youth was recognized by the wider community, which helped facilitated being accepted and valued by the BBFN and in part Boothroyd communities.

**Figure II-19 Youth in BBFN - BCIT Forest Tech Program**



**Ten local youths ages 16 to 23 participating in the Forest Technology Course**

#### **d) Gaining Cultural Competency for Collaboration**

The experiences on the Boston Bar First Nation reserve related to education in the summer of 2004 all contributed toward realizing the potential of education in the formal research process. Key to 2004 was developing my role as an education support, which the BBFN community welcomed. Another important aspect was the creation of the “Learning Lodge” as a place for hosting community education and research initiatives. The education activities of 2004 were not directly related to the research objectives. They were, however, instrumental in building a foundation for future education initiatives to develop. This foundation included gaining

cultural competency by learning local cultural protocol that supported me in working collaboratively with Band members, specifically participants in research.

Cultural competency involves developing cross-cultural awareness, attitude, knowledge, and skills, and requires reflecting on one's own cultural perspective while developing sensitivity to other cultures (Cross, 1989; Diller et al., 2005; McAllister & Irvine, 2000; Rogerson, 2006; Sue, 2001). In the context of Boston Bar First Nation I gained cross-cultural awareness and sensitivity through ongoing experiences and interactions with active and potential research participants, specifically the Band Administration and youth. Through this process I learned to communicate and work more effectively in the community-based context. Over the course of the summer I also developed the role of liaison between the Band Administration, youth and visiting BCIT professors. This required gaining cultural competency for each group, which helped bridge communication.

It was the frank communication of youth that supported me in gaining cultural awareness and sensitivity on the topic of communication. For example, they brought to my attention that I needed to find more appropriate ways to communicate with them and other community members. As I recall we were sitting on the lawn out-front of our houses after a game of soccer. The youth were in the process of enthusiastically teaching me local vocabulary, including sign language. Examples, of these included being taught the local use of common Nlaka'pamux phrases (greetings, good-byes, thank you), or terms like 'chinwagging', which means conversation. They laughed whole-heartedly at my attempts to get the local 'res' talk right. Spending time with youth in this informal and fun way provided an environment where they felt safe to communicate openly and gave me feedback on my communication. They told me that they often had trouble understanding me; because I used words they did not know the meaning of or had never heard before.



This is when I was confronted with a cultural difference that presented an obstacle to communicating, and prompted me to create the cultural awareness to overcome it. This experience brought to my attention that through my training as an academic I was using a vocabulary that was difficult to understand and potentially alienating in the community-based context. To overcome this obstacle I needed to adapt to the community-based setting. This included becoming aware of, learning, and practicing local communication and protocol on an ongoing basis. I was fortunate that BBFN youth and other community members encouraged and supported me in this process. In conclusion, being able to communicate and connect using popular local verbal and non-verbal communication was important in establishing overall familiarity and common ground. As well, ongoing interaction helped build trust, a cornerstone to working together with community members, such as youth.

In 2004, I also gained experience and skills to work more effectively with the Band Administration. This included being in continuous communication with the Band Administration over the traditional plant research activities, the development of the Code of Research Ethics, and youth related activities (i.e. research assistants, tutoring, and youth nights). In specific I developed a close working relationship with the Band Manager John Warren who was very knowledgeable of Band business and guided me pro-actively on effective communication with the Chief and Council. All together, this supported improving a collaborative working relationship and proved an important step in administrating and directing future local education initiatives.

### **3. 2005 Summer Program: Developing Youth Community Researchers (YCR)**

In 2005, a special summer youth program evolved through a participatory process with BBFN youth and the Band Administration. I acted as a catalyst, co-visionary, idea anchor and facilitator. The 2005 Summer Program built on the previous year's experience working with youth, gaining cultural competency and creating 'culturally safe' learning environments. The overall objective of the 2005 summer program was to revitalize local knowledge and usage of

plants established by the BBFN community as a whole, while also meeting the needs identified by youth.

Through direct youth engagement in the defining of methods and processes, the youth's role in the Summer Program was as Youth Community Researchers (YCR). Together, YCR and I created a common vision for the Summer Program at the beginning of their 2005 summer holidays. Youth identified the need for employment, welcomed learning opportunities and that they wanted the experience to be fun. Two main projects in this Program were initiation of the Tuckkwhiowhum Interpretive Plant Trail and a week focused on mountain huckleberries. Both projects integrated outdoor hands-on experiences with classroom-based learning. The outcomes were diverse, including a play for their younger relatives and a variety of publications for their own learning and sharing their gained knowledge with others. Overall, the program aimed to foster a connection to traditional Nlaka'pamux heritage, while building research and education capacity for youth participants.

**a) Youth Engagement: Building a Participatory Vision with Youth**

Engaging youth in community-based research meant being engaged with them within the scope of the research and beyond. From my experience in 2004, the idea of developing a more structured 2005 Summer Program for youth emerged. The primary focus of the Summer Program would be on revitalizing Indigenous plant knowledge and capacity building. A great example of a focal point for this 2005 Summer Program was co-coordinating youth nights. Soon after moving back to the BBFN reserve in May 2005, we coordinated regular youth nights with the help of Tamara Campbell, especially.

Youth nights included youth focused on fun activities, such as weekly soccer games in evenings (See Figure II-20), as well as including strategic planning meetings for structured Summer Youth Programs. These fun 'multi-age' activities fostered a 'youth community' and facilitated a networking/socializing venue featuring ongoing engagement for the research, and other educational activities. Fostering a community social relationship among Boston Bar youth, as



well as trusting relationship, was essential for building a participatory research vision, and reality with them.

**Figure II-20 BBFN Youth Engagements: Soccer**



## **b) Participatory Research Organization**

To successfully organize youth events it was important to build on the experiences and lessons from previous events and work in a participatory manner. To promote accessibility for youth events and high participation rates events needed to be welcoming, fun, interesting. Food and drinks also encouraged participation. Another important aspect was offering rides to the event, because of the distance between the Anderson and North Bend reserve. It was very important to work through youth to motivate one another, particularly through involving youth leaders in the organization. Events that lacked one or more of these characteristics would result in lower participation or engagement.

The organization of youth events was participatory, and put emphasis on being youth-directed. Youth spearheaded the organization of all youth events by coordinating word of mouth-advertising and participating in planning the logistics. While the majority of the organization was conducted by group identified youth leaders, many others cooperated when they could. Youth coordinators that emerged from the group gave important advice on structure of events and were key for spreading the word amongst youth. These youth coordinators were often older in age and had previously played leadership roles in the circle of youth.

To advertise for youth evenings, posters posted in the community represented an effective method to communicate with youth, and means of letting the entire community know of upcoming events (including other age groups) (See See Appendix VI). From community feedback on previous community publications I had learned certain effective design elements important for reaching youth. For example, graphic design of advertisements worked well when they included enticing visuals, such as using bright colours and fancy accents, big and bold writing, as well as including images and photographs.

### **(1) Developing a Participatory Vision for Summer Youth Program**

Shortly after the school year ended at the end of June 2004, a special youth night was arranged with the aim to build a participatory vision for a potential summer youth program that highlighted research on traditional plant knowledge and usage. This youth night was held at my residence, which had gained its function as a 'Learning Lodge' in the previous year. BBFN youth were invited for a movie night with pizza and drinks. Although the focus was on fun, this was acknowledged as an important meeting for bringing together as many of the BBFN youth as possible to work together on the idea of a Summer Youth Program and gain their insight and feedback.

During the youth night I was able to facilitate a discussion and asked the youth what they thought of a summer program. The idea of youth being community researchers working on local Indigenous plant knowledge was also proposed. BBFN youth responded and came up

with many ideas themselves, with some captured in the quote below. All of the ideas were recorded on a large flip-chart during the meeting and summarized in Appendix VI. . An interesting common theme came up among the youth and that was ‘employment’ and wanting to generate income throughout the summer months. Youth also gave very helpful feedback on how to communicate with them through word of mouth and poster at the Anderson and North Bend reserve.

**An example of Weekly Ideas from Youth Brainstorming Session  
(Research Journal, July 13<sup>th</sup>, 2005):**

***Drumming Lessons, Dancing Lesson, Youth Nights: Hacky, Soccer, Movies, etc..., Youth Res Baseball League, Breakdancing Lessons, Glow and Bowl, Activities at the Pool***

The above-described 2005 youth night kick-off event was carefully crafted with youth coordinators in order to enable inclusiveness and high turnout. The event brought together polarized social groups among the youth, and achieved high turnout – ages 5 to mid twenties. For my part, being able to achieve inclusiveness depended largely on carefully protecting my role as a ‘neutral’ researcher, able to work with all different individuals and groups without bias. This went a long way towards influencing the pre-existing local social dynamics. Everyone had a really great time socializing, and the evening also included a planning/brainstorming session, which I recorded.

**(2) Youth-directed Summer and BBFN Band Council Approval**

I presented the brainstorming ideas and youth night outcomes with the BBFN Band Council (Summarized in Appendix VII). The request by the youth to make money over the summer was discussed with Band Council, and I asked whether Council would consider offering wages if I coordinated a ‘youth community researcher’ (YCR) program. My goal was to work on revitalizing local Indigenous plant knowledge and usage with the youth while increasing their

academic knowledge and research / learning skills. This idea was embraced by the BBFN Band Council who agreed to provide hourly wages for youth participating as YCRs, and it was approved that I would develop and coordinate a summer YCR program. The YCR program was advertised by word of mouth and poster (See Appendix VIII: Youth Community Research Posting).

**c) Day 1: First Youth Community Researcher Meeting**

The first meeting for the “Youth Community Researcher” (YCR) Summer Program was held on August 10th. Youth interested to be YCRs came to the Learning Lodge and I gave them an overview of the summer program. The overall aim was to connect with traditional knowledge, particularly plant knowledge. As well, as for the youth researchers to learn academic research skills and plant knowledge. Core objectives of the Program involved a week focused on learning about huckleberries, building an interpretive plant trail, working on the community herbarium, and of course to have fun. About 10 youth, representing most of the youth living on the reserve ages 8 to 15, participated on regular basis in the Summer Program. Other youth of various ages dropped in from time to time to participate. An overview of the summer’s activities is on the calendar schedule shared with the 2005 YCR group (Appendix IX).

**d) Focus on Huckleberries – Land and Classroom Learning Integration**

One major activity of the 2005 summer program was a weeklong focus on ‘huckleberries’. In this initiative YCR participated in traditional harvesting of huckleberries followed by classroom research on huckleberries. Traditional knowledge, hands on and classroom based learning were then integrated in the form of theatre where youth shared what they learned with other community members, younger and older. This learning activity focused on the mountain huckleberry shows how traditional and academic knowledge can be used in a transdisciplinary manner and integrated in a unique, local and indigenous context while building education and research capacity.

### **(1) On the Land: Participating in Traditional Food Gathering Activities**

Monday, August 15th, 2005, the BBFN YCR had the opportunity to participate in a day of huckleberry picking facilitated by traditional food systems experts Roy Campbell and Elder Deanna Thiessen. The day was advertised by word of mouth, and an information poster posted at the gas bar (See Appendix X). On the organized day eight YCR spent the day collecting huckleberries in the high mountains above the BBFN North Bend reserve. For most of the youth, this was the first time for gathering huckleberry. A few youth were very experienced in huckleberry picking and shared their experience with others. The youth spread-out throughout the large huckleberry patch. Most of the youth worked in groups of 2 or 3, sitting together and chatting while picking the ripe red berries. Through this 'hands-on' learning activity and experience youth gained experience in traditional methods of gathering food, and the activity fostered connections to the land. The youth also had the opportunity to learn from Roy and Deanna, very knowledgeable community mentors enthusiastic about traditional activities and foods.

**Figure II-21 BBFN Youth Huckleberry Picking (2005)**

## Huckleberry Picking (2005 Aug 15)



**In this picture Aaronn Connar, Darren Florence, Trevor Florence, Victoria Durk, Megan Thomas, Jodi Campbell and Tonya Campbell.**

### **(2) Classroom Learning**

The huckleberry lesson extended from the land into the classroom. In the classroom environment at the Learning Lodge YCR learned about huckleberries from a variety of sources, including published materials (books and internet) and local knowledge. The learning space was organized to emphasize an interactive group learning environment. The tables were set up so the youth could sit facing each other with space at the centre to put learning materials that were shared by the group, such as literature resources. In the Learning Lodge classroom, a computer with internet access was also made available for web-based research.

To begin learning about huckleberries in the classroom setting one of the first lessons was focused on introducing plant identification. In this exercise the youth learned about different

naming systems from academic perspective such as the binomial naming system used globally, and about common and Nlaka'pamux names for plants. From learning about the names, the youth were encouraged to find information relating to mountain huckleberries, such as food, medicinal and social uses of huckleberries.

To conduct research on the huckleberry I put a variety of plant reference books and asked each youth to pick a book and review it for the class in terms of its purpose, strengths and limitations. This exercise allowed the YCR to discover individually and in group format what differences existed between various reference books. They demonstrated familiarity with use of these resources over time and were able to identify books for their different purposes.

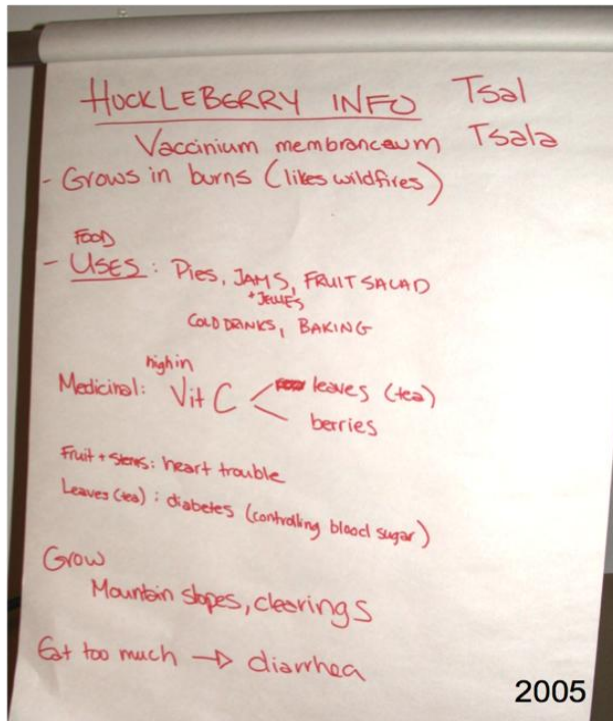
The youth worked in teams to research huckleberries in a variety of book sources, as well as doing online research. They learned the use of an index in finding specific information within a book. Of special interest to the YCR were books authored by Nancy Turner describing Thompson (Nlaka'pamux) and B.C. interior traditional plant use. With youth that were interested in doing online research I guided them in online academic research and finding relevant information.

The information the YCR had researched and noted was then shared among the group. For this a flip-chart was used where the collective information given by youth was recorded (see Figure II-22). In their collective knowledge YCR identified the common, scientific and Nlaka'pamux name for huckleberries. As well, YCR shared information on its growth habits, and uses.



Figure II-22 Classroom Learning Focus Tsal Tsala

## Classroom Learning: Tsal Tsala



### Learning together

Youth in the BBFN summer program share their information on huckleberries called Tsal Tsala in Nlaka'pamux, from literature research and their own personal knowledge and experience.

This process brought together the tactile experience from harvesting huckleberries, with classroom learning where youth learned to do literary and online research. As well as being encouraged to ask their relatives for information.

The information collected included that the plant commonly known as the huckleberry is called tsal tsala in the Nlaka'pamux language and *Vaccinium membranaceum* in the scientific binomial system. The plant grows in clearings and mountain slopes prefers, as well as previously burned areas. Food uses included harvesting the berries, which are eaten fresh or used in pies, jams and jellies, fruit salad, cold drinks and baking. Eating too many berries may cause diarrhea. Medicinal values included that berries are high in vitamin C, the fruit and stems have been used for heart trouble, and the leaves were used to make a tea to control diabetes. Questions arose on the topic of diabetes. Diabetes affects First Nations peoples at epidemic rates (Young, Reading, Elias, & O'Neil, 2000). Since I had done literature research on diabetes I led a discussion on diabetes with youth, explaining what it is, how it affects people, and known methods of treating it.



### **(3) Huckleberry Theatre**

BBFN youth community researchers learned much about huckleberries in one week integrating their experience of picking huckleberries on the land to researching and learning more about huckleberries in the classroom. Their final huckleberry project was coming up with a way to share their integrated huckleberry knowledge with the wider community. With a little encouragement they decided on doing a play for their young relatives at the BBFN Band's preschool in the Headstart program. The play was written from the collective research done with the youth on huckleberries. The huckleberry play was narrated and focused on the relationship between the Nlaka'pamux people and the huckleberry plant, including past and present local cultural information and values. The full script is found in Appendix X: YCR Huckleberry Theatre (2005). Overall, the play intended for the YCR to share their information in a creative, fun and tangible way. They became the teachers through this collaborative process and shared with the youngest generation on the BBFN reserve, as well as being witnessed by community Elders.

The huckleberry play included a narrator, and YCR that acted as 'The People' or the 'Huckleberry Bushes' (See Figure II-23). The preschoolers, younger than 5 years old, watched in delight as their older relatives acted out a play for them and the story unfolded. Darren Florence (13) was chosen as the huckleberry play narrator, because he knew Nlaka'pamux words and pronunciation best out of the group. In the introduction the narrator described the local context of the Nlaka'pamux people of Quayome. Quayome is one of the original village site near Boston Bar, which means 'place to pick berries' (Akrigg & Akrigg, 1997). In the play 'the people' went to the mountains where the huckleberry grow and an exchange occurs with the huckleberry bushes. The people brought gifts for the bushes, and in exchange the bushes shared with them about the food and medicinal uses, as well as allowed the people to pick huckleberries. After the exchange of gifts and information, the actors portraying the huckleberry bushes gave bowls filled with fresh huckleberries to the people. They brought these to their community represented by the audience of pre-school students. After the play

everyone enjoyed the fresh huckleberries and pies made by Elder Deanna Thiessen. The youth performed the play superbly, each having a role, and the huckleberry feast that followed represented an intergenerational celebration.

**Figure II-23 YCR Huckleberry Theatre**



**BBFN Youth Community Researchers perform the 'Huckleberry Play' at the local pre-school sharing an interactive story about the relationship between Nlaka'pmaux people and the huckleberry plant with younger generations, while Elders were witness. (Left to Right: Narration by Darren Florence, 'The People' and the 'Huckleberry Bush' actors exchanging dialogue and fresh huckleberries in bowls, Joseph Thomas enjoying huckleberry pie made by Elder Deanna Thiessen.**

#### **e) Tuckkwhiowhum Interpretive Trail on Traditional Plant Use**

The idea of developing an interpretive trail on traditional plant knowledge near the Tuckkwhiowhum Heritage Village was proposed to me by then Band Manager John Warren. He knew of a historical trail leading from the Heritage Village into the adjacent forest to be used for this purpose, and saw a potential of the YCR contributing to the development of the Heritage Village as well as building their own knowledge and skills. For the development of the interpretive trail YCR surveyed, conducted plant research, created a trail guide and signage, as well as developed presentation skills.

## (1) Interpretive Trail Survey

The YCR and I conducted a traditional plant survey on the historical trail for the purpose of developing an interpretive trail. On our first excursion we simply walked the historical trail to become familiar with its layout and the plants found along it. Even though most of the youth lived within easy walking distance from the historical trail, very few YCR knew of its existence. During the initial exploration of the trail I used my Nlaka'pamux ethnobotanical knowledge to identify plants with traditional use and shared this knowledge with the YCR. The next time we returned YCR and I conducted a traditional plant survey by flagging and photographing select plants identified to have traditional importance (See Figure II-24). The photographs were used for YCR to conduct traditional plant research of selected plants at the Learning Lodge.

**Figure II-24 YCR Interpretive Trail on Traditional Plant Knowledge**



IMAGES FROM 2005

← Chrissi flagging the trail for culturally important plants and those that would need to be removed when clearing the trail.

Boston Bar First Nation Youth learning about their traditionally used plants for their own knowledge and to share with other community members and visitors.



Trevor and Darren Florence giving a presentation on Ocean-spray (*Holodiscus* sp.) that was traditionally used to make tools like bows.



## **(2) YCR Traditional Plant Research**

YCR conducted traditional plant research on selected plants of the historical trail at the Learning Lodge to further develop the proposed Tuckkwhiowhum interpretive trail. For this purpose, the YCR used their plant research skills gained during the huckleberry week to investigate and learn about the diverse plants of the interpretive trail. Photo documentation of selected plants was used to identify the names of each plant. YCR then worked independently or in teams to conduct research on each plant noting traditional knowledge, especially Nlaka’pamux, on food, medicinal, technological and spiritual uses.

## **(3) YCR Trail Publications and Signage**

The collective traditional plant research was translated into making an interpretive trail plant guide using the Microsoft Publisher program, which YCR assisted in. The guide included an introduction to the development of the trail and the guide highlighting the contributions of the YCR, as well as a glossary of terms and references. For a total of 18 selected plants the guide included picture(s), names (Nlaka’pamux, common, and scientific), and summarized research for each plant. The final trail guide was called Tuckkwhiowhum Ethnobotanical Trail: Exploring Nlaka’pamux Wisdom and Usage of Local Plants. Sample pages are included in Appendix XII: YCR Interpretive Plant Trail Publication (2005). The full copy is held at the BBFN Band Office. YCR also created signage for the interpretive trail using the same (or similar) information as found in the trail guide.

## **(4) YCR Presenters**

The interpretive trail guide created with YCR facilitated for the youth to practice becoming guides for the trail. On several occasions we walked the trail together each youth taking a turn in practicing their presentation skills. Some youth also took family members on the trail and shared their knowledge with them. The idea for youth to become guides by the Band Administration was for them to become employed as guides once tourism was established at the Heritage Village.

## **f) Maintaining YCR Focus**

Creating space for personal expression in the summer youth program was important. The plant-based learning required intense focus, especially the research based activities. In order to maintain a positive feeling about plant research I needed to ensure this learning experience felt natural and enjoyable. For this purpose, I found it was important to include as many hands-on activities as possible, be flexible to individual learning needs, and provide alternate 'fun' programming, as well as free time for youth to express themselves as they needed.

### **(1) Flexible Learning**

For YCR to enjoy learning it was very helpful to be flexible and support personal learning styles and needs. For example, one youth identified that she focused best working by herself and listening to music using earphones. In the public school system, this student experienced considerable difficulty within the structured learning environment, to the point that she failed grades. In the flexible, student-directed learning environment of this initiative, this particular student excelled, and was one of the most focused and productive students, choosing to work both in groups and individually. I carefully observed and recorded students' individual interests in order to cater to specific learning styles or preferences. For example, a few students voiced that they were interested in computer-based work. In response, I worked with these students to increase their computer learning capacity, from conducting online research to creating publications.

### **(2) Cultural Activities**

The 2005 summer curriculum also included weekly drumming lessons. The drum lessons were facilitated by Hank Yamelst, a Nlaka'pamux Tribal Council youth worker, and on occasion accompanied by Ernie Michell from Siska First Nation. The lessons were hands-on and connected youth with cultural First Nation and Nlaka'pamux traditions. They also provided the opportunity for a variety of personal expressions, including singing, drumming, dancing, and recording the event through photography and video (See Figure II-25). Drumming classes provided a welcomed change in pace from focus intensive plant-based learning activities.

**Figure II-25 Drumming Classes**



The cultural classroom. (L) Youth learn traditional drumming from Nlaka'pamux youth support worker, Hank Yamelst. (R) Dancing to the beat of the drum.

### **(3) Free-Time**

General free time was key in creating a comfortable learning environment. This was 'unstructured' time for the youth to simply express what moved them in the moment, and occurred usually toward the end of the day after much of the focus-intensive learning activities were completed. At this time of day, the energy typically rose and a wonderful and lively chaos unfolded. This included impromptu dancing and singing, often including break-dancing and m.c.'ing (rapping), or sometimes they would also experiment with traditional songs, drums and dancing. Other times everyone just ran around, playing tag, shrieking, and having lots of fun.

The BBFN youth were very resourceful and independent, and once familiarized with the customs I expected in the Learning Lodge (my home), they were often in my fridge looking to make something to eat. It was a joy cooking with the youth and sharing meals with them. Most of all it was a joy witnessing the youth's unbridled creativity and expression when 'free' from any structured activity. This was valuable time for the youth community researchers to be able to unwind, to play, and to revitalize.

## **g) 2005 Summer Program Feedback**

### **(1) Youth Community Researcher Feedback**

A questionnaire was given to YCR who participated in the 2005 Summer Program to gain the youth's feedback. The questionnaire asked five questions, including what activities the youth participated in and which were their favourite and least favourite. As well, the questionnaire asked what they liked the most about the Summer Program and what their ideas were on improving the Summer Program for future education initiatives. The questionnaire and summarized feedback from individual youth are found in Appendix XIII. In the summary the youth's responses were recorded verbatim. The youth were given the option to opt out or provide anonymous feedback. All eight YCR who were given the questionnaire completed it with two anonymous submissions shown as (#1) and (#2). The other responses are summarized and indicate the youth community researcher's initials and age in 2005 (e.g. Sarah Martz – 24 = S.M 24).

The YCR feedback on the 2005 Summer Program provides evidence that having educational and skill-building elements connected with enjoyment was important to youth, and in my opinion kept the participation rate high. One youth (G.F. 13) mentioned that "just showing up everyday to work with Zarah and the rest of the crew. Because there all FUN!" Out of seven respondents three mentioned huckleberry picking and two the huckleberry play as their favourite activities. Trail building and plant research were also mentioned as favourite activities. From the response on what were your least favourite activities out of eight responses three mentioned huckleberry picking, others said research or trail building. This shows that having variety of activities was important to cater to diverse learning interests. To summarize YCR responses to what they liked the most about 2005 Summer Youth Program six out of eight responded positively in regard of the social aspect of the Program, with youth describing "meeting new people", "being .. with all the kids", "talking with friends", and "being able to work with everyone". Important to YCR was also having "something to do" and

"learning new things". As well as the experience of berry picking, including "eating berries" as they "were good" and having "a berry war".

## **(2) BBFN Band Council Feedback**

Following the 2005 Summer Program Chief Dolores O'Donaghey provided feedback from Band Council. In a letter she identified how pleased the Band Council was with the work the youth and I completed during the summer. The following is an excerpt from the letter found in full in Appendix XIV.

*"It was very gratifying to see our young people involved with learning about and collecting our traditional plants. You were able to tutor and encourage them to work together. They had fun working with you while they learned a great deal of basic science. They also had the experience of being out on the land to collect plants and the satisfaction of giving them to our elders.*

*The herbarium and the interpretive trail at the Nlaka'pamux Village are important community assets that are key parts of our whole project. The youth will be able to earn a wage next summer taking the public out on nature walks and talking to them about our history and culture.*

*Your research on our foods will also create important benefits for the health of our members.*

*We will be organizing an appreciation dinner for the community to acknowledge the work that has been achieved and I look forward to seeing you there."*

## **4. 2006 Summer Program: YCR to Cultural Ambassadors**

### **a) Program Description**

The 2006 Summer Program was designed to advance skills founded through the 2004-2005 Summer Programs with a specific aim to increase their sense of cultural identity, employment capacity, and leadership skills. The focus of the Program shifted from developing youth community researchers (YCR) to fostering cultural ambassadors. Ambassadors, in the sense



that youth would become representatives for their community and their cultural heritage. This Program was requested by the BBFN Administration and YCR and implemented with me as a program coordinator and facilitator.

Youth participation increased in 2006 with four additional youth joining the core group of eight from 2005. This represented almost all youth living on the reserve in the age group of 8 to 15. Other children and older youth also participate for special activities on a drop in basis. During the Summer Program the BBFN youth's sense of place was fostered through their involvement at the Tuckkwhiowhum Heritage Village, and participation in several capacity building activities, cultural workshops, and certificate courses. The full summer schedule for the months of July and August can be viewed in Appendix XV: 2006 Summer Program Calendar. Together these activities supported youth in becoming cultural ambassadors for their community.

#### **b) Summer Program Development**

Youth had a principal role in shaping the direction of the 2006 Summer Program and clarify their interest and involvement. In the planning stages a meeting was arranged where youth were asked for their feedback on the previous Summer Program, and were given the option of filling out a 2006 Summer Program questionnaire (see Appendix XVI). The first page of the questionnaire introduced tentative activities for the 2006 Summer Program discussed with the Band Administration. The second page asked youth for their feedback on what their activity preferences were and projected commitment for the 2006 Summer Program. The combined youth feedback from the 2005 and 2006 questionnaires, along with vision of the Band Administration and my own facilitation abilities, provided the initial direction of the 2006 Summer Program.

#### **c) The Heritage Village as Learning Environment**

The Tuckkwhiowhum Heritage Village became the central meeting, learning and activity space for the 2006 Program (See Figure II-26). The Heritage Village was in the process of being

developed as a BBFN initiative to provide a space for cultural activities, as well as showcase Nlaka'pamux heritage and build local prosperity through a variety of business ventures, including tourism. Several of traditional building structures at the Village, especially the winter house (pit house) and summer lodges were used as indoor and outdoor learning spaces, particularly hosting traditional knowledge workshops. Changing the primary meeting place for Summer Program activities from the Learning Lodge to the Heritage Village was in response to BBFN youth requesting a more accessible meeting place, and was encouraged by the BBFN Administration who wanted the youth to be integrated into the development of this community resource.

Through local support the youth became actively involved in the development of the Heritage Village, while building their own skills and knowledge. To learn about the Village and the traditional buildings, community mentor Gary Florence shared his cultural expertise with youth. This included information on cultural protocol and ceremonies to show respect for their ancestors. Landscaper, Bernard Gilchrist, also worked patiently with the youth so that they could effectively be integrated at the Heritage Village for meeting, learning and working.

The resulting contributions by the youth to the Heritage Village included enhancing the pit house, building walking paths, and further improving the interpretative trail on traditional plants they began developing the year before. The youth also created a seven page publication about the Heritage Village, summarizing knowledge gained on traditional buildings. The first page of the publication is in

Heritage Village Publication and a full copy is held by the BBFN Band Office. This publication was similar to the one created the previous year for the interpretive ethnobotanical trail. It acted as a guide for the youth to be able to remember and to present their knowledge on the Heritage Village. As well, it proved useful for the BBFN Band Office to promote the Heritage Village.

**Figure II-26 Tuckkwhiowhum Heritage Village**



#### **d) Capacity-Building Workshops**

The 2006 Summer Program included several workshops focused on building cultural and employment capacity. Cultural capacity was increased through traditional knowledge workshops on cedar and cattail weaving, jam making, as well as native art and carving. Employment capacity was developed through offering First Aid, First Host and True Colours certificate courses.

#### **(1) Traditional Knowledge and Usage Workshops**

##### ***(a) Cedar and Cattail Workshop***

The cedar and cattail weaving workshop highlighted traditional plant technologies, and were instrumental in supporting the research objective to revitalize traditional plant knowledge and usage. The weeklong workshop included the collection and processing of the plant materials

and was facilitated by Cynthia (Cindy) MacNeil (Supervisor, Employment Prep and Training Centre, Seabird Island).

In preparation for the cedar workshop, local mentors took two YCR to collect cedar bark locally and showed the young men how to separate the outer from the inner bark to be used in the workshop. The two young men recounted their cedar bark collection experience to the other youth describing the local protocol they learned and that it was hard work. On the first workshop day participants learned about soaking and splitting the inner-bark. This was followed by a lesson on simple to advanced weaving techniques. The youth made bracelets, headBands, baskets, and some attempted to make hats (See Figure II-27).

**Figure II-27 Cedar Workshop Images**



Left to Right: Cedar inner bark drying, Trevor Florence, Meghan Thomas, Geraldine Florence, Chrissi-Ann Connor, Cynthia MacNeil

In addition to the cedar bark workshop, a day was added to learn traditional plant use of a readily available local resource: cattail (*Typha latifolia*). The youth team and their mentors collected cattail leaves in 40°C heat (See Figure II-28). The shelter of one of the summer houses at Tuckkwhiowhum Village was used for youth to collectively weave together a mat made of cattail leaves. Cattail mats were used traditionally to cover teepee structures. The youth enjoyed this hands-on experience very much, as they learned traditional technology and each other's company.



**Figure II-28 Cattail Workshop Images**



**Collecting Cattail (*Typha latifolia*) on the BBFN reserve.**

Pictured: Jamie Florence, Matt Jack Victoria Durk, Geraldine Florence, Cynthia MacNeil, and Meghan Thomas.



**Weaving a cattail matt in the shelter of a traditional summer house at the Heritage Village.**

Pictured: Cynthia MacNeil, Matt Florence, Dillon Connar, and Jodi Campbell.

**(b) Blackberry Jam Making Workshop**

In mid-August, Band Councilor Christine Grafinger offered to host a jam making workshop at her house. The youth learned how to make blackberry jam, and about preserving foods in general. During the jam-making workshop, two youth volunteered to take notes of the process. After the workshop these notes were used to make a “Jam Making Guide” using Microsoft Publisher with our youth multimedia team (See **Appendix XVII: 2006 Jam Making Instructions**).

**(c) Native Art and Carving**

In order to facilitate the development of cultural identity a native art and carving workshop was given. Locally-based artists including Gary Florence (BBFN) and James Mack (Sto:lo and Nlaka’pamux Nations) shared their knowledge on designing and carving techniques unique to First Nation West-Coast culture. The underlying goal for this activity was for the youth to gain a sense of pride in their culture through learning about the beauty of their unique art while providing skills that could potentially develop into income generation. This workshop attracted the most attendance with 16 local youth and children attending, as well as Band Elder Deanna Thiessen whose three grandchildren were participating. Deanna was also a local artist and carver.

**Figure II-29 Native Art and Carving Workshop**



**James Mack and Gary Florence**



**James Mack giving instructions.**



**Grandmother Deanna with Chrissi-Ann**



**Aaron Connor carving.**



**Darcy Charlie with a fish design.**



**Students picking out their designs.**



**Out-door class in the Heritage Village Summer Lodge**

## **(2) Certificate Courses**

### **(a) *First Host and True Colours***

Jackie Bandura, from the Central Interior Community Futures in Kamloops, facilitated a two day certificate courses, including the First Host Certificate Program and a True Colours workshop, for 12 youth, ages 10 to 15,. The First Host program integrated First Nations cultural values with the Super Host training. Super Host training is highly valued by hospitality industries for being able to provide excellent customer service. The training provided the youth with tips, skills and knowledge on how to be superior hosts and working with people of all backgrounds, while staying strong in the First Nation's heritage. All the youth were given a pin to mark their successful completion of course, which also represented a beneficial addition to their resumes.

**Figure II-30 First Host Workshop Images**



**First Host Certificate Course BBFN  
Youth Participation**



**Jackie Bandura, First Host  
Instructor**



**Band Councilor Christine Grafinger  
serves a nutritious lunch**

On the second day Jackie Bandura facilitated a True Colours workshop. Through this workshop the youth were encouraged to learn about themselves, such as their own strengths and potential areas of growth. It was also helpful in identifying personality and learning styles that were useful to know for creating positive synergy in the team. As a leader of the youth group, I was able to fine-tune how I worked with youth by creating learning processes more suited for each personality type.



Figure II-31 True Colours Workshop Images



*(b) Canadian Red Cross Emergency First Aid*

On August 15<sup>th</sup>, 2006, a total of 12 youth of the youth summer program participated in a Red Cross emergency first aid course organized for them. This 8-hour course offered instruction on prevention, recognition and treatment of life-threatening emergencies. As well as, this course provided training in initial assessment, rescue breathing, choking, CPR, major bleeding, unconsciousness, shock and secondary assessment. The course was taught by Kevin, a paramedic who was often stationed locally. All twelve youth earned their first aid certification. The completion of this course contributed to the youth being more confident and knowledgeable about safety issues, as well as able to act better in emergency situations. First aid training is also an important asset in employability. In personal communication, Elder



Deanna Thiessen was glad the youth completed the course as you never know what emergencies could happen.

**Figure II-32 Emergency First Aid Course Images**



**e) BBFN Youth as Cultural Ambassadors**

On the final day of the 2006 summer youth program, BBFN youth showcased their skills as cultural ambassadors. Two representatives from the Sto:lo Nation Human Resources Development (SNHRD) came to visit, including Colleen Yamamoto (Program Officer) and Juanita Soles (Front Desk). The SNHRD had provided funding for the Summer Program. This opportunity allowed the youth to demonstrate their culminated experience, training, and integrated knowledge from the summer program's activities.

For days ahead of the visit the youth had prepared a special tour for their guests. On the day of the visit, all the youth showed up on time wearing their best, including the pins they received upon successfully completing the First Host Certificate Program. Using the skills from the First Host workshop they welcomed our two visitors from Sto:lo Nation. First they lead a

guided tour throughout the Heritage Village taking turns on explaining each structure from a community and cultural perspective, as well as any experiences they have had with the buildings. For example, the use of the pit-house as their meeting home, and that they spent great amounts of time and effort to look after the pit-house and make it hospitable. Overall, the 2006 youth as a team demonstrated great professionalism, knowledge and skill as cultural and community ambassadors. The visiting program funders were very impressed with the youth's presentation and knowledge (personal communication).

*"I just wanted to say thank you again to you and the youth at Tuckkwhiohum!! It was a perfect visit and tour! I enjoyed myself very much and loved being with you and the youth who all worked so hard thsi (sic) summer."- Juanita Soles, SNHRD, 2006*

**Figure II-33 Cultural Ambassadors**



The 2006 Summer Program Youth Ambassadors did an excellent job at showcasing their hospitality skills, cultural knowledge, and the excellent work they had accomplished over the summer to special visitors from Sto:lo First Nation – Colleen Yamamoto and Juanita Soles. (Pictures courtesy of Juanita Soles)

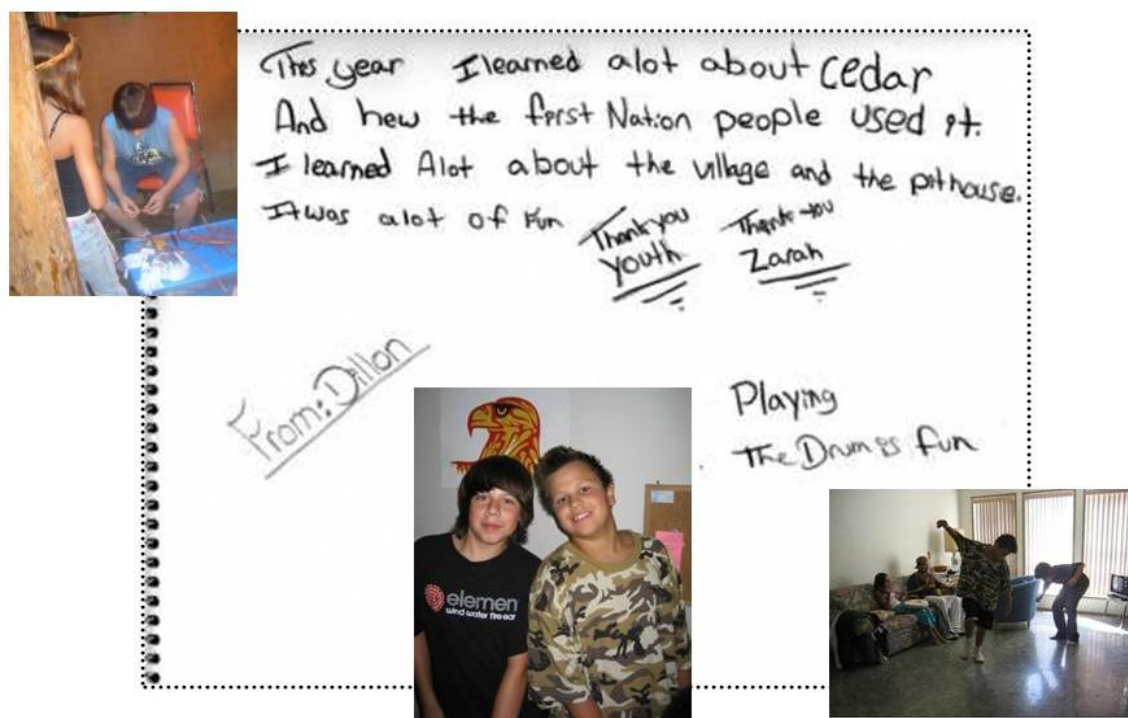
## f) 2006 Summer Program Feedback

### (1) Youth Feedback

Two youth, Chrissi-Anne and Dillon Connor, submitted feedback for the 2006 Summer Program before heading back to their residence in Alberta. Along with their elder brother Aaron they all participated in the 2005 and 2006 Summer Program while they visited their grandparents over the summer. The Summer Programs facilitated for these non-reserve living youth to connect with their Nlaka’pamux roots, as well as integrating with the youth living on the reserve.

Dillon wrote that he learned a lot about cedar and how First Nation people used it, as well as the Heritage Village and the pit-house. In his feedback he describes that this was “a lot of fun” and expressed his gratitude (See Figure II-34).

**Figure II-34 2006 Youth Program Feedback from Dillon Connor**

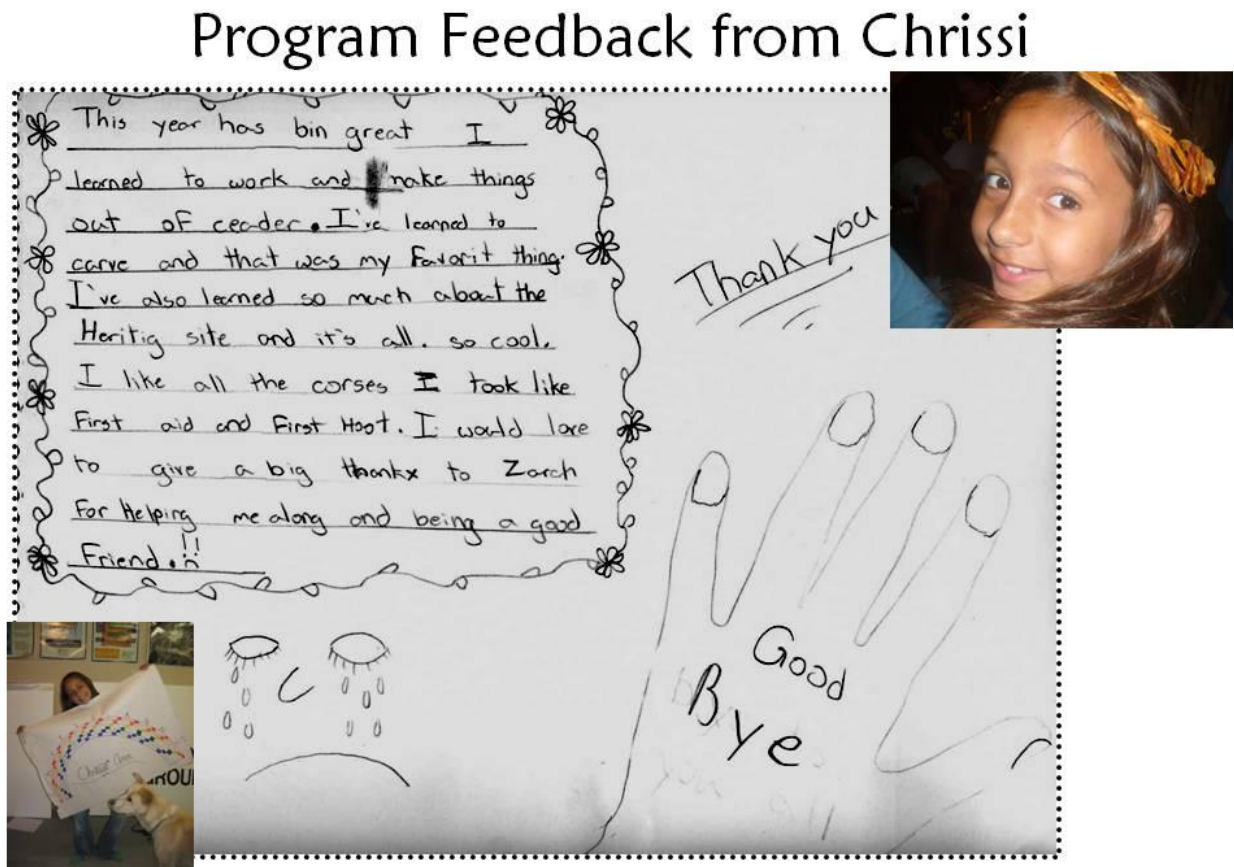


Chrissi-Ann wrote that she “learned to work and make things out of ceader (sic)”, as well as carving and the Heritage Village. All activities she described as “so cool” (See Figure II-35). Her



favourite was carving. She also expressed that she liked all the courses she took, such as First Aid and First Host. And she expressed her gratitude for the Program and facilitation.

**Figure II-35 2006 Youth Program Feedback from Chrissi-Ann Connor**



## (2) Elder Feedback

When interviewing Elder and program mentor Deanna Thiessen she shared that she appreciated the program as a whole (personal communication, 2006). She was impressed by how willingly all the kids liked to go. She thought that the weaving workshop was important because it has become a lost art and because it taught the kids to appreciate the tree of life (Cedar). Also she was glad the kids had the chance to take the First Aid course, because you never know what can happen.

## **5. 2007 Summer Program: Connecting BBFN YCR with UBC**

In August of 2007, the BBFN Youth Community Researchers came to the University of British Columbia (UBC). This field trip aimed to foster a connection for youth between the community-based educational experience and the larger educational setting of the university. This event was co-organized with Christine Grafinger, Band Councilor who was enthusiastic about the youth coming to UBC and being part of the field trip. The UBC field trip successfully introduced the youth with key Aboriginal faculties and resources, including creating a direct connection with UBC Aboriginal student advisors.

The BBFN youth field trip at UBC began at the Faculty of Forestry. The youth were welcomed by Tristan Banwell, the Forestry Admissions Advisor, and Dr. Ronald Trosper, Associate Professor and expert in Aboriginal Forestry and Forest Resources Management. Both introduced the youth to the UBC Faculty of Forestry building and discussed opportunities for Aboriginal students in forestry. The next appointment was at the First Nations House of Learning (FNHL), where the BBFN youth crew met with William G. Lindsay the Aboriginal Student Services Coordinator. Lindsay gave the students an introduction and tour of the FNHL, a home away from home for Aboriginal Students, followed by a visit to the First Nation library, Xwi7xwa. Afterward, Graeme Joseph the Aboriginal Student Recruiter and Advisor met with the youth to speak with the youth crew about becoming future UBC students and answered their questions (See Figure II-36). The final destination was the UBC Museum of Anthropology where youth were able to witness Aboriginal cultures in B.C., Canada, and all over the world.

**Figure II-36 BBFN Youth connect with UBC**



BBFN Youth Community Researchers come to Vancouver and are welcomed at UBC visiting and meeting student coordinators at the Faculty of Forestry, First Nations House of Learning and Museum of Anthropology.

## **D. Conclusion**

This chapter presents the research activities and results that emerged through the collaborative community-based research process. Main community-based activities included the traditional plant research and documentation, as well as the education initiatives that promoted the revitalization of traditional plant knowledge and usage. Community members of all ages were involved in developing the research process and carrying out the activities. The traditional plant research focused on community Elders and mentors sharing their wisdom, which is recorded in this chapter. The education initiatives provided a forum for this knowledge to be passed on to the community's youth who learned about traditional plant knowledge and usage through a variety of activities. Youth also learned academic knowledge and research skills through the process. The implications of these research results are discussed in greater detail in Chapter IV: Research Synthesis and Reflections. Overall, the community-based research process of Connecting Our Roots was community-directed and created multiple outcomes focused on contributing toward revitalizing traditional plant knowledge and usage.

## Chapter III. Case Study - Tseweta Research

### A. Introduction and Selection of Tseweta for Laboratory Research

The third objective of Connecting Our Roots was to assess the nutritional and therapeutic properties of selected plant resources. From the community-based plant research documenting traditional plant knowledge and usage (TPKU) in the BBFN community Tseweta (*Lomatium nudicaule*)<sup>1</sup> emerged as a plant of special interest for Boston Bar First Nation for further study. Traditionally, Tseweta was used as a food and medicine. Today, Tseweta is one of the few traditional food plants still consumed as a leafy green vegetable and is particularly popular among elders. Figure III-3 shows a *L. nudicaule* flowering with leaves. Because of the contemporary cultural importance of Tseweta, BBFN were interested in quantitative data relating to Tseweta's traditional uses as a food and medicinal plant.

The BBFN Band Council supported the focus on Tseweta as part of Connecting Our Root's holistic health research goal in revitalizing TPku. Chief Dolores O'Donaghey and then BBFN Band Manager John Warren motivated the Tseweta research to proceed, especially the laboratory analysis. They were particularly interested in the nutritional analysis to share with their community members. Along with Band Council members, they saw the significance of revitalizing traditional plant knowledge and usage as an important part of bettering the health and well-being in their community. Having scientific information on their traditionally used plants, such as Tseweta, would support this initiative.

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<sup>1</sup> In this thesis the common Nlaka'pamux name Tseweta and the scientific notation *L. nudicaule* are used interchangeably based on context of the information.



**Figure III-1 *Lomatium nudicaule* flowering (May 2008) Photo by Sarah Martz**

The result of a preliminary literature research showed that data was limited on the nutritional and therapeutic properties of *Lomatium nudicaule*. However, a rich ethnobotanical record (Kuhnlein, 1991; Steedman, 1928; Turner et al., 1990) existed documenting an abundance of food, medicinal and spiritual uses of both the *Lomatium* genus and *L. nudicaule* in specific. The family Apiaceae and genus *Lomatium* are known for exhibiting chemical diversity (Berenbaum, 2001). For *L. nudicaule* in specific the only scientific data published have been on its nutritional aspects by Keely (1980) and Benson et al. (1973) who focused on the micronutrient composition in the ethnobotanical context of the confederated tribes of Warm Springs.

This chapter aims to provide greater understanding of Tseweta adding a scientific perspective from laboratory analysis to local Indigenous plant knowledge. The preliminary literature research on *Lomatium nudicaule* provided promising leads on its known and potential beneficial health qualities though data was limited and warranted further investigation. In this case study the phytochemical, biological activity and nutritional properties of on Tseweta (*L. nudicaule*) were investigated using primarily quantitative laboratory methods. Overall, the Tseweta research was initiated at the request of Boston Bar First Nation and contributed to the holistic and transdisciplinary health research goals of Connecting Our Roots.



## **B. Background: Tseweta (*Lomatium nudicaule*) Species Profile:**

### **1. Botanical and Nlaka'pamux Classification**

*Lomatium nudicaule* (Pursh) Coult. & Rose is in the family Apiaceae, also commonly referred to as the Celery or Carrot Family. It is a plant with significant traditional usage as food, medicine, and for sacred or spiritual purposes by the Nlaka'pamux First Nation, also known as the Thompson Tribe (N. J. Turner, Thompson, Thompson, & York, 1990). Anthropologists and ethnobotanists in the area have recorded the plant's Nlaka'pamux name as /c'tewéte? (N. J. Turner et al., 1990) or tsewê'ta (E. V. Steedman, 1930). English common names for *L. nudicaule* are Wild Celery, Barestem Biscuitroot, Barestem Lomatium, or Barestem Desert-Parsley (E. W. Anderson & Bedell, 1987; Government of Canada, 2007; N. J. Turner et al., 1990). Other terms include the word Indian, such as Indian Celery or Indian Consumption Plant (N. J. Turner et al., 1990), which one BBFN Band Member pointed out to me was inappropriate (personal communication, 2004).

### **2. Growth patterns and range**

A species native to western North America, *L. nudicaule* is a taprooted perennial herb that grows 20 to 90 cm tall. It has basal compound leaves that are 1-3 times divided and 2-9 cm long. *L. nudicaule* has small yellow flowers that grow in compound umbels like most members of the family Apiaceae, or Celery family. Its fruits or seeds are oblong or elliptic, meaning longer than wide, 7-15 mm long, and ribbed with wings up to ½ the width of the body (Klinkenberg, 2007).

The species' ranges from the coast of south-western British Columbia east to western Alberta and south to Utah and California (Klinkenberg, 2007). The plant is most common on the south-east of Vancouver Island and the Gulf Islands, and is infrequently found in other parts of its range. It typically grows in steppe zones, open lowland woods, and on dry rocky or grassland slopes. Figure III-2 shows the species range of *L. nudicaule*.

**Figure III-2 *Lomatium nudicaule* species range BC**



Source: Static map generated from all available databases by E-Flora BC, 10 Jan 2007.

### **3. Traditional Uses by Aboriginal Peoples**

*Lomatium nudicaule* was used by North American indigenous peoples on the Pacific North-West primarily for food, medicinal and spiritual uses. Traditional uses for *L. nudicaule* by North American indigenous groups have been documented for Nlaka'pamux and Okanagan in the interior of British Columbia (Perry, 1952; E. V. Steedman, 1928; Teit, 1900; 1990); for Coast Salish people in British Columbia, including the Cowichan, Kwakiutl, Nitinaht, Saanich, Songish (Boas & Codere, 1966; N. C. Turner & Bell, 1973; N. J. Turner & Bell, 1971; N. J. Turner, Thomas, Carlson, & Ogilvie, 1983; N. J. Turner et al., 1990); and Native American people including the Atsugewi and Confederated Tribes of Warm Springs, particularly the Paiute people (Benson et al., 1973; Garth, 1953; Keely, 1980; Mahar, 1953). A concise summary of published traditional uses of *L. nudicaule* can be found in the North American Ethnobotanical Database (Moerman, 1998).

Tseweta (*L. nudicaule*) continues to be an important traditional food plant among the Nlaka'pamux (Thompson), and has been used for its qualities in preparing food, beverages, medicines, and as a scent. Early descriptions of Nlaka'pamux uses of *L. nudicaule* were described by ethnographers J.A. Teit (Teit, 1900), E.V. Steedman (1928) and F. Perry (1952). A more recent publication by Nancy Turner, Laurence Thompson, Terry Thompson, and the late Annie York (1990) called the *Thompson Ethnobotany – Knowledge and Usage of Plants by the Thompson Indians of British Columbia* describes the traditional and continual use of *L. nudicaule* in increased depth (p.156-158).

#### **a) Food Uses**

In general as a food the young immature plant was harvested late spring and early summer, and the young tender leaves and stems were eaten by the Nlaka'pamux, Okanagan, Atsugewi and Confederated Tribes of Warm Springs (Benson et al., 1973; Garth, 1953; Mahar, 1953; Perry, 1952; E. V. Steedman, 1928; N. J. Turner et al., 1990). The leaves and immature seeds were also used as flavouring or spice, and the whole dried plant was used to make a tea like beverage (N. J. Turner et al., 1990).

In Nlaka'pamux territory the leaves, stems and shoots of *L. nudicaule* of young plants were harvested in late spring to early summer. The young stalks and leaves are noted to have been important spring vegetables (E. V. Steedman, 1928: 479, 482-484; Teit, 1900: 233; N. J. Turner et al., 1990: 157). Louie Phillips from Lytton described the plants to be best gathered in June: “at the time when the flower heads are developing” and the “stalks are 20 to 25 cm high” (N. J. Turner et al., 1990: 156).

The plant could be “eaten raw, or cooked as a potherb, or used as a flavouring in soups and stews” (N. J. Turner et al., 1990: 157). The stalks of *L. nudicaule* stalks were noted as being peeled and eaten like celery (Perry, 1952: 38; E. V. Steedman, 1928: 483). The cooked greens were eaten with salmon (N. J. Turner et al., 1990: 157). As well, Steedman (1928) also noted

that the roots were also formerly used as food (p.479). However, Louie Phillips says not the entire root was eaten just the “whitish, fleshy crown” (N. J. Turner et al., 1990: 157).

The dried stems, leaves, flowers, and mature fruit were also described to make medicinal and beverage tea (E. V. Steedman, 1928: 494; Teit, 1900: 233). As well, young, green fruits (seed pods) were used as flavouring (spice), to make tea, or chewed and eaten raw (N. J. Turner et al., 1990). Steedman (1930: 495) noted that “wild celery” tea was “very frequently drunk”. In present times the leaves are often frozen or canned for storage and future use (N. J. Turner et al., 1990).

## **b) Medicinal Uses**

Generally, for medicinal purposes mostly the seed pods were used (Boas & Codere, 1966; N. C. Turner & Bell, 1973; N. J. Turner & Bell, 1971; N. J. Turner et al., 1983; N. J. Turner et al., 1990). See Figure 4-4 for picture of seed-pods. For example, the Kwakiutl people used a poultice of chewed seeds as an analgesic, anti-rheumatic, cold remedy, gastrointestinal aid, gynecological aid and orthopedic aid (Boas & Codere, 1966; N. C. Turner & Bell, 1973). More specifically, the poultice of chewed seeds were applied to remedy stomach aches, breast swelling, backaches, swollen knees and feet (Boas & Codere, 1966; N. C. Turner & Bell, 1973). The seeds were sucked for sore throats and to loosen phlegm, or eaten to relieve constipation. For general sickness a compound with seeds was used in a steam bath (Boas & Codere, 1966; N. C. Turner & Bell, 1973). An infusion of seeds was also taken as a gynecological aid by women to ease delivery (N. C. Turner & Bell, 1973). Coast Salish people, such as the Cowichan, Saanich and Songish chewed the seeds for colds, and the Nitinaht applied a poultice made from seeds to the chest for colds (N. J. Turner & Bell, 1971). As well the seeds were swallowed to treat internal complaints (N. J. Turner & Bell, 1971).

Nlaka’pamux medicinal uses of *L. nudicaule* were primarily to remedy colds (N. J. Turner et al., 1990). Teit (Teit, 1900: 370) noted that the whole plant was used for “various medicinal purposes.” For example, the whole plant, or just the stems and leaves, were drunk to remedy

cold and fevers (E. V. Steedman, 1928: 473; Teit, 1900: 368; N. J. Turner et al., 1990: 158). Louie Phillip used “two teaspoons of dried seeds boiled in a pot of water for colds”, or “to sweat out colds” (N. J. Turner et al., 1990: 158).



**Figure III-3 *Lomatium nudicaule* ‘Tseweta’ Seedpods (Picture by Sarah Martz)**

### **c) Other Uses**

*L. nudicaule* were also used in ceremony; as a fumigant, incense or fragrance; as a charm; and in fishing technology. Coast Salish people, in particular the Cowichan, Saanich and Songish burnt the seeds to fumigate homes, and as a ceremonial practice to “drive away ghosts” (N. J. Turner & Bell, 1971). The Nitinaht used the seeds or leaves as a scent or for charms, and for devil’s club codfish lures (N. J. Turner et al., 1983). Nlaka’pamux people also used the plant as a scent (E. V. Steedman, 1928).

### **d) Oral History: WS’ANE’C (Saanich) people telling of “Origin of the Salmon” and *L. nudicaule***

*Lomatium nudicaule* is also found in traditional stories, such as its role as an important food and ceremonial plant. One called the *Origin of the Salmon* documented in Dr. Nancy Turner's (2005 p. 48) book *The Earth's Blanket – Traditional Teachings for Sustainable Living* is a story from the WS'ANE'C (Saanich) people in which *L. nudicaule*, called *qexmín* in their language, is described as the food for all the Salmon people. The story tells of a time when salmon were on their own land and the WS'ANE'C people were facing starvation because the big game they relied on had disappeared. So two brave young men set forth onto the sea to search for salmon, and after a long journey arrived in a strange new land where they found a village and a man that greeted them who said: "You have arrived" (N. J. Turner, 2005: 48). The young men stayed with their hosts who were the Salmon people and they were made aware that each house in the village burnt the aromatic smoke of *qexmín* seeds, which was their food. The youth returned to their homeland following the salmon that showed them the way, and the teachings the head of the Salmon people shared with them including burning *qexmín* so "that the salmon might feed on its smoke and sustain themselves", ... "Then if you treat the salmon well, you will always have them in abundance" (N. J. Turner, 2005: 49). This represents a short retelling of a story that in full conveys the interconnections between people and ecology and the "ceremonial and food roles of plants" such as *Lomatium nudicaule*.

## **C. Collections for Laboratory Analysis**

### **1. Boston Bar First Nation Community-based Context**

#### **a) Roy and Tamara Campbell**

For the Tseweta research Band Councilor Roy Campbell took on the responsibility of personally supporting and mentoring the community-based Tseweta research, supported by his daughter Tamara. Roy introduced me to where Tseweta grew and is harvested locally, particularly the area known as Botanie Valley near Lytton, B.C.. Roy's daughter Tamara Campbell was a diligent community researcher involved in the Tseweta research participated collections for herbarium samples and laboratory analysis in the summers of 2003, 2004, and 2005.

Collecting Tseweta with Roy and Tamara were cultural experiences to remember and cherish. For example, Roy parking his truck at the base of what he called 'Medicine Mountain' in Botanie Valley and turning up pow-wow music to accompany us while we collected Tseweta in the hot sun for the whole day. Another memory included having unprotected legs during collections, which led to many deerfly bites that turned into large purple and very itchy sores. Picking Tseweta leaves was a challenging task as one had to be continuously bent over to reach the leaves at their base near the ground.

## **b) Nlaka'pamux Elders**

### **(1) Hilda Isaac: "Everything is Changing"**

Hilda Isaac was also involved in the Tseweta research. She was very pleased with her granddaughter Tamara's interest in traditional knowledge, and shared her deep knowledge of Nlaka'pamux culture, including Tseweta. Tamara and I would spend hours with Hilda feeling privileged to be in Hilda's presence and privy to her wisdom. In a recorded semi-structured interview with Hilda on July 26<sup>th</sup>, 2004, she shared with us information on Tseweta. She described that "everything is changing," in specific the seasonal times when plants are ready for harvest, including Tseweta. Hilda pointed out that Tseweta leaves were ready to be harvested earlier than in other years when they were typically harvested in May and June.

### **(2) Reconnecting with their Roots: Elders Deanna Thiessen and Julie Grafinger**

In June 2005 a special excursion to collect Tseweta with local Elders from BBFN was planned. In the morning of June 17<sup>th</sup>, 2005, Elders Deanna Thiessen and Julie Grafinger and I headed toward Lytton to meet up with Simon Peters from Lytton First Nation. Simon agreed to take us to collect traditional food plants, particularly Tseweta. On the way up to Lytton following the windy highway through the Fraser Canyon I asked Deanna and Julie how they felt about the day. All three of us were excited to go and collect Tseweta. I shared with them how keen I was to learn from them about Tseweta and other traditional plant knowledge. Both laughed and said that this was their first time they were going to collect Tseweta and how excited they

were to finally get a chance to do it. Deanna said something like: “Finally! Deanna gets to do what she wants” (Personal communication, 2005). Both shared with me that they remembered their grandmothers collecting Tseweta and preparing it when they were children. Though neither had the chance to participate in the collection or preparation of Tseweta until now. Both cited that they had to work too hard in other areas of their lives and were not encouraged to participate in traditional plant use practices. Now as Elders themselves they were eager to ‘revitalize’ their traditional plant use knowledge and practice.

At a hotel in Lytton, we joined up with Elder Simon Peters from Lytton First Nation to go to Botanie Valley with him to collect Tseweta and perhaps other traditional food plants in season. Simon still speaks Nlaka’pamux fluently. His elders shared their traditions with him. He has been collecting traditional foods for a long time and continues what he has been taught. On the way to collect Tseweta we stopped to look at stinging nettles (*Urtica dioica*). As well, we gather immature *Heracleum lanatum* or ‘Heko’ in Nlaka’pamux to taste the juicy stem tissue of its peeled young shoots.

At the top of Botanie road we walked about looking at the diversity of plants found in the meadows, and then stopped to collect Tseweta. We spent a good hour collecting the young to mature leaves. Simon showed us how to pick the plant. He pulled off the flower head and base of the leaves surrounding it and then picked the leaves from it. I just picked the leaves right of the plant. Julie and Deanna also got busy picking Tseweta. When I asked them how things are going they shared that they were afraid of picking the wrong plant. To their satisfaction I went over identifying Tseweta with them again. I also made sure to point out what the poisonous mountain death camas (*Zigadenus venenosus*) looks like, as it grows interspersed in the same area as Tseweta. At the end of the day, Julie shared her enthusiasm about exploring the possibility of growing traditional food plants, or other native plant species in the gardens of BBFN. Collecting traditional foods with local Elders was a special experience due to everyone’s enthusiasm for connecting with their roots.





**Figure III-4 Elders Deanna Thiessen, Julia Grafinger, and Simon Peters collecting ‘Heko’ (*Heracleum lanatum*) on a Tseweta collection foray to Botanie Valley (17 June 2005)**

## **2. Specific Local Tseweta Collection Sites**

### **a) Botanie Valley – Medicine Mountain**

To collect Tseweta Roy Campbell brought us to a hillside in Botanie Valley he called Medicine Mountain. In early summer, around June, the entire hillside was densely covered with Tseweta. The fragrance of the plant was pungent in the air smelling like celery. Below the hillside, what Roy identified as the ‘Old Race’ track was a flat area where cows had grazed the vegetation right to the ground. However, the hillside where the Tseweta was growing was lush with vegetation. Common companion plants at Medicine Mountain include *Penstemon procerus* (Slender Blue Penstemon), *Cerastium arvense* (Field Chickweed), *Brodiaea hyacinthina* (Fool’s Onion), *Arnica mollis* (Hairy Arnica), and *Fritallaria lanceolata* (Chocolate Lily). Also growing among the very frequent Tseweta plants was Mountain Death Camas (*Zigadenus venenosus*).

## **b) North Bend**

Another minor site identified by Roy Campbell where a few Tseweta plants grew was a few kilometres north of North Bend along Chamaux Road. However, this site was for interest only and no plants were collected from this site. Primarily this was since this Tseweta population was small, numbering up to approximately 20 plants, compared with the many hundreds of plants growing in Botanie Valley. As well, this plant population was growing adjacent to active railroad tracks making it undesirable to collect them for food or medicinal purposes. In Turner et al. (1990) it has been noted that *L. nudicaule* does not grow further south in the Fraser Canyon than Kanaka Bar or Siska (p. 157). Although in small numbers, evidence of a small population of *L. nudicaule* near North Bend shows that this plant does grow further south than Siska in the Fraser Canyon. This is interesting for BBFN who are interested in revitalizing the use of Tseweta, which includes exploring the potential of growing Tseweta locally on their reserve in the future.

## **3. Materials & Methods**

### **a) Collection 2004 and 2005: Leaf Samples**

The leaves of *Lomatium nudicaule*, Tseweta, were collected for consumption and for research on two dates in 2004 and 2005 at Medicine Mountain, in Botanie Valley NE of Lytton, BC. The Tseweta plants were picked on Botanie Valley Road at 1185 m elevation (Coordinates: N 50°24'28.4"; W121°32'36.5"). The plants were picked on the hillside with a moderate to steep incline just up from the road running below.

In 2004, on June 22<sup>nd</sup>, *Lomatium nudicaule* leaf samples were collected with BBFN community research assistant Tamara Campbell. The temperature on this collection date was very hot with temperatures of 34°C +. In 2005, on June 17<sup>th</sup>, *L. nudicaule* samples were collected with Elders, Deanna Thiessen and Julie Grafinger from Boston Bar First Nation and Elder and cultural guide Simon Peters from Lytton First Nation. The climate was humid and overcast. Voucher specimen in UBC Herbarium (V227320).

*Lomatium nudicaule* leaves were picked and collected in non-sealed plastic bags. They were transported for one hour to a facility in North Bend, BC, where they were rinsed with cold water to remove any dirt or debris and the leaves cleaned of their pedicels (leaf stalks). The leaves were then packaged in freezer zip-lock bags and frozen at - 20°C in a household freezer. After 2 months of freezer storage the leaves were transported frozen to UBC facilities where they were freeze-dried using a Modulyo freeze dryer (Edwards High Vacuum, Burlington, Ontario, Canada), then weighed (See Table III-1) and stored in a fridge at - 4°C in sealed plastic zip-lock bags.

**Table III-1 Weights of freeze-dried *Lomatium nudicaule* leaves with zip-lock packages collected in 2005**

Package	Weight (g)	Notes
1	106.84	Collected by Elders (Deanna Thiessen and Julie Grafinger) 2005
2	81.29	Collected by Sarah Antonia Martz, 2005
3	78.67	Collected by Sarah Antonia Martz, 2005
4	86.97	Collected by Sarah Antonia Martz, 2005

## **b) Collection 2005: Seed Pod Samples**

In the midst of summer on July 21<sup>st</sup>, 2005, *Lomatium nudicaule* seed pods were collected for analysis. The seed pods were collected at Medicine Mountain in Botanie Valley, near Lytton, which is the same area where the leaves were collected. Collection for seed pods was as follows. Seed pods were cut off the plant and collected in plastic bags. They were then transported to a facility in North Bend, BC, about 1 hour away from Botanie Valley. In North Bend the seed pods were rinsed with cold water to remove any dirt or debris and the pedicels removed. The seed-pods were then packaged in freezer zip-lock bags and frozen at - 20°C in a household freezer. After 1 month of freezer storage the seedpods were transported frozen to UBC facilities where they were freeze-dried with Modulyo freeze dryer (Edwards High Vacuum, Burlington, Ontario, Canada), weighed (See Table III-2), and stored in fridge in sealed plastic zip-lock bags.



**Figure III-5 Tara Campbell Cleaning Tseweta Seed Pods (2005)**

**Table III-2 Weights of freeze-dried *Lomatium nudicaule* seed pods with zip-lock packages collected in 2005**

Package	Weight (g)	Notes
1	142.16	Collected by Sarah Antonia Martz, 2005
2	81.10	Collected by Sarah Antonia Martz, 2005
3	146.32	Collected by Sarah Antonia Martz, 2005
4	126.83	Collected by Sarah Antonia Martz, 2005

## **D. Laboratory Research**

### **1. Phytochemical Analysis: Terpenoids**

#### **a) Introduction**

Terpenoids are the largest group of natural products (Gershenzon & Dudareva, 2007). They are derived from branched five-carbon (isoprene) units and represent a wide variety of naturally occurring compounds produced by many plant species (Croteau, Kutchan, & Lewis, 2000; Dorman & Deans, 2000). Terpenoids are essential in plant processes, such as development, growth and general metabolism. In addition, a large number of terpenoids have specialized functions that contribute toward a plant's bioactive nature. Particularly in association with other organisms specialized terpenoids serve in reproduction, symbiosis and defense, acting as toxins, anti-feedants, repellents, attractants and antibiotics (Gershenzon & Dudareva, 2007).

The chemical diversity and bioactivity of terpenoids have been of interest to humans from ancient to modern times who have valued the contribution of terpenoids as flavours, fragrances, pharmaceuticals, pesticides and food supplements such as vitamins or sweeteners

(Bohlmann & Keeling, 2008). For example, well known terpenoids include monoterpenes such as R-limonene typically accounting for over 90% of the essential oils of citrus fruits, or highly complex terpenoids such as taxol, a key ingredient in anticancer products (Croteau et al., 2000; Schwab, Davidovich-Rikanati, & Lewinsohn, 2008). As well, published research has provided evidence that a wide variety of essential oils possess antimicrobial activity, and that particularly the presence of monoterpene constituents contribute to this activity (Cox et al., 2000; Dorman & Deans, 2000; Filipowicz, Kaminski, Kurlenda, Asztemborska, & Ochocka, 2003; Kalembe & Kunicka, 2003).

*Lomatium nudicaule* is an aromatic herb used by North American west-coast Indigenous peoples as food, flavour and medicine, including by Nlaka'pamux people (Moerman, 1998; N. J. Turner et al., 1990; N. J. Turner, 2005). In the areas it grows its presence can be indicated by a pungent smell much like celery. These qualities indicate that *L. nudicaule* may be rich in phytochemical constituents, particularly terpenoids that contribute to its aromatic and bioactive qualities. A terpanoid analysis was conducted since terpenanoids are often primary constituents in volatile oils of aromatic and medicinal plants, as *Lomatium nudicaule* is, and responsible for bioactive plant properties such as fragrance, flavour, and medicinal value (Bohlmann & Keeling, 2008; Dorman & Deans, 2000). The goal of the analysis was to provide greater understanding of the phytochemical composition of *L. nudicaule's*, and perhaps provide further insight to its biological active nature.

## **b) Materials & Method**

Unpublished method obtained from Jeanne Robert, June 2007, based on Lewinsohn et al. (1993) and adapted for the analysis of *L. nudicaule*.

## **c) Terpene Extraction and Analysis**

Triplicates of plant samples of each *Lomatium nudicaule* leaf and seed-pod were added to 2 ml glass gas chromatography (GC) sample vials and immersed in 1.5 ml MTBE (tertiary-butyl methyl ether) containing the internal standards isobutyl benzene (100 µg/ml; Fluka) and

dichlorodehydroabiatic acid (200 µg/ml; Helix Biotech). The leaf samples were from the collection date June 17<sup>th</sup>, 2005 and the seed-pods June 21<sup>st</sup>, 2005. Samples were then vigorously shaken overnight at room temperatures (approx. 20<sup>0</sup>C). 20 hours later the plant tissue was removed, oven dried (37<sup>0</sup>C for 7 days), and weighed. From the whole extract 1.5 mL was removed and added to a new GC vial with 0.3 ml of 0.1 M (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> (pH 8.0) and vortexed to wash out small organic acids from solution. The cleaned extract was then divided into two fractions of 0.5 ml each, one for analysis diterpenes and the other for mono- and sesquiterpenes.

The first fraction, prepared to derivatise diterpenes, was washed with 160 µl MeOH (Fisher Scientific) and approximately 0.15 ml TMS-diazomethane (Sigma Aldrich). In order to methylate the diterpene resin acids, the methylation reaction was allowed to proceed for 20 minutes in a capped vial, and was then evaporated to dryness with compressed nitrogen gas (Praxair). The second fraction containing mono- and sesquiterpenes was used to resuspend the methylated diterpene fraction. And the combined sample was then passed through a column with Na<sub>2</sub>SO<sub>4</sub> (Sigma Aldrich) over silica gel (Av pore 60 A Sigma Aldrich) and glass wool. The sample was then concentrated to approximately 100 µl using compressed nitrogen gas (Praxair).

For terpene analysis, an Agilent 122-7032 GC with an autosampler and equipped with a flame ionization detector ((FID; 7683 series)) fitted with a DB-WAX column (0.25 mm x 0.25 µm x 30 m). The flow rate was 1 mL H<sub>2</sub> min<sup>-1</sup> and the FID was operated at 300°C. One microliter of extract was introduced into the injection port at 250°C and was split in either a 20:1 ratio for the plant extracts. The GC was programmed with an initial oven temperature of 40°C (3-min hold), and temperature increased at a rate of 3°C min<sup>-1</sup> until 110°C, followed by 10°C min<sup>-1</sup> until 180°C and then 15°C min<sup>-1</sup> up to 250°C.

Compound identification was done using GC-MS analysis accomplished with a Agilent 122-7032 coupled with mass spectrometry (MS; 5973N mass selective detector, quadropole analyzer,

electron ionization, 70eV) using a DB-WAX column as described above. Split injections (1- $\mu$ L etheral extract) were made at a ratio of 5:1 (plant extracts) with an injector temperature of 250°C. The instrument was programmed

from initial temperature of 40°C (3-min hold) and increased at a rate of 3°C min<sup>-1</sup> until 110°C, followed by 10°C min<sup>-1</sup> until 180°C and then 15°C min<sup>-1</sup> up to 250°C. Helium was used at a constant flow of 1 mL. GC-FID-generated peaks were integrated using an Agilent GC/FID and integrated analysis software. Identification of terpenes was based on comparison of retention times and mass spectra with authentic standards or with mass spectra in the Wiley or National Institute of Standards and Technology libraries. Terpene concentrations were calculated by comparing the integrated peak area to that of the internal standard. Isobutylbenzene was used as the internal standard for both monoterpenes and sesquiterpenes. Methylated dichlorodehydroabietic acid was employed as an internal standard to calculate diterpene concentrations. Peaks on the GC/FID chromatogram were matched with those of the GC/MS by matching intervals between peaks. Analysis software was used to produce integrated results to calculate the area under peaks of interest (API). The API was then used to calculate the approximate quantity of each compound in  $\mu$ g per gram dry weight of plant sample.

The quantification of peaks in the FID chromatograms was achieved as follows: The actual weight of a known concentration of the internal standard isobutyl benzene present in the sample was calculated [Concentration Isobutyl benzene ( $\mu$ g/ml) x volume (ml) = Weight ( $\mu$ g)]. To calculate and quantify the amount of each peak of interest (PI) or compound found in each *L. nudicaule* sample the following formula was used:

$$\left[ \frac{\text{Area Peak of Interest}}{\text{Area Peak Internal Standard}} \times \text{Actual Weight Internal Standard } (\mu\text{g}) \right] /$$
  
dry weight of *L. nudicaule* plant sample (g) = X ( $\mu$ g/g) of compound of interest in the plant sample.



#### d) Results

Compounds identified in *L. nudicaule* **leaves** using GC/MS were: beta pinene (Q95), myrcene, l-limonene, sabinene, trans-beta ocimene, and 6-butyl-1,4-cycloheptadiene. For the *L. nudicaule* **seed-pod samples** the following compounds were identified alpha pinene (Q 97), beta pinene (Q 95), two separate peaks for l-phellandrene (Q 91) and beta-phellandrene (Q 91), limonene, linalool, and germacrene (Q92). Table III-3 Chemical composition and calculated quantity of terpene extract isolated from *Lomatium nudicaule*.

**Table III-3 Chemical composition and calculated quantity of terpene extract isolated from *Lomatium nudicaule***

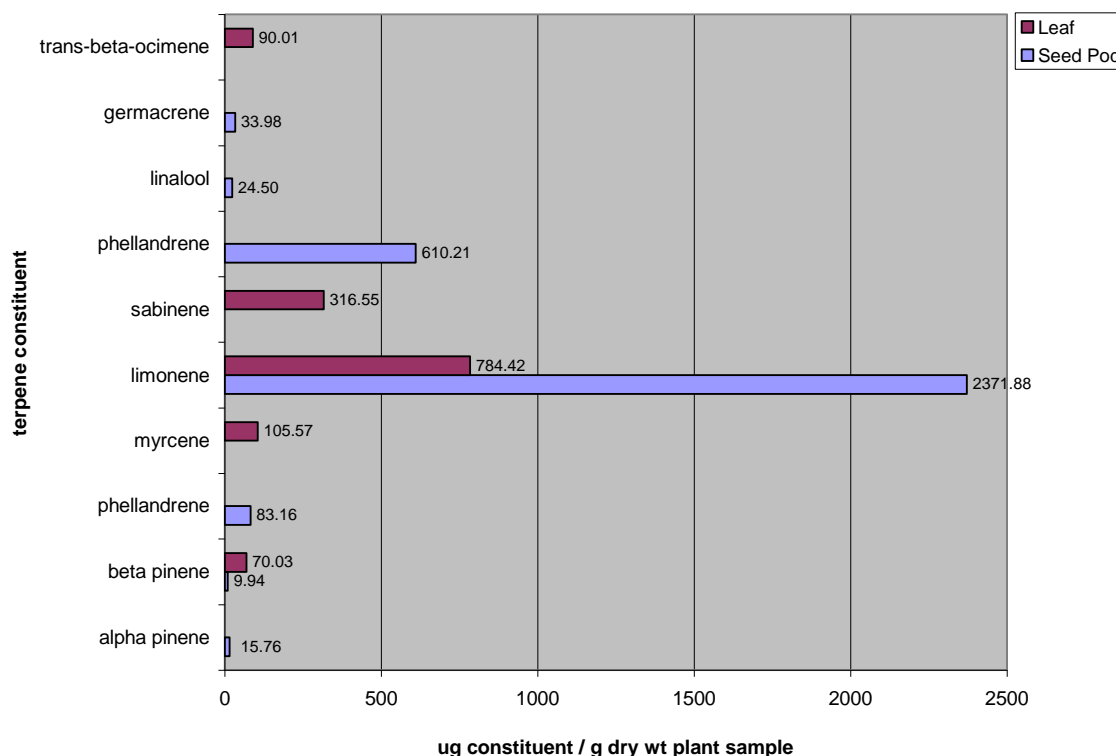
	Terpene Constituents	Amount (µg / g)
<b>Seed Pod</b>  <b>Sample SP3</b>	Alpha pinene	10.67
	Beta pinene	9.17
	l-Phellandrene	61.69
	Limonene	1815.20
	beta-Phellandrene	468.95
	Linalool	9.17
	Germacrene	18.55
<b>Leaf</b>  <b>Sample L3</b>	Beta-pinene	59.35
	Myrcene	50.87
	l-Limonene	794.44
	Sabinene	187.61
	Trans-beta-ocimene	53.24
	6-butyl-1,4-cycloheptadiene	n/a

In both leaf and seed-pod samples the internal standard isobutylbenzene appeared at the retention time of 22.2 minutes. However, the other internal standard dichlorodehydroabietic acid was not detected. Common compounds in both leaf and seed-pod samples were limonene and beta-pinene, all of which were found at very similar retention times in both leaf and seed-pod samples. Compounds that were different in leaf and seed-pod samples were: myrcene, sabinene, trans-beta ocimene and 6-butyl-1,4-cycloheptadiene in the leaf samples,

and alpha-pinene, linalool and germacrene in seed-pod samples. Linalool and germacrene were comparatively small peaks found in the column bleed, thus the signal may have not been interpreted clearly.

*Lomatium nudicaule* terpene constituents identified and quantified through analysis all belonged to the chemical class of acyclic and bicyclic monoterpenes, except for germacrene, a sesquiterpene. Acyclic monoterpene constituents found in the seed-pod were limonene, phellandrene, and linalool, whereas in the leaf extract they were limonene, myrcene, and trans-beta-ocimene. Bicyclic monoterpenes in the seed-pod included alpha and beta-pinene, and in the leaf extract, sabinene and beta-pinene. The quantity in  $\mu\text{g}$  constituent / 100 g. dry weight of plant sample in brackets after each constituent is as follows, from most to least. Seed-Pod extract: limonene (2371.88), l-phellandrene or alpha-thujene (610.21), beta-phellandrene or beta-thujene (83.16), germacrene (33.98), linalool (24.50), alpha-pinene (15.76) and l-beta-pinene (9.94). Leaf extract: l-limonene (784.42), sabinene (316.55), myrcene (105.57), trans-beta-ocimene (90.01) and beta-pinene (70.03). Table 6-2 in the Appendix gives the chemical composition of terpene extract isolated from *Lomatium nudicaule* seed-pod and leaf samples including their retention times and calculated quantities. Figure III-6 shows a graph visually indicating the relative amounts of leaf and seed-pod extract calculated for the constituents found in *L. nudicaule*.

**Figure III-6 *L. nudicaule* seed pod and leaf extract terpene constituents and amounts**



### e) Discussion

Most of the monoterpenes found in *L. nudicaule* are known for various properties such as fragrance or medicinal value. For example, the most abundant constituent in both the *L. nudicaule* seed-pod and leaf extract were optical isomers of the cyclic monoterpene limonene. The R-enantiomer (+)-limonene, or D-limonene, is the compound responsible for the citrus aroma and is found in large quantities in the rinds of citrus fruits in the Family Ruteaceae – hence the name limonene from “limon” or lemon (Schwab et al., 2008; Wikipedia, 2008). The (S)-enantiomer (–)-limonene, or *l*-limonene in contrast has an aroma that invokes pine or turpentine like smell. In the biosynthetic pathway of cyclic monoterpenes (–)-limonene is generated from geranyl diphosphate (GDP) through the enzymatic action of limonene synthase, which also produces minor amounts of bicyclic (–)- $\alpha$ -pinene and (–)- $\beta$ -pinene, as

well as acyclic myrcene (Bohlmann & Keeling, 2008). Regarding evidence of bioactivity of limonene, Filipowicz (2003) reported that limonene enantiomers showed comparable activities against fungi, and in addition two reports stated that the (+)-limonene enantiomer had stronger activity against various fungal and bacterial strains (Aggarwal et al., 2002; Lis-Balchin, Ochocka, Deans, Asztemborska, & Hart, 1996).

Monoterpene constituents found in the *L. nudicaule* phytochemical analysis may contribute toward potential biological activity of its leaf and seed-pod extracts. Several monoterpenes were identified by Dorman & Deans (2000) for their spectrum of anti-microbial activity from widest to most limited, in order: (2)-linalool,  $\beta$ -pinene, R(-)-limonene,  $\alpha$ -pinene, (-)-sabinene, myrcene, phellandrene, and  $\beta$ -ocimene. These compounds were also either directly indicated to be constituents of *L. nudicaule* or structurally related to identified constituents from this terpene analysis. Dorman & Deans (2000) further noted that antimicrobial activity was generally increased by the presence of a double bond, such as for limonene, or that the presence of alpha-isomers are inactive relative to beta-isomers, such as (+)-limonene over *l*-limonene, and alpha or beta-pinene where the (-) enantiomeric forms show a greater inhibitory effect than (+)(Filipowicz et al., 2003; Lis-Balchin, Ochocka, Deans, Asztemborska, & Hart, 1999).

Biological activity of phytochemicals has been observed in previous studies. For example, in a study by Al-Burtamani et al. (2005) the phytochemical profile of the studied plant *Haplophyllum tuberculatum* (Rutaceae) exhibited antibacterial activity, and had several similar constituents as *L. nudicaule*. The phytochemical constituents of *H. tuberculatum* included beta-phellandrene, limonene, trans-beta-ocimene, myrcene, and alpha-phellandrene (in order of most abundant to least). In the study by Al-Burtamani et al. (2005) ten microlitres of pure oil inhibited the growth of bacteria *Escherichia coli*, *Salmonella choleraesuis*, and *Bacillus subtilis* to the same degree as 10 micrograms of gentamycin sulfate (Al-Burtamani et al., 2005). The oil also exhibited dose-dependent activity against fungi *Fusarium oxysporium* and

*Curvularia lunata* (Al-Burtamani et al., 2005). Other studies that observed the intricate connection between peoples' health and plant oils as antimicrobial agents show that the cis or (–) isomer can play an instrumental role in the antifungal activity of extracts. In example, there is evidence that alpha and beta pinene mode of action is due to their power to “destroy cellular integrity, inhibit respiration, and ion transport processes” (Cox et al., 2000).

## **2. Biological Activity: Anti-fungal Analysis**

### **a) Introduction**

Analyzing the antifungal activity of *Lomatium nudicaule* leaf and seed-pod extracts against indoor moulds is important because these moulds pose health threats and have been a particular issue on First Nations reserves in Canada (Osterberg, 2009). In this study the antifungal bioactivity of *L. nudicaule* leaf and seed-pod extract was analyzed against four fungal strains, *Alternaria sp.*, *Aspergillus fumigatus*, *Penicillium sp.* and *Trichoderma sp.*, collected by graduate student Patricia Osterberg as part of her research on indoor moulds in First Nation on reserve communities (Osterberg, 2009).

Indoor molds have been associated with causing various health issues, including respiratory illness, such as atopic asthma, allergic bronchopulmonary aspergillosis (ABPA), and allergic fungal sinusitis (Fung & Hughson, 2003; Terr, 2004). In particular, *Aspergillus fumigatus* has been well studied for its role in respiratory illnesses associated with indoor moulds. Research has shown *A. fumigatus* to be responsible for ABPA which is a noninfectious, immunologically induced bronchial inflammation clinically characterized by coughing, wheezing, fever, and mucus expectoration (Terr, 2004). Often in conjunction with ABPA, *A. fumigatus* has also been indicated in producing allergic fungal rhinosinusitis. Also, gliotoxin a secondary metabolite and mycotoxin produced by *A. fumigatus* has been attributed to the pathogenesis of vaginal candidiasis (Shah & Larsen, 1991). This analysis on the antifungal activity of *L. nudicaule* leaf and seed-pod extract aimed to address health concerns about indoor moulds by providing deeper understanding of *Lomatium nudicaule*'s antifungal properties.

The biological activity of *Lomatium nudicaule* has not been thoroughly investigated. As of this time there have been no specific publications on the biological activity of *L. nudicaule*. From the rich ethnobotanical records describing many medicinal applications of the *Lomatium* genus and *L. nudicaule* in specific it can be inferred that this would have a biological basis (Moerman, 1998). This analysis aimed to act as a preliminary test for the biological activity of *Lomatium nudicaule* leaf and seed-pod extracts. Traditionally, *L. nudicaule* was used throughout its natural habitat by Pacific-coast North American Indigenous groups as a medicine, particularly to treat respiratory illnesses (Cowichan, Kwakiutl, Nitinaht, Saanich, Songish, Thompson) and inflammation (Kwakiutl) (Boas & Codere, 1966; N. C. Turner & Bell, 1973; N. J. Turner & Bell, 1971; N. J. Turner et al., 1983; N. J. Turner et al., 1990). It was also used as a fumigant by Coast Salish people, including the Cowichan, Nitinaht, Saanich, and Songish (N. J. Turner & Bell, 1971).

Regarding information specifically on the antifungal properties exhibited within the genus *Lomatium*, there has been little research published. Meepagala et al. (2005) studied the antifungal properties of *Lomatium californicum* against *Colletotrichum fragariae* and showed activity, which may be due to the compound Z-ligustilide that is abundant in *L. californicum*. A.R. McCutcheon et al. (1994) included *Lomatium dissectum* root extract in an analysis of antifungal activities of British Columbia medicinal plants. However, *L. dissectum* in this study exhibited weak antifungal activity in contrast to its strong antibacterial and antimycobacterial effects (McCutcheon et al., 1992; McCutcheon et al., 1997).

## **b) Materials & Methods**

### **Crude Extract Preparation**

The *Lomatium nudicaule* freeze dried leaves from collection date 22 June 2004 and 17 June 2005 were crushed moderately in original plastic zip-lock bag. The seed pods collected 22 July 2005 were not crushed. Using a scale (BP 2100 S, Sartorius, Gottingen, Germany) 10 g. of each leaf and seed pod plant samples were weighed out. Each plant sample was put in a 500 mL Erlenmeyer flask and 95% Ethanol was added to the flask just to cover the plant material. The Erlenmeyer flask with the plant sample and 95% Ethanol were then set on a shaker and agitated for 24 hours. After 24 hours the extract was filtered using a clean funnel and Whatman # 1 filter paper and the filtrate collected in a clean round-bottom flask. The extract was then dried using a rotoevaporator (Rotavapor R110, Buechi, Switzerland) and resuspended with ethanol and added to preweighed 20 mL glass vial. In Biological Safety Cabinet (BSC – Sterilgard Class II, Type A/BC, The Baker Company, Sanford Maine, 1995) the extract was dried and again resuspended with 95% Ethanol to prepare a final concentration of 1 g extract in 10 mL of solvent.

### **Fungal Cultures**

Fungal cultures were obtained from UBC graduate student Patricia Osterburg who collected fungal aerosol samples as part of her M.Sc. thesis work on indoor moulds in First Nation on reserve communities (Osterberg, 2009). The fungal aerosol samples were transported to the Aboriginal Health and Natural Products Chemistry Laboratory, where they were incubated, identified, and prepared using cryo-preservation medium for spore suspensions (Osterberg, 2009). For this antifungal bioassay fungal cultures of *Alternaria sp.*, *Aspergillus fumigatus*, *Penicillium sp.* and *Trichoderma sp.* were selected, because of their mention as potential health hazards (Fung & Hughson, 2003; Koskinen, Husman, Meklin, & Nevalainen, 1999; Portnoy, Kwak, Dowling, VanOsdol, & Barnes, 2005; Terr, 2004).

### c) Results

Antifungal activity was observed for *Lomatium nudicaule* seed pod extract, however, no antifungal activity was observed for the *L. nudicaule* leaf extract. As expected, the negative control (95% EtOH, the same as the extract solvent) showed no activity. The positive control (Nystatin) showed activity for all replicates, except for replicate three. The exception is discussed below. The inhibition results for *L. nudicaule* seed pod extract and the positive control are presented in Table III-4, and discussed in detail in the following paragraphs.

The *Lomatium nudicaule* seed pod extract and the positive control Nystatin exhibited antifungal activity observed by producing complete and/or partial zones of inhibition for all tested fungal strains, including *Alternaria sp.*, *Aspergillus fumigatus*, *Penicillium sp.*, and *Trichoderma sp.*. A 'Complete' zone of inhibition was the diameter measured exhibiting complete fungal exclusion. Partial inhibition was characterized by areas of decreased fungal density and discoloration. In Table 6-4 a superscript p indicates the total diameter of partial inhibition. In some cases, both zones of complete and partial inhibition were observed. These are noted in Table 6-4 by giving the inner diameter of complete inhibition first and then the outer diameter of the partial inhibition (indicated by superscript p).

These were observed in all four replicates for *Alternaria sp.*, *Aspergillus fumigatus*, and *Penicillium sp.*. The zones of complete inhibition were consistent in their diameter reading for all four replicates with *L. nudicaule* seed pod extract results for *Alternaria sp.* showing only 1 mm variation (from 9 to 10 mm), *A. fumigatus* a variation of 3 mm (from 8 to 11 mm), and *Penicillium sp.* no variation (9 mm). For *Trichoderma sp.*, the *L. nudicaule* leaf extract did not produce complete zones of inhibition. Instead a zone of 'partial' inhibition was recorded.



**Table III-4 Inhibition results for Antifungal Activity of Lomatium nudicaule seed pod extract (P) and positive control (+) against 4 types of Indoor Moulds**

		Zones of Inhibition (diameter measured in mm)			
<i>Fungal Strain</i>	<i>Replicate #</i>	1	2	3	4
<i>Alternaria sp.</i>	P	10	10	9	9
	+	15	15	20	20
<i>Aspergillus fumigatus</i>	P	10	11	9	8
	+	20	12	17	12
<i>Penicillium sp.</i>	P	9	9	9	9
	+	11/18 <sup>p</sup>	17/26 <sup>p</sup>	–	16 <sup>p</sup>
<i>Trichoderma sp.</i>	P	15 <sup>p</sup>	17 <sup>p</sup>	15 <sup>p</sup>	17 <sup>p</sup>
	+	16/25 <sup>p</sup>	17/26 <sup>p</sup>	8/20 <sup>p</sup>	20/30 <sup>p</sup>

(P) Lomatium nudicaule Seed Pod Extract; (+) Positive Control – Nystatin  
Superscript 'p' indicates zone of partial inhibition.

For *Alternaria sp.* and *Aspergillus fumigatus* clearly demarcated zones of complete inhibition were observed for the *L. nudicaule* seed pod extract and the positive control Nystatin. For *Penicillium sp.* complete zones inhibition were observed for the *L. nudicaule* seed pod extract; whereas for the positive control a zone of complete inhibition was observed by an inner diameter from which a zone of partial inhibition extended to an outer diameter. For *Trichoderma sp.* zones of partial inhibition were observed for the *L. nudicaule* seed pod extract. A similar effect as for *Penicillium sp.* was observed for the positive control on *Trichoderma sp.* where complete inhibition was observed by an inner diameter from which a zone of partial inhibition extended to an outer diameter.

Consistency in the results or variations and exceptions for the *L. nudicaule* seed pod extract and the positive control Nystatin were observed as follows. Consistent results in diameter measurements were observed for the *L. nudicaule* seed pod extract tested against all fungal strains. For example, diameters between replicates varied no more than 3 mm as for *Aspergillus fumigatus*. There was more variation in the results for the positive control Nystatin. For *Alternaria sp.* there was a diameter difference of 5 mm between the zones of complete inhibition in replicate 1 & 2 versus 2 & 4. For *A. fumigatus* the zones of complete inhibition ranged from 12 mm to 20 mm for the positive control. For *Penicillium sp.* there were two replicates which showed complete and partial zones of inhibition, one which showed only partial and one exception where no results were observed. An explanation for the exception is that the disc may have lacked Nystatin as a result of missing the disc during distribution. For *Trichoderma sp.* the positive control exhibited consistency for having both complete and partial zones of inhibition; however, there was variation of up to 12 mm in between diameters for zones of complete inhibition, and 10 mm for partial inhibition.

#### **d) Discussion**

The antimicrobial efficacy of naturally derived compounds has been recognized in traditional cultures and is being verified in the contemporary academic literature. In this preliminary analysis *Lomatium nudicaule* was tested for its antifungal biological activity. The results of this research can only be described as inconclusive evidence as the anti-fungal assays was not done in triplicate. Therefore, the results can only be used to provide insight to future investigations on the anti-fungal biological activity of *L. nudicaule*. To help guide future research on *L. nudicaule* the results from this analysis are discussed below.

The **leaves** and **seed-pods** of *L. nudicaule* were tested for antifungal activity of crude extract. The results from the antifungal tests of *L. nudicaule* seed-pods indicated that the crude extract may be biologically active against the four strains of indoor moulds it was tested against. Zones of inhibition, complete and partial, were observed against all fungal strains. Several

factors that may affect the biological activity of *L. nudicaule* can be taken into consideration, including laboratory method, phytochemical composition, extract concentration, and chemotaxonomy. These may help explain the lack of observed biological activity of *L. nudicaule* leaf extract, especially in contrast to the observed antifungal activity of the seed-pod extract. Further investigation could contribute to clarify the discrepancies of these results and elucidate other biological activities.

The difference in phytochemical composition between *L. nudicaule* leaf and seed-pod may also contribute to a difference in observed biological activities. Results from the phytochemical analysis investigating the terpanoid constituents of *L. nudicaule* showed that the seed-pod extract has higher concentrations and greater diversity of monoterpenes than the leaf extract. For example, the seed-pod extract contained 2.3 mg limonene per gram plant sample, whereas the leaf extract contained considerably less with 0.78 mg/g. Differences in terpene constituent composition included the lack of phellandrene, germacrene, linalool and alpha-pinene in the leaf extract, which were present in the seed-pod extract. The higher concentration, singular contribution and/or synergistic effects of constituents found in the seed-pod extract, in contrast with the leaf extract, may be contributing factors to the lack of observed bioactivity in the *L. nudicaule* leaf extract and the observed anti-fungal activity of the seed-pod extract.

### **3. Nutritional Analysis**

#### **a) Introduction**

The nutritional analysis of Tseweta or *Lomatium nudicaule* intended to address local community health inquiries on nutrition and health, and within a wider scope provide greater understanding on the contributions of traditional food plants to healthier diets and ways of living. Boston Bar First Nation (BBFN) clearly expressed their interest to investigate the nutritional contributions of traditional food plants (TFPs) in the local area, particularly those still used by their community members today. Of the TFPs documented to be of current interest to the BBFN Tseweta was the most lacking in published nutritional data when compared to other TFPs. Tseweta has remained to be an important traditional food plant for BBFN, particularly for its use as a green vegetable and for its distinctive flavour-imparting characteristic (personal communication). The BBFN community, had a strong interest to revitalize its use as a food, and was particularly interested in having a comprehensive nutritional analysis done for Tseweta.

The nutritional contributions by *L. nudicaule* have been sparsely described. Kuhnlein and Turner (1990) summarized available nutritional data on *L. nudicaule* from two previously published studies by Benson et al. (1973) and Keely (1980). These studies primarily provided data on micronutrients, such as vitamin C, and lacked information on macronutrients other than water. Also based on Benson's (1973), publication was the local traditional food plant guide called *Nutritive values of Native Foods of Warm Springs Indians* (Hilty, Peters, Benson, Edwards, & Miller, 1980). This guide provided a qualitative statement citing that the young *L. nudicaule* plants are "remarkably high" in vitamin C content and that one cup provides more than the adult Recommended Dietary Allowance (RDA). The RDA is the "average daily dietary intake of a nutrient that is sufficient to meet the requirements of nearly all (97-98 %) healthy persons" (Health Canada, 2003). Keely (1980) furthermore noted that the fresh shoots and leaves of *L. nudicaule* may have provided significant contribution of ascorbic acid in times of

scarcity, primarily late winter and spring in pre-contact First Nation diets, when other usual sources such as dried or fresh berries were used up or not seasonally available.

This analysis aimed to build on previous studies and provide greater insight on the nutritional constituents of *L. nudicaule* leaves; including macro and micro-nutrients. The nutritional analysis includes a nutritional comparison of *L. nudicaule* leaves with nine other traditional and market vegetable foods, addresses the current availability of fresh market bought vegetables in the Boston Bar area, and discusses key nutrients documented for *L. nudicaule*, namely fibre, calcium and vitamin A, linking nutrient levels in human diets with health. The greater goal of this study is to support BBFN in their vision to revitalize traditional foods, and contribute to the growing compendium of knowledge on Indigenous and traditional food plants.

## **b) Materials & Method**

### **Nutritional Analysis of *L. nudicaule***

The analysis of *L. nudicaule* leaf sample collected in June 2005 was performed by CANTEST LTD in Burnaby, BC, a full service analytical laboratory in May 2006. The analysis was specifically done for nutritional labeling of 100g of *Lomatium nudicaule* frozen leaf food sample. The resulting analysis included basic nutritional food composition data on the energy, calories from fat, fat (mono and polysaturated fats, trans fatty acids), cholesterol, carbohydrate (total sugars and total dietary fibre), protein, sodium, potassium, iron, calcium and vitamin A & C content. The test methods used were according to CANTEST as follows: Proximate analysis was done per Official Methods of Analysis of the Association of the Official Analytical Chemists (OMAA-AOAC), 17<sup>th</sup> edition (AOAC, 2000). Fatty acid analysis was performed based on method 41.1.28A (996.06) (OMAA-AOAC) and included the derivation to methyl esters and analysis by GC/FID or GC/MS (AOAC, 2000). For fat analysis the fatty acids were converted to triglycerides following GC/MS analysis. Dietary fibre includes hemicelluloses, celluloses, lignins, pectins, gums, non digestible oligosaccharides and waxes in foods as per Sigma Chemical Company Technical Bulletin No. TDFAB-3 on Total Dietary Fibre Assay Kit. Total sugars were analyzed

using procedures described in OMAA-AOAC method 980.13, using an HPLC equipped with an RI detector (AOAC, 2000). Total sugar content includes the summation of glucose, fructose, maltose, sucrose, and lactose. Vitamin A and C were analyzed based on procedures in “Methods for Determination of Vitamins in Foods” (Brubacher, Müller-Mulot, & Southgate, 1985, p. 23-32 and 66-77) using liquid chromatography. Vitamin A analysis did not include beta-carotene, which was analyzed using procedures outlined in OMAA-AOAC 32.5.17 (AOAC, 2000).

### **Nutritional Comparison of Traditional and Market foods with *L. nudicaule***

To provide perspective on the nutritional value of *Lomatium nudicaule* leaves the nutrient values reported in this study were compared with nine other Nlaka’pamux traditional and common market plant foods. The plants chosen for comparison were Cow’s Parsnip (*Heracleum lanatum*), Thimbleberry (*Rubus parviflorus*), Stinging Nettle (*Urtica dioica*), dandelion (*Taraxacum officinale*), chicory (*Chicorium intybus*), spinach (*Spinacia oleracea*), kale (*Brassica oleracea* Acephala Group), and iceberg lettuce (*Lactuca sp*). All of the plants chosen for this comparison are in the category of vegetables, including leaves, stems and shoots. Each plant included in the comparison is discussed in further detail in the following paragraphs. Nutritional data for Nlaka’pamux traditional plant foods were derived from Kuhnlein and Turner (1991), and data for market foods, including dandelion and chicory, from the Canadian Nutrient File (2007).

Traditional food plants chosen for these nutritional comparisons are also in the category of Nlaka’pamux spring vegetables, including leaves, shoots, and young stalks. Plants such Cow’s Parsnip (*Heracleum lanatum*), Thimbleberry (*Rubus parviflorus*), and Stinging Nettle (*Urtica dioica*) are traditional Nlaka’pamux food plants known respectively as **/hék<sup>w</sup>u?** pronounced Heko (p.152), **/sóx<sup>w</sup>m’s** meaning “to-peel-off-the-covering-of-a-shoot” (p. 270), and **s-wel’/wl’iq̓t** meaning “any plant that stings” (p.289) (N. J. Turner et al., 1990). These plants are still collected and eaten by some community members of the Boston Bar First Nation. Fireweed (*Epilobium angustifolium*) or in Nlaka’pamuxin **‘s/xik’i?̓t** (p. 235), is a traditional

Nlaka'pamux food plant whose young stalks were consumed (N. J. Turner et al., 1990).

However, this plant was not as popular as the other traditional foods named above. Each of these plants are found in Nlaka'pamux territory, and members of the Boston Bar First Nation from young to old have expressed their interest in sharing or learning more about their traditional food system.

Dandelion (*Taraxacum officinale*), and chicory (*Chicorium intybus*) were not part of the traditional diet as they are introduced species; however, both plants grow in abundance in the Boston Bar area and have a history of medicinal and food use. Although endemic to Europe and northern Asia, both plants are now distributed throughout the world (Escudero, De Arellano, Fernández, Albarracín, & Mucciarelli, 2003). For example, on the North Bend reserve both dandelion and chicory are some of the most common plants growing along roadsides, and residential areas especially as part of untended lawns. In the *Thompson Ethnobotany*, Turner et al. (1990) wrote "at the present time it [*Taraxacum*] is so common at places like Botanie Valley that it colours the valley bottoms yellow in spring." In the Boston Bar area *T. officinale* was described to be eaten in the "spring for greens and salads" and quoting Teit (1896-1918) by "Indians Halfbreeds & whites" (N. J. Turner et al., 1990: 185). The consumption of chicory as a food plant is neither mentioned in the *Thompson Ethnobotany* nor *Traditional Plant Foods of Canadian Indigenous Peoples* (N. J. Turner et al., 1990). The leaves of both plants are noted for the nutritional value, and are eaten raw or cooked (Plants for a Future; Plants for a Future). For the outcomes of a study by Escudero et al. (2003) the "a nutritive potential for *Taraxacum officinale* leaves" was highlighted and proposed that this plant is "a good candidate for use as a food source" considering its well known pharmacological effects and low toxicity. The authors support the promotion of dandelion for food consumption and see it as a means to "improving the nutritional condition of areas of population with poor economic resources" (Escudero et al., 2003).

Commonly consumed market plant foods chosen for this comparison were spinach (*Spinacia oleracea*), kale (*Brassica oleracea* Acephala Group), and iceberg lettuce (*Lactuca sp*). These three were chosen as they are green leafy vegetables, similar to *L. nudicaule*, and are commonly consumed in modern conventional Canadian diets. Spinach and kale are dark leafy greens noted as rich sources of minerals, such as calcium and iron, vitamins, and antioxidants (Ismail, Marjan, & Foong, 2004). Minerals in kale are more bioavailable than spinach, because the latter contains high levels of oxalates that bind minerals and impede absorption (Bronner, 1993; Heaney & Weaver, 1990). When comparing the nutrient file data for 100 g raw spinach and kale to that of iceberg lettuce, iceberg lettuce shows poor nutrient value (Health Canada, 2007).

The Canadian Food Guide and Indigenous author Devon Mihesuah both make the case to choose dark leafy green vegetables over iceberg lettuce as part of making healthier dietary choices (2007d; Mihesuah, 2004). However, iceberg lettuce was reported as one of the most commonly consumed vegetables in America (Johnston, Taylor, & Hampl, 2000). In contrast, only one in five Americans reported eating cruciferous vegetables, such as broccoli and kale (Johnston et al., 2000). In the Boston Bar area iceberg lettuce is one of the few vegetables available to buy at local grocery outlets, and is commonly served in salads and as a fixing by local food vendors (See .

Table III-9).

#### **Local Accessibility of Market bought Fresh Vegetables**

In order to assess the availability of market fresh produce in the Boston Bar area local vendors selling groceries were identified and surveyed. In the Boston Bar area there are five stores that sell groceries. The survey was conducted in January of 2008 and repeated in September 2008, where each store was contacted by phone and asked these questions:

1. Does the vendor carry fresh produce?



2. If the vendor carries fresh produce, what kinds does it carry, specifically?

The answers were noted and tabulated (See Table III-9). The phone survey was repeated to check for seasonal availability during winter and late summer harvest time.

## c) Results & Discussion

### Nutritional Constituents: Amounts and Nutrition Label

This nutritional analysis provided new data on a typical nutritional constituent profile and quantities for *Lomatium nudicaule*. New data that have not been previously reported include values for food energy, protein, fat, carbohydrates, crude fiber, ash, vitamin A, and sodium. In this analysis the following nutritional values per 100 g previously frozen *L. nudicaule* leaf were detected: food energy (50 kcal / 266 kJ), water (moisture) content (85.2 g), protein (2.7 g), fat (0.74 g; saturated 0.14g, monounsaturated 0.11g, polyunsaturated 0.49g – 0.1g omega 6 and 0.4 g omega 3), carbohydrate (9.2 g), crude fiber (8.3 g), ash (2.2 g), vitamin A (beta carotene - 4440 IU), calcium (364 mg), sodium (2.33 mg), potassium (366 mg), and iron (1.12 mg) (See Table III-5). Nutrients that were not detected, because they may be present below the detection limit or not present at all, are listed here followed by the detection limit per 100 g: trans fatty acids (0.01 g), cholesterol (0.25 mg), simple sugars (0.2g), retinol (33 IU) and vitamin c (ascorbic acid - 0.42 mg). The full report can be found in Appendix XVII.

**Table III-5 Nutrient values of *Lomatium nudicaule* (Tseweta) leaves**

Name Scientific / Common	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)
<i>Lomatium nudicaule</i> Tseweta	leaves	50	85.2	2.7	0.5	9.2	8.3	2.2	4440	364	2.33	366	1.12

Labeling of food products with “Nutrition Facts” was introduced in Canada in 2003 and made mandatory by 2005. Nutritional labels are beneficial to get an overview of important macro- and micronutrients needed to achieve optimum health, and to compare food products. Based on the nutritional analysis results of *Lomatium nudicaule* leaves a Canadian nutrition label was produced by CANTEST LTD for reference purposes only. Figure III-7 represents nutrition facts label for *Lomatium nudicaule* leaves per 100 g. This nutrition label provides information on energy and nutrient content per 1 serving (100g) depicted in both amounts and percent daily value (% DV). The percent daily values represent nutrient amount in food sample to meet the reference or recommended daily intakes and are based on a 2000 calorie diet (Health Canada, 2008). The label for *L. nudicaule* shows that the following macro and micronutrients provide the following percent daily values: fat (1%), saturated and trans-fats (0%), cholesterol (0%), sodium (0%), potassium (10%), carbohydrates (3%), fiber (33%), vitamin A (45%), vitamin C (0%), calcium (35%), and iron (8%).

The U.S. Federal Drug Administration (1996DA) and Health Canada (2006) provide relevant information on analyzing nutrition fact labels. The quick guide to % DV by the FDA (1996DA) describes values less than 5 % as low and more than 20 % as high. Using this guide *L. nudicaule* has low % DV for fat (particularly saturated and trans-fats), cholesterol, sodium, carbohydrates, and vitamin C. Percent DV that can be described as high include fiber, vitamin A, and calcium. Low and high percent daily values are beneficial to identify because this can be used as a frame of reference and used to compare to other foods’ % DV. As well, percent daily values combined with actual nutrient amounts can be used to analyze foods for their potential contributions and effects on health.

Figure III-7 *Lomatium nudicaule* Nutritional Label

## Cteweta (2005)

Nutrition Facts	
Valeur Nutritive	
Per 1 serving (100 g) / Pour 1 serving (100 g)	
Amount	% Daily Value
Teneur	% valeur quotidienne
<b>Calories / Calories 50</b>	
<b>Fat / Lipides 0.5 g</b>	<b>1%</b>
Saturated / saturé 0 g	0%
+Trans / trans 0 g	
Polyunsaturated/polyunsaturés 0.5 g	
Omega-6/oméga-6 0.1 g	
Omega-3/oméga-3 0.4 g	
Monounsaturated/monounsaturés 0.1g	
<b>Cholesterol / Cholestérol 0 mg</b>	<b>0%</b>
<b>Sodium / Sodium 0 mg</b>	<b>0%</b>
<b>Potassium / Potassium 370 mg</b>	<b>10%</b>
<b>Carbohydrate / Glucides 9 g</b>	<b>3%</b>
Fiber / Fibres 8 g	33%
Sugars / Sucres 0 g	
<b>Protein / Protéines 3 g</b>	
Vitamin A / Vitamine A	45%
Vitamin C / Vitamine C	0%
Calcium / Calcium	35%
Iron / Fer	8%

Analysis of previously published research

Previously published data on the nutritional constituents of *Lomatium nudicaule* have been limited and provided primarily information on micronutrient content. Kuhnlein and Turner (1990) summarized available nutritional data on *L. nudicaule* from two independent sources by Benson et al. (1973) and by Keely (1980). Both authors analyzed nutrient values for *L. nudicaule* in the context of the Warm Springs Reservation of the Pacific Northwest, located in the high central plateau east of the Cascade Mountains in Oregon.

Benson et al. (1973) analyzed 100 g fresh stem tissue of *L. nudicaule* and reported nutrient values as follows: water 87.8 g, calcium 36.6 mg, potassium 303.8 mg, magnesium 22.3 mg, copper 0.12 mg, zinc 0.39 mg, iron 0.7 mg, thiamine 0.02 mg, riboflavin 0.08 mg, vitamin C 66.0 mg (young growth) and 17 mg (old growth). Keely (1980) provided an additional value for vitamin C for *L. nudicaule* shoots as 40.7 mg/100 g fresh weight. Comparative nutrient values between this study and Benson et al. (1973) and Keely (1980) are shown in Table III-6. Nutrient values that can be compared with this study from previously published nutritional analysis data on *L. nudicaule* include moisture, potassium, calcium and vitamin C. Similar quantities are reported for water and potassium. Discrepancies are found for vitamin C and calcium.

**Table III-6 Nutrient values from previously published nutritional analysis data on *L. nudicaule***

	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)	Iron (mg)
This Analysis	leaves	50	85.2	2.7	0.5	9.2	8.3	2.2	4440	-	364	2.33	366	1.12
Benson et al. (1973)	Stems		87.8							17 & 66	36.6		303. 8	0.7
Keely (1980)										40.7				

### Calcium discrepancy

In this study *Lomatium nudicaule* leaves contained 364 mg calcium per 100 g, whereas Benson et al. (1973) reported 36.6 mg/100 g fresh weight. For this study and the Benson et al. (1973) analysis OM – AOAC were used. Variations mineral content of vegetables have been observed as early as 1936. A study by Davidson and LeClerc (1936) described how mineral content, including calcium, varies in vegetables such as spinach and kale. For example, spinach collected at different sites on the same field showed variation in mineral content; however, when the spinach originated from two independent fields with different growing conditions this variation was even more pronounced with differences above 100%. Irrigation and fertilization methods were cited as potential factors. Davidson and LeClerc (1936) also noted that instead of identifying specific values to minerals found in vegetables a range of values should be sought. Another study concluded that the greatest influence on vegetable mineral content were environmental factors, such as soil type, fertilizer practice, and climate (Bear, Toth, & Prince, 1948). The same study based in the United States concluded that “Ash, Ca, and cation-equivalent values tend to increase from south to north and east to west” (Bear et al., 1948).

### Vitamin C discrepancy

Discrepancies in vitamin C content are as follows. No vitamin C was detected in this study. Previously published vitamin C nutrient values reported vary between and within publications. Kuhnlein and Turner (1990) quoted the vitamin C content of 100 g fresh *L. nudicaule* by Benson et al. (1973) as 66.0 mg and Kelly (1980) as 40.7 mg. In the original publication by Keely (1980) the vitamin C content was stated as 43.23 g. Keely (1980) also noted that Benson et al. (1973) found a difference in vitamin content between young and old growth with 66 mg and 17 mg respectively. Keely (1980) attributed the difference in ascorbic acid values between his and Benson et al. (1973) to potential intraspecies variation, as well as, the effects of light exposure on vitamin C content prior to harvest.

### Addressing the lack of vitamin C detected in this study

In this study vitamin C was not detected, whereas previous studies reported vitamin C values. A major difference in methodology between this study and Benson et al. (1973) is that frozen *L. nudicaule* samples in this study were analyzed after 6 months, whereas in Benson et al. (1973) vitamin analysis of plant samples was usually done within 24 hours of being frozen. A variety of pre-harvest, harvest and post-harvest factors can influence the degradation of vitamin C in food plants. These are discussed in the following paragraphs.

**Pre-harvest** factors that have been reported to promote lower vitamin C content include low light exposure, frequent irrigation, high temperatures and high concentrations of nitrogen relative to available potassium (Lee & Kader, 2000). It should be noted that the effects of these listed factors only represent observed trends, and that variation, as well as contradictory results have been reported (Lee & Kader, 2000).

During **harvest** and handling, mechanical injuries such as bruising, surface abrasion or cuts can accelerate oxidation and thus vitamin C loss, particularly in the tender leaves of leafy greens such as *Lomatium nudicaule* (Lee & Kader, 2000). Vitamin C degrades quickly upon oxidation, which can be catalyzed by the release of vitamin C degrading enzymes, such as ascorbate oxidase that may be released when plant cells are damaged (Lee & Kader, 2000).

**Post-harvest**, vitamin C concentrations may have been negatively impacted because plant samples were transported at ambient temperatures before being frozen. This may have exposed them to high temperatures, as ambient temperatures in the Fraser Canyon can easily reach 40 C in the summer. High temperatures have been reported to negatively impact vitamin C content (Lee & Kader, 2000). As well, the samples were frozen for more than 6 months before being analyzed. For example, vitamin C losses of up to 56% were observed after long-term frozen storage of raspberries at minus 20 C (de Ancos, Gonzalez, & Cano, 2000).

To promote the preservation of future *Lomatium nudicaule* plant parts to be used for analysis particularly for vitamin C, a protocol for collecting plant samples could include: minimizing mechanical injury caused to leaves during harvesting, transporting plants in a cool container, and analyzing plant samples, if possible fresh, before being frozen and once frozen to analyze plants prior to 6 months.

### **Nutritional Comparison**

Analysis of comparative nutrient values of a total of ten traditional and market food plants, including *L.nudicaule* was done. Nutrient data from this nutrient analysis and previously published analysis was compiled as shown in Table III-7. This chart allowed for comparing nutrient values between plant species. All the amounts constitute 100 g fresh weight of each food. For example, 100 g of *L. nudicaule* is approximately equal to a one cup serving (Benson et al., 1973). As well, nutritional comparison chart was used to rank plant nutrient values within each nutrient category from highest to lowest value starting with 1. The ranking scores are shown in Table III-8.

**Table III-7 Nutritional Comparison Chart of traditional and market green leafy vegetables**

Name  Scientific / Common	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)	Iron (mg)
<i>Lomatium nudicaule</i>  * Tseweta *	leaves	50	85.2	2.7	0.5	9.2	8.3	2.2	4440	17-66 <sup>1</sup>	364	2.33	366	1.12
<b>Traditional Foods<sup>1</sup></b>														
<i>Chichorium intybus</i>  Chicory	leaves	24	93	1.8	0.3	3.8	0.8	1.3	400	28.6	86	40	420	0.9
<i>Taraxacum officinale</i>  Dandelion	greens	45	85	2.7	0.7	9.2	1.6	1.8	1400	35.0	209	73	422	4.1
<i>Epilobium angustifolium</i>  Fireweed	leaves	-	76	6.5	-	2.9	1.4	1.8	22	88.0	175	50	404	2.7
<i>Heracleum lanatum</i>  Cow's parsnip	Stalks peeled	20	95	0.4	0.2	3.8	0.9	0.6	7.5	3.5	28	0.5	-	0.3
<i>Rubus parviflorus</i>  Bryers, Thimbleberry	Shoots peeled	22	93	0.6	0.4	5.5	1.0	0.6	41	5.9	24	1.0	-	0.4
<i>Urtica dioica</i>  Stinging Nettle	Leaves	38	89	1.8	0.6	7.9	1.4	1.2	2248	75.0	236	0.8	321 (leaves)	1.0



Name  Scientific / Common	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)	Iron (mg)
<b>Market Foods<sup>2</sup></b>														
Kale	leaves	28	91.1	2.66	0.46	4.9	2.0	0.9	3750	39.3	136	15	333	0.93
Spinach	leaves	31	89.5	3.94	0.75	4.3	3.1	1.5	7035	24.3	155	74	372	2.03
Iceberg Lettuce	leaves	14	95.6	0.90	0.14	2.97	1.2	0.4	299	2.8	18	10	141	0.41

Sources: 1 'Traditional Foods' Kuhnlein & Turner (1990); 2 'Market Foods' Canadian Nutrient File 2007

**Table III-8 Ranking Scores of the Nutritional Comparison Chart**

Name  Scientific / Common	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)	Iron (mg)
<i>Lomatium nudicaule</i>  Tseweta	leaves	<b>1</b>	<b>7</b>	<b>3*</b>	<b>4</b>	<b>1*</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>6</b>	<b>5</b>	<b>4</b>
<b>Traditional Foods</b>														
<i>Chichorium intybus</i>  Chicory	leaves	<b>6</b>	<b>3*</b>	<b>5*</b>	<b>7</b>	<b>6</b>	<b>9</b>	<b>2</b>	<b>6</b>	<b>6</b>	<b>7</b>	<b>4</b>	<b>2</b>	<b>7</b>
<i>Taraxacum officinale</i>  Dandelion	greens	<b>2</b>	<b>9</b>	<b>3*</b>	<b>2</b>	<b>1*</b>	<b>4</b>	<b>4*</b>	<b>5</b>	<b>5</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>

Name  Scientific / Common	Part Used	Food Energy (kcal)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Crude Fibre (g)	Ash (g)	Vitamin A (IU)	Vitamin C (mg)	Calcium (mg)	Sodium (mg)	Potassium (mg)	Iron (mg)
<i>Epilobium angustifolium</i>  Fireweed	leaves	n/a	8	1	n/a	8	5*	4*	9	1	4	3	3	2
<i>Heracleum lanatum</i>  Cow's parsnip	Stalks peeled	8	2	8	8	6	8	7	10	9	8	9	n/a	10
<i>Rubus parviflorus</i>  Bryers, Thimbleberry	Shoots peeled	7	3*	7	6	3	7	7	8	8	9	7	n/a	9
<i>Urtica dioica</i>  Stinging Nettle	Leaves	3	6	5*	3	2	5*	3	4	2	2	8	8	5
<b>Market Foods</b>														
Kale	leaves	5	4	4	5	4	3	6	3	4	6	5*	6	6
Spinach	leaves	4	5	2	1	5	2	5	1	7	5	1	4	3
Iceberg Lettuce	leaves	9	1	6	9	7	6	8	7	10	10	5*	7	8

- Each species ranked in each nutrient category highest to lowest with 1 being the highest value (highlighted).
- An asterix (\*) indicates multiples of the same value.

The results from the ranking analysis were that *L. nudicaule* leaves had the highest ranking in the following five nutrient categories: food energy (50 kcal), carbohydrate (9.2 g), crude fiber (8.3 g), ash (2.2 g), and calcium (364 mg). Overall, *L. nudicaule* ranked highest in more nutrient

categories than any other compared food plant. As well, *L. nudicaule* ranked second highest for vitamin A (4440 IU), and third highest for protein (tied with *T. officinale* greens at 2.7 g) and vitamin C (66<sup>2</sup> mg). *L. nudicaule* had mid-ranking values (4 and 5) for fat (0.5g), sodium (2.33g), potassium (366 mg), and iron (1.12g). The lowest rank for *L. nudicaule* was seven out of nine for water content (85.2 g). From using the comparison charts some nutrient categories, such as fiber, food energy, mineral and vitamin content, especially stand out because they are present in higher quantities in *L. nudicaule*'s than any of the other nine plant foods in the comparison.

The most notable nutrient value that makes *L. nudicaule* distinct from other compared plants is the fiber content of its leaves (8.3 g), which is more than twice the value given for spinach (3.1g), the second highest fiber containing plant. All other compared foods contained 2 g of fiber or less, with cow's parsnip having the least (0.9 g). The comparison also showed that *L. nudicaule* provides the most food energy (50 kcal). Dandelion and stinging nettle provided the next highest food energy values (45 kcal and 39 kcal respectively), and iceberg lettuce the least (14 kcal). *L. nudicaule* is also comparatively high in minerals, such as calcium and iron. In fact in the comparison it contained the highest amount of calcium (364 mg), which is more than 100 mg above the calcium values of the next highest ranking plants, stinging nettle (236 g) and dandelion (209g). *L. nudicaule* had an average value for iron (1.12 g), comparable to the iron content of kale (0.93g). Plants containing considerably higher iron were dandelion (4.1 g), fireweed (2.7 g), and spinach (2.03 g). The comparison showed that *L. nudicaule* has relatively high vitamin content, including vitamin C (66 mg) and vitamin A (4440 IU), where it ranked third and second respectively. Vitamin A values ranged widely in the comparison from plants like iceberg lettuce (2.8 IU) containing very little, to spinach (7035 IU) containing the most.

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<sup>2</sup> as reported by Turner and Kuhnlein (1990)

### **Nutritional health effects of Selected Nutrients: Fibre, Calcium and Vitamin A**

The nutritional analysis of *Lomatium nudicaule* showed the plant is particularly rich in fibre, calcium, and Vitamin A - providing the highest percent daily values of all the nutrients found in *L. nudicaule*. Other important nutrients found in moderate amounts in *L. nudicaule* are protein, polyunsaturated plant fats, vitamin C, potassium and iron. To highlight the health effects of some of these nutrients, fibre, calcium, and Vitamin A are discussed in detail in this section, because they are found in greatest abundance in *L. nudicaule* and thus may have the greatest nutritional effect on human health. As well, these nutrients have been shown to lack in First Nation peoples' diets that have shifted away from traditional diets (Receveur, Boulay, & Kuhnlein, 1997). It should also be noted that even though certain nutrients may be associated with particular health benefits, effects on overall health are usually a combination of factors. These include health effects of specific nutrients (alone or in combination), lifestyle choices and the synergy of diets and lifestyles as a whole.

#### ***Fibre***

*L. nudicaule* leaves are particularly high in dietary fibre. Dietary fibre are made of complex non-digestible carbohydrates and lignin found in plant foods, and are categorized based on their water solubility as insoluble or soluble fibre (Harvard School of Public Health Nutrition Source, 2007). Dietary fibre has been associated with several potential health benefits. For instance, high fibre intakes have been linked with: better glycaemic control, lower serum cholesterol concentrations, reduced blood pressure, enhanced weight control, and improved gastrointestinal function (J. W. Anderson, Smith, & Gustafson, 1994). As such, the action of high fibre diets reduces risk factors associated with diseases such as metabolic syndrome, diabetes, heart disease, diverticulosis, and constipation. As well, high total fibre has been linked with reduced cancer deaths. In specific, for chronic conditions such as type 2 diabetes dietary fibre have shown to decrease glucose, insulin, and serum lipid concentrations in both diabetic and non-diabetic persons (J. W. Anderson & Hanna, 1999; Chandalia et al., 2000). As

well McKeown et al. (2002) postulate that elevated fibre concentrations improves insulin sensitivity.

*L. nudicaule* leaves exhibited high fibre content with approximately 8.3 g total fibre per 100 g plant dry weight. *L. nudicaule* leaves had the highest fibre content when compared with the eight other traditional and market leafy green vegetables. It also had more than twice the amount of fibre than fresh spinach, the second highest fibre containing plant compared. Current guidelines in Canada recommend that adults should consume at least 26 grams of fibre per day (Engel). The daily reference intakes (RDI) for fibre recommended by Health Canada are 38 g for men and 25 g for women ages 14 to 50 (Health Canada, 2006 a). Yet, the average Canadian only consumes 4.5 to 11 g of fibre per day (Engel). Based on a 2000 calorie diet a 100 g portion of *L. nudicaule* leaves accounts for 33 % of the recommended daily fibre intake. Percent daily values over 5% are considered high. This indicates that *L. nudicaule* can be a valuable source of fibre and contribute toward a high fibre diet, which is associated with important health benefits.

### *Calcium*

Calcium is present in relatively high quantities in *L. nudicaule* leaves and is important in maintaining human health. Calcium is the most abundant mineral in the human body with 99% of it stored in bones (National Institutes of Health, 2006a). A constant level of calcium is maintained in body fluid and tissues to support vital body processes such as muscle contraction, blood vessel contraction and expansion, nervous system messaging, and the secretion of hormones and enzymes. Calcium is also essential for the healthy development of bones and teeth. As well, a health claim in Canada states that “calcium intake, when combined with sufficient vitamin D, a healthy diet, and regular exercise, may reduce the risk of developing osteoporosis” (L'Abbe, Whiting, & Hanley, 2004). Higher amounts for calcium are required by young people to provide additional bone mass and in older adults to reduce bone loss and fractures.

*Lomatium nudicaule* per 100 g provides 364 mg and has a 35 % DV for calcium. The % DV is based on a 1000 mg calcium intake recommended for adults (Institute of Medicine (IOM), 2006). It should be recognized that children, youth, and the elderly generally require more calcium. For example, the recommended adequate intake (AI) for calcium is 1300 mg, 1000 mg, and 1200 mg for ages 9-18, 19-50, and 50+ respectively ( IOM 2006). Pregnant and breastfeeding mother's recommended AI for calcium is 1300 mg and 1000 mg for ages 14-18 and 19+ respectively. The minimum intake for calcium is 65 mg (based on approximately 5% of the highest AI) ( IOM 2006).

Health Canada (2002) lists excellent and good sources of calcium to include milk products (yoghurt, milk, cheese), fish, and sesame seeds. Vegetables such as mustard greens are listed under sources. Per 100 g whole milk (3.75% fat) contains 119 mg of calcium; kale (raw; frozen; cooked) 135-138 mg; and spinach (raw; frozen; cooked) 99, 155, 153 mg (Health Canada, 2007). Compared with *L. nudicaule*, which provides 364 mg calcium per 100 g, the mentioned sources of calcium all provide less. This exemplifies that *L. nudicaule* compares with or exceeds other sources of calcium per 100 g. From this information *L. nudicaule* could also be listed as an excellent source of calcium. However, the bioavailable calcium needs to be determined in the future, and for this purpose, the presence of oxalates or other compounds that interfere with calcium availability studied.

### ***Vitamin A***

*L. nudicaule* leaves are high in vitamin A, vital for human health. Vitamin A has important roles in human health including in cell division, cell differentiation, reproduction, vision, bone growth, and immune defense (National Institutes of Health, 2006b). Vitamin A is particularly important in preventing and fighting infections. In prevention, vitamin A plays an important role in maintaining effective barriers in the body against bacterial or viral intruders by promoting healthy surface linings of the eyes, respiratory, urinary and intestinal tracts, as well as skin and mucous membranes. Vitamin A also aids in regulation of the immune system, and may help lymphocytes fight infections more effectively. Another important activity of vitamin

A compounds are their action as physiological modulators that have shown benefits in the prevention of cell mutagenesis and thus certain cancers (Olson, 1996).

*L. nudicaule* leaves showed a relatively high vitamin A content, providing 4440 IU of beta carotene per 100 g serving and a 45 % DV. Vitamin A is a group of compounds that are derived in the diet from plants in the form of carotenoids (provitamin A) or from animals in the form of retinol (preformed vitamin A) (National Institutes of Health, 2006b). Of the provitamin A carotenoids, beta-carotene is most efficiently made into retinol; retinol being the most usable (active) forms of vitamin A (National Institutes of Health, 2006b). To maintain proper health the dietary reference intakes for vitamin A are 3000 IU per day for men and 2333 IU for women, with lactating women requiring as much as 4333 IU (Health Canada, 2006 a). Safe total daily values for adults, including pregnant women, of vitamin A are 8000 – 10,000 IU (Olson, 1996). Beyond this vitamin A can induce acute, chronic, or developmental toxicity. Therefore, in one 100 g serving of *L. nudicaule* the daily DRI for men and women can be reached. No more than 200 g of *L. nudicaule* should be consumed per day in order to prevent vitamin A toxicity.

#### **Local Accessibility of Market bought Fresh Vegetables**

In the phone survey to assess market availability of local fresh produce in the immediate area (15 km radius) of Boston Bar a total of five vendors selling groceries were identified and contacted in January and September of 2008. The vendors included one grocery/hardware store, the Fraser Canyon Market (also known as Happy Face Market), and two gas stations, including the Canyon Husky and the Boston Bar Esso, within the township limits of Boston Bar proper. As well, two First Nation run gas bars in the immediate vicinity of Boston Bar were surveyed, including the Boston Bar First Nation Gas Bar and Boothroyd First Nation Kamoose Gas Bar. The results of the survey are shown in .

Table III-9.

**Table III-9 Fresh Produce Availability Survey Results**

	Survey	Question Asked	
Vendor	2008 Month	1. Do you carry fresh produce?	2. If yes, what kind of fresh produce do you have available?
Fraser Canyon Market (604) 867-9422 48045 Trans Canada Hwy	Jan.	Yes	lettuce (iceberg)
	Sept.	Yes	lettuce (iceberg and romaine), broccoli, cabbage, celery, peppers (green, red and yellow), tomatoes, potatoes and garlic
Canyon Husky Gas Station 604-867 -9288 48165 Trans-Canada Hwy	Jan.	No	
	Sept.	No	
Boston Bar Esso Gas Station 604-867-8868 48100 Trans-Canada Hwy	Jan.	No	
	Sept.	No	
Boston Bar First Nation Bear Essentials Gas Bar 604-867-9252 Trans-Canada Hwy	Jan.	No	
	Sept.	No	
Boothroyd First Nation Kamoose Gas Bar 604-867-9522 Trans-Canada Hwy	Jan.	No	
	Sept.	No	

From the survey only one of five stores had fresh produce available. The Fraser Canyon Market carried fresh produce year round, with a small section of fresh vegetables. At the time of the survey in January 2008 they had heads of lettuce available. At the time of the survey in September 2008 they had a variety of fresh produce available including lettuce (iceberg and romaine), broccoli, cabbage, celery, peppers (green, red and yellow), tomatoes, potatoes and garlic. Other stores interviewed said they did not carry fresh produce, neither in January nor in September.



The results of this survey show that market availability of fresh produce is limited in the Boston Bar area with seasonal availability of what is offered at one local store. Within a 70 km radius there are Hope and Lytton, B.C., two greater centers in closest proximity to Boston Bar, where a variety of vendors have fresh produce available to buy year round. A motorized vehicle and time is required to readily access these centers for fresh produce.

## **Chapter IV. Research Synthesis and Reflections**

### **A. Introduction: Significance, Transformation, Success and Challenges**

This final chapter situates Connecting Our Roots (COR) within the greater context of holistic Indigenous health research, and provides a research synthesis and discussion on the main components: Research Process, Plant Research, and Education. COR's research process was fostered through the ongoing collaboration of myself, the academic researcher, and Boston Bar First Nation, the Indigenous research partner, as well as academic mentors at UBC. In this community-based participatory action research (CPAR) my role has been as a participant, learner, resource, catalyst and facilitator. This dissertation reflects my role as the research storyteller.

As an opening to this final chapter I offer a reflection on reporting back to the Boston Bar First Nation community. 'Bringing the Research Home' is written in a narrative style. COR's participatory research involved the engagement and interaction of people, which are difficult to convey in formalistic writing. Through using a narrative style I aim to facilitate insight to the 'lived experience' of the CPAR process and bring you, the reader, into the circle of relationships and connections that were an essential part of the COR research journey.

I chose to share this personal experience of reporting back, because it provides an overview of the whole research process. Being back to the BBFN reserve I was also reminded of why this research was significant for me. COR was about creating and maintaining healthy relationships. Bringing the full research findings back to the community in the form of a thesis, I was both excited to share the full report on our collaborative research and I was nervous about how my interpretation and telling of the research would be received.

## **1. Bringing the Research Home**

On March 20<sup>th</sup>, 2009, I travelled to the Boston Bar First Nation reserve from my home in Vancouver as I had done so many times before over the past six years. The BBFN Band Council had invited me for the purpose of sharing with them this dissertation on our collaborative research. This thesis was written by me and represents my interpretation of the personal and collective research experience. The content of this thesis was inspired by and features the rich experiences of the community-based research process with Boston Bar First Nation. Before proceeding with any academic presentations or publications an approval of the thesis content from the BBFN Council was required. This was part of the participatory process and the respectful and responsible research environment fostered in the COR research. As well, it was a matter of principle outlined in the BBFN-UBC IAH Code of Research Ethics developed as part of COR. In this view, the BBFN Council was my community examining committee. Before the meeting with the BBFN Band Council I anticipated our dialogue and their response.

“Research beyond Hope and just past Hell’s Gate,” is a play on words describing the location of the Boston Bar First Nation reserve. I set off to meet with the BBFN Council, leaving Vancouver in the early afternoon after a long night of preparations and printing volumes of materials in the morning. From experience, I knew the roads to the BBFN reserve could be treacherous due to weather and road conditions. Beyond Hope, Highway One climbs as a winding passage through the Canyon, where semi-trucks barrel through tight tunnels, landslides take out roads regularly, and accidents abound. This time driving up the Canyon there was a torrential downpour. I felt relieved when I reached Hell’s Gate, because it meant the BBFN reserve was minutes away.

When I walked into the Band Office lugging my presentation with me through the rain I was relieved to be greeted by familiar faces. The whole BBFN Band Council was present and seated around an oval shaped table in the middle of the room, including Chief Dolores O’Donaghey, Councillors Roy Campbell, Roy ‘Ali’ O’Handley, and Christine Grafinger. The first person I saw was Roy Campbell, who has been my primary community mentor and who always looked out

for me. His presence grounded me, as he had been a foundation for me to be able to do this work.

Each one of the Council members have been co-directors of this research and engaged in the research process as primary community mentors over the years. Among them again, I felt the positive connection that had been cultivated over the years, and we greeted each other warmly. It had been a while since I sat with them to discuss research matters, as we had done regularly throughout the research process. I felt at ease knowing that our ability to work together had enabled this process.

I shared a PowerPoint presentation, including 58 colour slides on the whole research process, outcomes and reflections as well as supporting printed materials, such as publications from the COR activities for future use and reference. These included professionally printed and bound colour copies of the 'Reporting Back' presentation, the full thesis draft, posters of the research, and community publications we had co-created, including Heritage Village and Interpretive Plant Trail guides. The Band Council also received digital copies of all the major publications and pictures taken during the research process, so that they had the access to original files produced as part of COR.

The presentation materials, and this thesis, produced lively discussion, especially offered about featured community members. Each Council member flipped through the pages of the hand-outs and provided feedback. Chief Dolores O'Donaghey provided detailed editorial feedback on the content, formatting, and overall grammar and spelling in the publications. The Band Council expressed their appreciation for the presentation and format, accessibility of information, and applicability of materials presented.

During the presentation, the Council and I reflected on participating in the research process together, and found common ground even when discussing challenging aspects of the research. This included sharing academic methodology and outcomes complicated by the

transdisciplinary nature of this research that spans cultures, knowledge systems, and disciplines. The Tseweta research alone involves Indigenous science, botany, anthropology, biochemistry, microbiology, and nutritional sciences. The trusting relationship and knowledge translation skills I developed over the years supported a comfortable environment for participatory dialogue to discuss complicated results with the Band Council. The result was that Band Council members were engaged in asking questions that I answered to the best of my ability and greater understanding and interest in the analysis and outcomes was facilitated by discussion.

During the Council meeting there was also in-depth dialogue about the future direction of the research outcomes. For one, the Council identified that the capacity building aspects and tangible resources produced by this research will be important assets for their Heritage Village. The Heritage Village will be opened to the community and public in summer 2009. Council shared with me that it intends to feature Connecting Our Roots research and outcomes at the visitor's centre through posters, guides and presentations. The Band Council also intends to further develop the traditional plant trail with proper permanent signage using the YCR's research and publications created as part of COR. This will serve to share the research outcomes with a wider community, and the Council invited me to return to help facilitate incorporating the outcomes of COR in future community initiatives. Some of the BBFN youth who participated in COR have already expressed their interest to share their cultural expertise and implement their skills as hosts. These are some of the ways the research outcomes of COR will continue to contribute toward preserving, showcasing and revitalizing the Boston Bar First Nation's, and also Nlaka'pamux, heritage and living culture.

Overall, it was a wonderful experience for me to share the COR research in its entirety with the BBFN Band Council. The Council's interest was high and we had a good time around the table in the Band Office discussing the research process, outcomes and future directions. I believe that the community-based participatory research process contributed to the Band Council's

keen interest in the research, because this approach supported Band members to be active agents of positive change for their community.

At the end of my presentation I asked the BBFN Band Council for their feedback and approval of the thesis document. The response from Council was that they were very pleased with the research conduct and outcomes, as well as the thesis document. I also asked their approval of the pictures used in the thesis. Other than corrections on name spellings the Band Council expressed their satisfaction with the content and presentation. When I asked Chief Dolores O'Donaghey what her favourite aspect of the research was for her she said: "The meaning of the research name "Connecting Our Roots" (personal communication, March 20<sup>th</sup>, 2009)

After the Council meeting I also followed up with BBFN community members on a personal basis, and experienced so many heartfelt community connections. Especially memorable were Gary 'Kachels' Florence's reflections which he shared with me while he showed me the new winter home and developments at the Heritage Village (personal communication, March 21st, 2009). Kachels means 'Little Big Man' in Nlaka'pamux, a name given to him by his grandmother. Gary sees himself as the spiritual leader of the Heritage Village, the 'Eagle Man'. During our walk Gary reflected that he saw me as a community healer - knowledgeable about traditional and modern plant knowledge and most importantly that I helped bring the people together and connect them with their roots. For Gary, creating unity in the community was a healing process. To be healthier he saw the need "to be in contact with who we really are" (March 21st, 2009). He then took me to his house and gave me a carving he made of an eagle head out of local soapstone. He told me that next time he will see me he will add the feathers that he felt I have earned.

The experience of coming back to BBFN to report was personally significant. First of all it was very meaningful that the BBFN Band Council approved of the research and the thesis unanimously. In addition, during the follow up visits with research mentors I recognized that through the research experience I had gained deep connections with the people and the land,

and that this provided the motivation and sustenance to follow through with the research process as it did. A special personal relationship had been cultivated over the past years with each person with whom I worked closely. In their homes I was treated like a special guest, a friend, or an adopted family member. Many people gifted me with traditional foods that they had hunted or gathered and prepared. This was part of the generosity that the BBFN community had shown me throughout the research process and that I am very thankful for.

Altogether, the COR research fostered an environment for meaningful engagement and outcomes of lasting significance. I was transformed by being able to be part of this process as a catalyst and facilitator. COR brought us together, Indigenous and academic, sharing our ‘transdisciplinary’ knowledge and skills to proactively address issues as part of this community-driven holistic health research initiative. As Kachels reflected, the meaning of this research was “for everyone to get their roots planted and believe in who they are” (Gary Florence, personal communication, March 21, 2009).

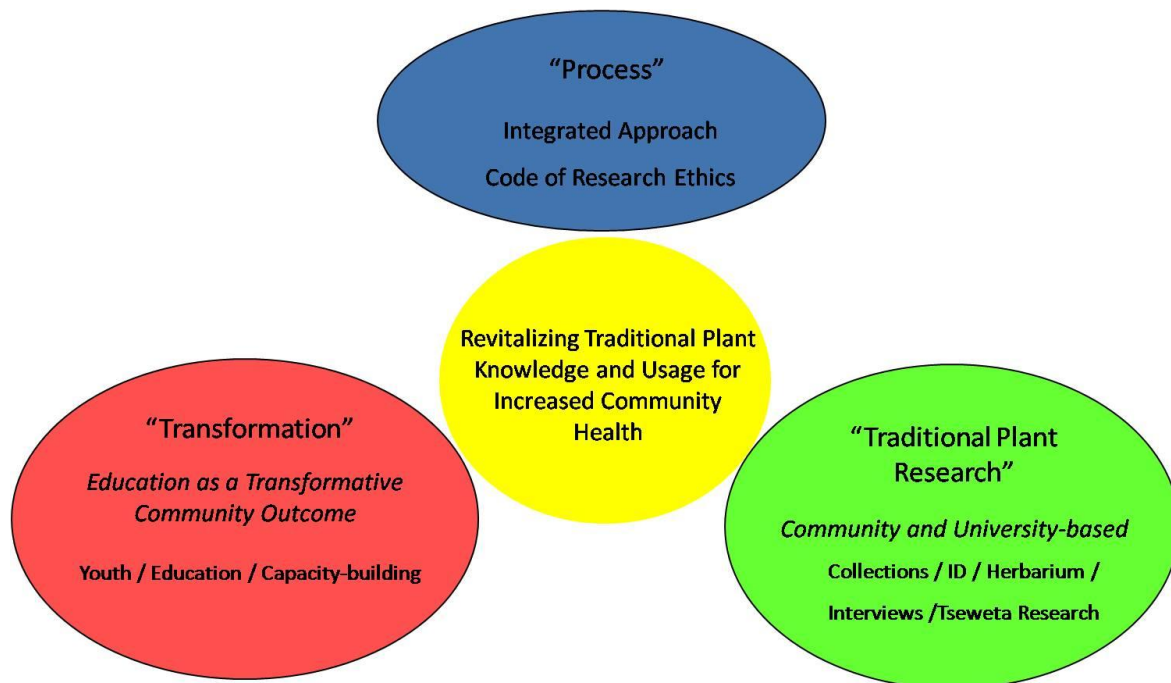
## **2. COR - Three Main Components**

The research reflection shared above speaks to the multi-dimensionality of Connecting Our Roots, and the significance of the research process and outcomes to participants. In the larger context, the COR research is part of an holistic and ecological approach to health where the health of people is rooted and connected with the health and integrity of the local environment (Martin, MacAulay, McComber, Moore, & Wien, 2006). Through the participatory process of Connecting Our Roots, three main components developed that contributed to Indigenous health research: Process, Traditional Plant Research, and Transformation. These three main components are centered on the research focus of revitalizing traditional plant knowledge and usage for greater health in their community, as requested by Boston Bar First Nation.

Figure IV-1 shows the three main components of COR centered around TPKU, including: 1) “Process” involved creating a culturally appropriate research environment sensitive to the

Aboriginal context of Boston Bar First Nation, 2) “Traditional Plant Research” as a holistic and ecological approach to health and wellbeing, and 3) “Transformation” involved community-based youth education initiatives which were a transformative outcome of the research process. All three components are interrelated and facilitated by the processes of developing cultural competency and knowledge translation. This chapter is organized to reflect these three main research components and aims to provide a synthesis on the learning outcomes and significance of the results and experience.

**Figure IV-1 Connecting Our Roots Main Research Components**



## **B. Research Process:**

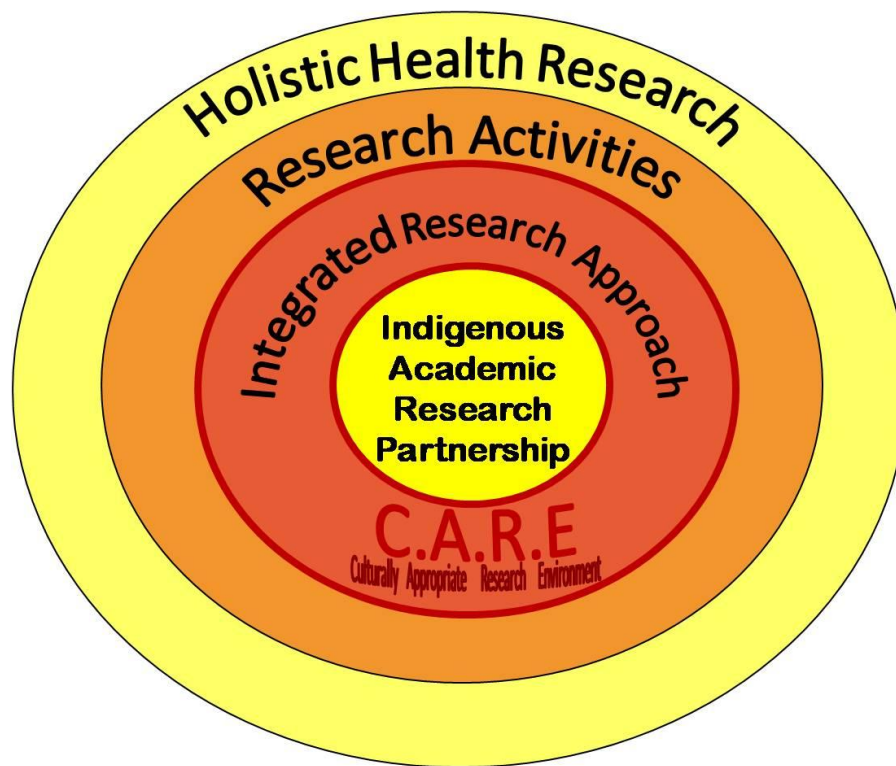
Establishing the culturally appropriate research environment created by COR was fundamental for the research process to proceed. This was the first objective of COR. An integrated research approach was adopted in order to be respectful to the Indigenous context of COR. Specifically this included Indigenous principles and ethics, as well as academic research



approaches, such as community-based participatory action research that supported the transdisciplinary and transformative grounding of this research. This integrated approach acknowledged and proactively addressed historical power imbalances between Indigenous communities and academic research institutions. Principally, this approach supported the empowerment of the Boston Bar First Nation as full research partners, which provided the basis for the holistic health research process to proceed and unfold as it did. Below, I lay out the successive development of this holistic research approach. In the following section, I provide a descriptive account of the specific components that facilitated this research process to manifest, such as the Indigenous principles and ethics and the ‘on-the ground’ community-based participatory research.

### **1. COR’s Holistic Health Approach**

In COR’s holistic health approach the research process involved successive development (Figure IV-2). Pictured at the centre of diagram is the Indigenous - academic research partnership, which initiated the research process by envisioning and negotiating the research process collaboratively. To pursue the research vision, the need for a culturally appropriate research environment (CARE) was identified by research partners and established through choosing an integrated research approach. This provided structure by defining the research ethics, as well as principles and methodologies that guided the research process to develop further. The participatory approach of COR involved an increasing amount of research participants in the community setting who contributed toward developing the multifaceted research activities. Each activity contributed toward the holistic health goals of Boston Bar First Nation.



**Figure IV-2 COR: Holistic Health Research Framework**

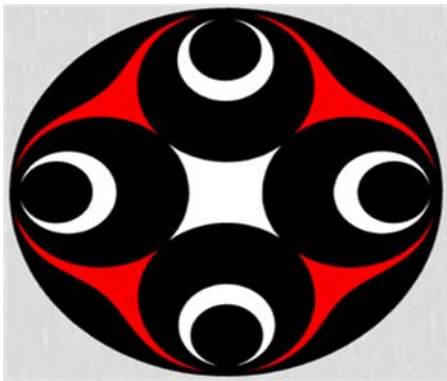
## **2. Indigenous Principles and Ethics**

COR's research process was co-directed by Boston Bar First Nation and respectful of local customs, reflecting an Indigenous research framework. As well, COR was guided by Indigenous research principles, and established a BBFN – UBC IAH Code of Research Ethics (Chapter I.B.2.b). This was strongly influenced by UBC IAH and BC ACADRE (now NEAR BC), which provided leadership in developing a culturally appropriate research environment.

### **a) 4 R Indigenous research principles**

The 4 R Indigenous research principles of respect, responsibility, relevance, and reciprocity (1991) guided the research process. The following explains how the research process manifested each these principles.

# Indigenous Guiding Principles



## BC ACADRE – 4 R Principles

- **respect** Indigenous Peoples' cultures
- **relevance** in Indigenous communities
- **responsibility** through being empowering
- **reciprocity** through an effective exchange between research participant on learning and research.

(Kirkness and Barnhardt, 1991)

### (1) **Respect for Boston Bar First Nation's culture and knowledge**

The integrated approach taken in COR recognized multiple knowledge and realities as valid privileging neither culture nor knowledge over another. These represent core values of CPAR and transdisciplinarity. Following these principles the local Indigenous knowledge of Boston Bar First Nation was valued at every step of the research. BBFN's perspective set the research vision and direction to focus on traditional plant knowledge as part of a holistic health research initiative. Furthermore, BBFN Administration and COR participants contributed their expertise and knowledge as engaged participants throughout the research and co-developed the research process and outcomes (Chapter II: Key Participants). These mentors included youth, Elders, parents and Band Administrators who within their community represented a diverse spectrum of perspectives and knowledge.

### (2) **Responsibility through empowerment**

In Connecting Our Roots, the Boston Bar First Nation community members were actively engaged in co-directing all phases of research at the community-based and academic level. The BBFN Chief and Band Manager acted on the academic supervisory committee, and the Band Council administered the community-based research and resulting actions. This

supported the capacity of the BBFN Administration to oversee research activities in their community. In Connecting Our Roots, Elders became actively engaged in all major research activities providing their mentorship and guidance throughout the research process. As well, COR engaged youth to participate and become involved in building their education, research and cultural capacity.

### **(3) Relevance in the Boston Bar First Nation community**

The high community-based participation in this study from the beginning to completion of this study ensured that the research had **relevance** to BBFN's culture and community. The research focus was defined by the BBFN, and the research activities developed as part of collaborative process with BBFN community members, particularly the BBFN Administration, Elders and youth. Relevant outcomes were produced as the research process was participatory and responsive to the needs of these participants.

### **(4) Reciprocity with Boston Bar First Nation through an effective exchange between research participants**

Finally, **reciprocity** or the "two-way process of learning and research exchange" was at the heart of the COR research process. There was a constant two-way flow of information between the BBFN community and myself. The BBFN Band Council and community members shared their vision, needs, and expertise with me, and we learned together and from each other. To facilitate reciprocity, learning effective strategies for knowledge translation was an important part of the research process.

### **b) Research Ethics**

The BBFN – UBC Code of Research Ethics served as ethical foundation for this research and ensured that expectations of each research partner were clearly described. This Code of Research Ethics can be used as a template for the Boston Bar First Nation in pursuing future research. As well, this research protocol may also be used by other Aboriginal groups as a model for defining the specific code of research ethics. At this time the Band Council shared

with me that they have already been approached for permission to use this Code of Research Ethics as a model for another community.

### **3. Community-based Participatory Process**

The integrated research approach provided the theoretical framework and principles for the research process. However, it was the ‘on the ground’ experience based on human interactions that allowed for the research process to truly flourish. The experience of being an academic researcher working in a community-based setting is unique, as it is based on the interpersonal relationships that develop and foster collaboration.

#### **a) Building Positive Relationships**

*“Boston Bar at last. The summer and the real work of the M.Sc. begins – community-based research. I am on my way to become part of this community. My reception was wonderful. Right away I was swooped up into the arms and hearts of the Campbell family. Before that I stopped by the Band Office and visited with Marie [Phillips], John [Warren] and Dolores [O’Donaghey]. John is excellent to work with. He really provides me with a foothold in this community. Walking to the store with the girls, Tonya, Tamara, Tara and Tina, cooking dinner, or watching videos with Roy on plant gathering is just the beginning. “*

*(Research Journal, May 27<sup>th</sup>, 2004)*

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Participatory research process requires building positive relationships and productive communication (Stringer, 2007). The challenge of beginning participatory research is to build the participatory working relationships and network(s). Making initial contacts in the community-based setting is important to building social networks for the research. My initial contacts were the members of the BBFN Band Council to whom I was introduced to by Dr.

Eduardo Jovel in the fall of 2003. At the beginning of my research I worked with the Band Council, specifically Councilor Roy Campbell who took me under his wing. Through Roy's willingness to accept me as a co-researcher I was able to get to know the cultural and geographical terrain of the Boston Bar First Nation. I also built a working relationship with Roy's daughters while we pursued the traditional plant research together.

***"Roy, thank you for your guidance, your patience, your ability to share and pass on knowledge. Also thank you for being a great support, in the community, and for me being here."***

***Thank you card to Roy - Research Journal, August 2004***

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Establishing a positive working relationship with Roy Campbell and his family helped facilitate getting to know more community members and led to me being accepted by the community at large. Through our ability to work together and the positive connection that was fostered the Campbell family adopted me as one of their own. This meant they looked out for me, included me in their plans, and gave me a sense of belonging. They also invited me to family and community functions and introduced me to their contacts. Since I am social person I soon got to know most of the Boston Bar First Nation community, as well as family members and friends that lived up and down the Canyon.

***"It feels just like home – Roy including me in all his plans going Pine mushroom picking ... sitting at the Band Office participating in a meeting. It's like I'm always here. The Roy Campbell family my place to call home also"***  
***(Research Journal, October 17<sup>th</sup>, 2004).***

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Building working research relationships was a more diligent process than social networking. This meant connecting with community members who were interested in participating in the Connecting Our Roots research, and then developing the research relationship. This process took time and commitment. For example, Tamara and I formed a meaningful friendship from

working together on traditional plant research over several years. Tamara introduced me to her grandmother Hilda Isaac who became a primary mentor for the traditional plant research. The time spent with Tamara and Hilda was precious to me for the meaningful engagement and what we gave to each other in terms of knowledge exchange, shared experiences, and collaborating on the research process. During my time with the BBFN I developed relationships with over 20 research participants of diverse ages. Each and every relationship was dynamic and unique.

Full community support was offered once I had built meaningful relationships in the community, and contributed positively to the community through my research and personal engagement. This was shown to me on an individual basis, as well as at the community level. On an individual basis it meant the community members welcomed me and shared their generosity, particularly traditional foods. Photography was a gift I had to share with the community that was greatly appreciated. I captured moments of the community-based research, as well as community moments, such as weddings and graduations. Over the years I printed off volumes of pictures and returned them to the community members. At the community level, the Boston Bar First Nation Band showed their appreciation for my work and contributions to the Band by inviting my family and I to a Blanket Ceremony.

***What a beautiful experience – being honoured. “BBFN hosted a beautiful dinner in honour of an old member returning and to thank me for my work up there. Elders were present. There was drumming and singing; we feasted on salmon, rice, beans, potatoes, bannock, huckleberry jam and pie, fresh huckleberries, etc ...”***

***The community honoured us with a blanket ceremony “to show that we are loved and not alone”. It was Roy who came and put a blanket around my shoulders and said to me: “Thanks for working with the youth. All you have done for our kids”. “Each person present and close to me honoured me with gifts and words of friendship and love. I feel like a community member –***

*they, including the Chief, called me a community member". My personal response was that "I wanted to cry and felt so blessed".*

*Reflection from Research Journal, September 11<sup>th</sup>, 2004*

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## **b) Productive Communication**

Productive communication was another key aspect of the community-based participatory research process. In Connecting Our Roots' cross-cultural Indigenous academic research environment this required knowledge translation (KT) strategies. The Canadian Institute for Health Research (CIHR) sees effective knowledge translation as an important aspect of creating meaningful outcomes in community-based health research, and defines it as "the exchange, synthesis and ethically-sound application of knowledge - within a complex system of interactions among researchers and users" (2008). In more direct terms, KT can be seen as transforming knowledge into action (Estey, Kmetz, & Reading, 2008). Although there has been a fast growing body of KT literature in the mainstream health research there is still a need for evolving theories and strategies for KT in an Indigenous context (Estey et al., 2008).

The research experience of Connecting Our Roots provided insight toward knowledge translation strategies in an Indigenous research context. This included implementing processes, practices and activities labeled as KT that were successfully integrated as key elements of Connecting Our Roots. Some of these activities have been described by Estey (2008) as: "involving communities and individuals in shaping research", "engaging in meaningful dialogues", "making research findings accessible", as well as "training and education." More specifically, in the Connecting Our Roots research knowledge translation was important to facilitate communication between and within distinct research communities. The ongoing challenge was to effectively bridge disparate worldviews and knowledge systems, such as Indigenous and academic. The culturally appropriate research environment



contributed toward finding common ground for dialogue and collaborative actions. Gaining cultural competency was also important to develop effective knowledge translation strategies.

### **c) Cultural Competency**

Cultural competency (CC) refers to the possession and usage of complex social skills in cross-cultural settings (Cross, 1989; Diller et al., 2005; Rogerson, 2006; Sue, 2001). For me, developing cultural competency meant learning culturally appropriate communication and interpersonal protocols. Gaining these helped build respectful and positive relationships, as well as it improved communication with community members and my ability to work with research participants. These were critical to develop as part of the research in order to translate knowledge into action with community members.

The process of gaining cultural competency involved being self-aware of my cultural background and influence on social interactions. In Chapter II (Section C.2.d), I described how cultural competency was achieved "through ongoing experience and interaction" in the community-based setting of BBFN. A 'lived experience' of becoming self-aware through an interaction with youth is described in detail in Chapter II (Section C.2.d). In this experience youth brought to my attention that some of my language was difficult for them to understand. From this experience I realized that my usage of university level vocabulary did not translate well in the community-based setting, and that I needed to gain awareness of this and proactively address it to improve my communication skills. To properly address this cultural difference, I paid close attention to my interactions with youth and other community members in order to learn what comprised culturally appropriate communication.

In order to communicate in a culturally appropriate manner I needed to become aware of verbal and non-verbal communication as well as protocol. This included learning local vocabulary, specifically local lingo, Nlaka'pamux words, gestures, and humour. I learned humour is a consistent element in communication, which I appreciated. Being able to share in this humour and participate in it was instrumental in building familiarity and integrating in the

community. As a basic rule for more effective communication I tried my best to use everyday language in all my communication, whether this was in conversation or in written documents. Experiences and lessons learned were powerful and important as they generated greater cultural awareness, propelled me toward building local cultural competence, and created KT skills.

Band Council meetings were central to the research process, as the Council administered the community-based research. Council meetings provided a direct researcher-community forum to ask questions, report on the research process, receive feedback and decide on future directions. Therefore, it was important for me to gain competency specific to working with the Band Council. During the summers I lived on the reserve I was able to attend Band Council meetings regularly. At times this was on a weekly basis. All community-based initiatives were discussed and collectively decided on with the Band Council. Often before presenting to Band Council, I would consult with the Band Manager, John Warren. He was my first contact person at the Band Office. At Council meetings it was John who would put me on the Council Agenda. John also had thorough knowledge of band business and protocol. With this knowledge he frequently provided proactive feedback on my proposals or presentations and acted as my liaison with the Band Council.

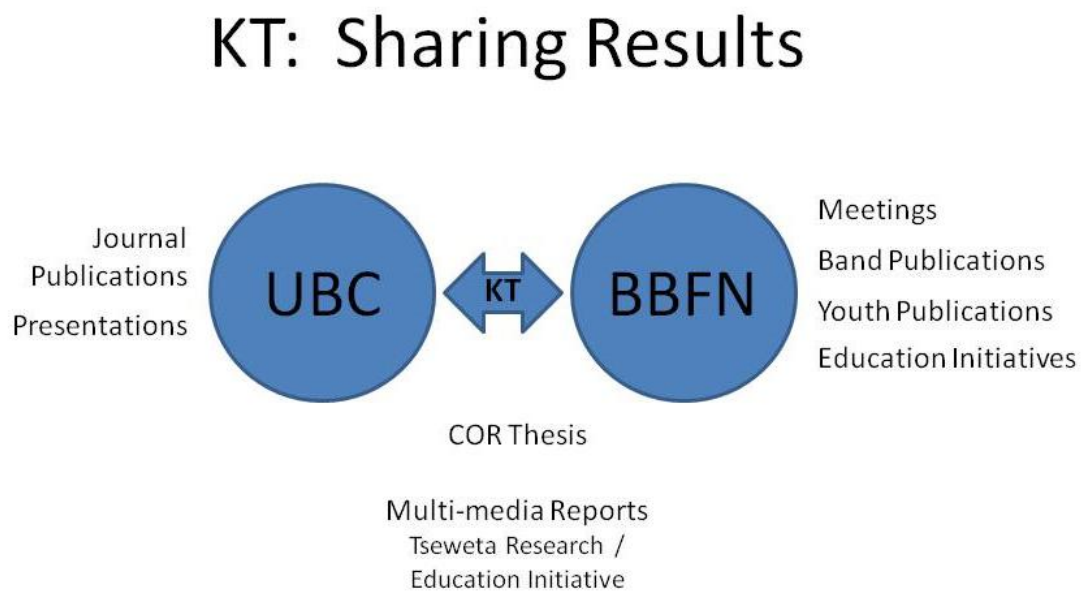
Through gaining cultural competency I developed a role as communication liaison in the community as whole and between specific groups. In a journal entry I reflected: "I feel like I have become a hub. A point of reference for many" (June 19, 2004). I became a centre for the exchange of communication. For example, the professors who came to teach the Forest Technology course in 2004 often asked me to help them communicate with local youth taking the course. Vice a versa youth asked me to facilitate communication with professors, as well as the Band Council. This role as communication liaison became more pronounced over time as my connections and cultural competency increased with experience.

I found developing cultural competency facilitated knowledge translation that was integral for the development of the research process. Within the BBFN community my cultural competency skills specific to various research participant groups facilitated the process, turning knowledge into action. For example, I was able to communicate well with youth because I took care to learn their particular cultural protocols. Through this process I gained their respect and trust, and they felt comfortable to share their thoughts with me. I also took care to learn how to work effectively with the Band Council. This process supported knowledge translation as I was able to facilitate communication between youth and Band Council for developing collective actions such as the COR education initiatives.

#### **4. Communication of Research**

Knowledge translation was important to facilitate accessibility to report the findings of this cross-cultural and transdisciplinary study was important. Thus, developing cross-cultural competency was very important to facilitate knowledge translation during the process and reporting. Throughout the research it was a constant learning process to find effective methods of knowledge translation within the BBFN community, between BBFN and UBC, and the community at large. I learned that effectively sharing results required a variety of reporting methods. A summary of methods for knowledge translation are shown in Figure IV-3.

Figure IV-3 Sharing Research Results



### 5. Reaching Diverse Audiences: BBFN – UBC – and Community at Large

For sharing results a variety of reporting methods were used. Accessibility to information represented an important aspect for reporting. Due to the transdisciplinary and cross-cultural nature of this research diverse audiences had to be taken into consideration. I used conventional practices for sharing results in academic settings, such as audio-visual presentations in several conferences and courses (See Appendix XIX: Communication of Results). As well, the final thesis document and potential journal articles will be available to the community at large. For sharing results within the BBFN community, reports needed to be accessible to diverse knowledge comprehension levels and styles. For example, it may be challenging to many BBFN community members to read and understand conventional academic report writing. For this reason it was important to be as inclusive as possible with report writing and presentation. Accounts and strategies for accommodating report writing and presentation are given below.

## **(1) Reporting within BBFN Community**

*"Dolores also asked us to make pamphlets to give to community members describing our research" (Research Journal, May 11th, 2005).*

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Reporting within the BBFN community involved working closely with BBFN community members and learning effective communication strategies. Communicating about the research process and sharing results was very welcomed by BBFN community members. A variety of formats were appreciated for communication depending on the intended audience, including publishing in the Band Newsletter, posting posters and flyers at community centers (i.e. Band Office and Gas Bar), and multi-media reports. It was important for the information to be accessible to a variety of community members. Thus, it was important to present information in everyday language. Visuals were also very welcomed. Forums for sharing information were Band Council meetings, youth meetings, community gatherings, and personal interactions. A variety of publications intended specifically for the BBFN community were created as result of the community-based research process. This included publications produced with BBFN youth and multi-media reports. These materials are held in the BBFN archives, and were distributed among community research participants.

### ***(a) Youth Publications***

BBFN youth were involved in the creation of a variety of publications as community researchers. These included the Tuckkwhiowhum Interpretive Ethnobotanical Trail Guide (2005), the Tuckkwhiowhum Boston Bar First Nation Heritage Site Guide (2006), Jam Making Instructions (2006), and the supplement for the 2006 multimedia report featuring an index of all the 2006 summer program participants. Youth seemed generally inclined to use many visuals supported by minimal point form text for presentations to be easily understood.

The youth publications empowered youth to document and share their knowledge and skills gained through participating in COR. The guides to the interpretive trail and Heritage Village documented local cultural knowledge and facilitated sharing this information within the

community, and with others who come to visit. For example, the guides were used by the youth as a resource while giving guided tours of the Heritage Village and trail. Potentially, this ability may secure income for the youth in the future. As well, parts of the documents were used by the Band Administration for funding applications and for promoting the Heritage Village. These examples show the potential of capacity-building being an empowering process and how action research can produce meaningful results beyond the research scope.

***(b) Multi-media Reporting***

Sharing information on the research process in multi-media format was a reporting method welcomed by the BBFN Band Council and community members. Throughout the research multimedia reports were provided to the BBFN Band Council. Once presented to Council they were then used to communicate results to the community at large. Examples of these included: posterboards with pictures and text, pamphlets, short reports summarizing information (i.e. Tseweta 'mini' Report), and detailed reports on the research process and outcomes. Examples of the detailed reports include a 45 page report on the 2006 Summer Program and the 58 page report on the final thesis document. These were composed in PowerPoint, presented to the BBFN Band Council, and professionally printed and bound versions given to the community for archival and educational purposes. The PowerPoint medium allowed for a reader friendly design layout including pictures and text. The multi-media format made the report accessible and interesting to people of all ages and educational backgrounds.

***For a report to the Band Council on the research process and outcomes in fall 2005, I prepared poster boards as a means for visually aiding my presentation. Before presenting to Council I ran my presentation and ideas by the Band Manager John Warren who approved of this format. "My style was a simple time-line" and "5 posterboards I folded to look like BIG menus with pictures and descriptions glued to them", each covering a topic such as the 1.) Summer Youth Program, 2.) Youth Community Researchers, 3.) huckleberry***

*picking, 4.) interpretive trail, and 5.) other miscellaneous items. The posterboards were received well by the Council. Chief O'Donaghey smiled broadly while studying each posterboard carefully.*

*(Reflection from Research Journal, October 23, 2005)*

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## **C. Traditional Plant Research:**

The research focus on traditional plants developed through Boston Bar First Nation wanting to proactively address health concerns in their community by 'literally' reconnecting with their roots. Their aim was to revitalize traditional plant knowledge and usage. The research objectives developed to do this included documenting TPKU in the community, and assessing select plants for their nutritional and therapeutic properties. The purpose of these objectives was to record the collective community knowledge and current usage of traditional used plants, as well as investigate the health benefits. This translated into community-based research activities, including working with local plant experts, harvesting traditional plant foods, and exploring local food production. Using the aforementioned CPAR methodological approach, Tseweta (*Lomatium nudicaule*) was selected for laboratory analysis. Considered together, these research activities aimed to support revitalizing TPKU and strengthening local food security in the scope of this holistic health research.

### **1. Community Traditional Plant Experts**

Traditional plant knowledge and usage (TPKU) was documented through working closely with local plant experts, such as Roy Campbell and Hilda Isaac. Roy Campbell was central for this research activity to proceed, and was my primary mentor on TPKU throughout the research. He organized field trips and shared the local knowledge and protocol on harvesting traditional food plants. It was largely through his leadership that I was able to learn the local knowledge and skills required for doing the community-based traditional plant research. My university training in Ethno-botany aided our efforts in documenting TPKU.

A practice championed by Roy Campbell was the distribution of traditional foods to Elders. This was really appreciated by Elders, such as Mary Thomas and Hilda Isaac, who were not able to participate in traditional food gathering activities anymore. When I brought huckleberries to Elder Mary James her eyes lit up and she smiled broadly (Chapter II, Section B.2.d). For Hilda this practice supported her health, as she believed in the health benefits of traditional foods (Chapter II, Section B.3.a).

Most of the local plant experts were Elders who shared their wisdom as part of the traditional plant research. This included personal stories of them using traditional foods, and/or remembering how their Elders practiced traditional food techniques. An example was Herman Phillips who described his grandmother making Indian ice-cream with hooshum berries for children in the community (Chapter II, Section B.2.b). Hermann's wife, the late Marie Phillips also shared with me how she remembered her Elders when she was young camping for the huckleberry season with women filling large baskets that were transported using horseback (Chapter II, Section B.2.c). In many ways this research was to honour the wisdom of these Elders.

Since the research began in 2003, three out of the six Elders that are quoted in this thesis have passed on, including Hilda Isaac, Deanna Thiessen and Marie Phillips. In this way, this dissertation serves to record their legacy for the community and their descendents. The knowledge of these Elders is special as it spans an era of great change for Nlaka'pamux peoples. The stories Elders shared about traditional knowledge were from their childhoods where traditional ways of life were still practiced by their parents and grandparents. Their stories also conveyed the colonial influences on their lives, including the disruption of traditional knowledge and practices.



## **2. Harvesting Traditional Foods and Connecting with Cultural Heritage**

Harvesting traditional foods contributed to the strengthening of cultural continuity and BBFN's goal to revitalize traditional plant knowledge. Collecting traditional foods was a hands on, experiential, physically strenuous outdoor activity that brought participants in connection with the land and its resources within a cultural context. As well, this was an intergenerational research activity that fostered cultural knowledge transmission to youth.

Both youth and Elders shared that participating in certain traditional food activities was their first time. For each this had a special significance. For the Elders that participated in harvesting traditional foods it was about reconnecting with their cultural heritage, for youth it was about discovering it. From the stories Elders shared and the feedback youth gave the sensory experience of collecting traditional foods linked to memories and satiated taste-buds. My role was to document this experience for the Band's record taking pictures, and noting feedback. The following paragraphs describe these experiences in more detail.

For Elders, like Deanna Thiessen and Julie Grafinger, participating in traditional food activities was an opportunity to reconnect with their traditional heritage. For example, on our way to collect Tseweta I was surprised when both Deanna and Julie shared with me "that this was their first time they were going to collect Tseweta and how excited they were to finally get a chance to do it" (Chapter III Section D.1.2). Both reflected that growing up they had not been encouraged to participate in traditional plant use practices and had been too busy during the lives as working parents to practice traditional knowledge. Another obstacle for learning and practicing traditional knowledge for Deanna was that she had lived away from the reserve. However, both Julie and Deanna remember their Elders preparing Tseweta. Collecting Tseweta for Deanna brought back memories of being in her grandmother's kitchen, where Tseweta was prepared for the family (personal communication, June 17, 2005). Now as an Elder and having moved back to the reserve Deanna was keen on reconnecting with her heritage in the traditional territory of her ancestors.

For BBFN youth traditional food gathering was about discovering their heritage as a holistic experience. An example of this was huckleberry picking with the youth community researchers, which for most of them was their first time (Chapter III, Section 3.C.3). Roy Campbell and Elder Deanna Thiessen led the day field trip, and youth had the opportunity to learn from them. In the 2005 Summer Program feedback youth mentioned huckleberry picking as one of their favourite activities. Nine year old Megan Thomas responded to the question on what her favourite activities were and why, with “huckleberry picking – never gone before, went with all friends” (Appendix XII). This also speaks to the social forum that traditional food activities provided. In their feedback youth also consistently mention that what they liked about berry picking was the taste, saying they were “yummy” and “good”. A sense of connection with the area where huckleberries are picked was also created, with one youth advising that the Summer Program could be improved by “go[ing] up the mountain more.” Altogether this holistic experience of picking huckleberries included fostering social relationships, learning from mentors, engaging the senses, connecting with place, and continuing their cultural heritage.

### **3. Local Food Security**

Strengthening local food security was also explored as part of the traditional plant and holistic health research. Food security is defined as food that is “affordable, available, accessible, appropriate, safe and sustainable for all” (Rojas, 2009. p.134). A large Canadian study found food insecurity affects 1/3 of off-reserve Aboriginal households (Che & Chen , 2001; Health Council of Canada, 2005). This study did not include on-reserve food insecurity. However, epidemic levels of chronic and largely diet-related diseases, such as obesity and diabetes are affecting Aboriginal peoples living on or off-reserve in disproportionate numbers (Health Council of Canada, 2005). This has been attributed to a shift from traditional diets to modern diets high in processed foods (H. Kuhnlein et al., 2006). Wild-crafted traditional foods and locally cultivated foods provide a potential solution for strengthening the food security and health for on-reserve First Nation living in remote areas, such as Boston Bar First Nation.

Increasing efforts for harvesting traditional food plants can contribute toward BBFN's food security. Traditional food plants are available and affordable as they grow naturally and are free to harvest. They are also culturally appropriate, and when harvesting is managed properly, a sustainable food. Safety concerns around harvesting traditional foods, include bear encounters, as well as potential contamination through industrial pesticide use (i.e. forestry and hydro), which could use further investigation. In the experience of COR, accessibility may be largest issue to overcome in terms of increasing the role of traditional food plants role in food security measures.

Limiting factors for accessing traditional food plants included the lack of knowledge and transportation. To harvest traditional food plants requires knowledge, such as what, where and how to harvest. In this study, this knowledge gap was address by involving community members in traditional food plant harvest. For many who participated this was a new experience, however, through their participation they gained the knowledge and skills to harvest traditional foods. Transportation was another issue to accessing traditional food plants. There were several traditional food plants which grow on or near the BBFN reserve and were readily accessible with the knowledge to harvest them. However, popular food plants like Tseweta and huckleberries are more difficult to access and required transportation to harvest them. When guidance and transportation were offered, community members who had the time joined traditional food plant harvesting forays.

In addition to traditional plant foods, Connecting Our Roots explored cultivating foods on the reserve to increase food security. For example, the survey on vegetable availability in the Tseweta study showed that iceberg lettuce is the only leafy green vegetable available at one store in Boston Bar indicating the limited local availability of fresh vegetables to purchase. The greenhouse and garden initiatives of Connecting Our Roots showed that it is possible to grow a variety of healthy fruits and vegetables in the greenhouse, and that there was community interest in gardening initiatives. As well, in the past having food plant knowledge provided

food security during times of economic depression. For example, Elder Hilda Isaac shared that her family did not feel the effects of the Great Depression in the 1930's as much as others. This was because her family cultivated agricultural crops and harvested traditional food plants, as she said "by the sack full" (Hilda Isaac, Interview transcript, 2004; Chapter II, Section B.3.a). From the experiences of COR, community gardens and greenhouse initiatives present local and viable measures to increase food security in the BBFN community. The challenge will be to coordinate such activities and build food technology capacity in the community.

#### **4. Tseweta Research**

*Lomatium nudicaule* has been traditionally used as a food, medicine, scent, and ceremonial plant by Indigenous groups on the Pacific side of North America, from the tribes of Warm Springs in the south to the Coast Salish further north, and inland by the Okanagan and Nlaka'pamux. The Boston Bar First Nation (Nlaka'pamux) continues to value what they locally call Tseweta (*L. nudicaule*) as a food and medicinal plant, and were interested in revitalizing its use among its community members. As, Band Councilor Roy 'Ali'O'Handley shared: "Tseweta is the first thing to go at a community dinner" (personal communication, March 20<sup>th</sup>, 2009). Elders in particular, such as Hilda Isaac, shared with me that they were fond of the plant and liked to eat (personal communication).

To support the efforts to revitalize the use of Tseweta the BBFN Band Council expressed interest in the laboratory analysis of Tseweta. This research was made possible through BBFN community members who shared their traditional knowledge and interest in future research on Tseweta, and various laboratories at UBC where the chemical, biological activity and nutritional value of *L. nudicaule* was investigated. Each disciplinary analysis provided a unique perspective on *L. nudicaule*'s properties and potential health benefits. From interconnecting disciplines and knowledge new understanding emerged, particularly, in gaining greater understanding of *L. nudicaule*'s contributions to human health.

### **a) Phytochemical Analysis and link to Biological Activity**

Greater understanding on *L. nudicaule*'s valued properties as a fragrance and medicinal plant were made through the results of the phytochemical analysis. The terpene analysis identified plant constituents that are known contributors to the fragrance and/or the biological activity of plants. For example, the monoterpene limonene, found to be the most abundant constituent in both the *L. nudicaule* seed-pod and leaf, is known as a potent contributor to fragrance and has shown biological activity against fungi and bacteria in previous research (Aggarwal et al., 2002; Filipowicz, Kaminski, Kurlenda, Asztemborska, & Ochocka, 2003; Lis-Balchin, Ochocka, Deans, Asztemborska, & Hart, 1996). Other constituents found in *L. nudicaule*, such as alpha and beta pinene have also been indicated in antifungal and antibacterial activity through destroying cellular integrity and inhibiting respiration and the ion transport process (Cox et al., 2000). Although there is a large compendium of research related to the bioactivity of phytochemicals, the need to investigate naturally derived phytochemicals exists (Abad, Ansuategui, & Bermejo, 2007; Bajpai, Rahman, & Kang, 2007; Cavaleiro, Pinto, Goncalves, & Salgueiro, 2006; Kalembe & Kunicka, 2003; Shin & Lim, 2004). In particular, for phytochemicals derived from plants used traditionally for food, medicine or spiritual practice. The growing compendium of information can be useful in the fields of health, human and environmental, as new challenges in these areas are on the increase with contemporary pressures

### **b) Biological activity and First Nations Health**

In the preliminary analysis of the biological activity of *L. nudicaule*, antifungal activity was observed for the seed-pod extract that if investigated further may provide an interesting link between the traditional use of this plant and the contemporary issue of indoor moulds in First Nations communities. For this analysis the *L. nudicaule* seed-pod extract was tested against four indoor moulds that were implicated as potential health hazards. This selection of indoor moulds came from a research project Boston Bar First Nation, as well as coastal communities, participated in as they were concerned about the adverse health effects of indoor moulds in

their communities {{509 Osterberg, P.M. 2009;}}. Traditionally, the seed-pods of *L. nudicaule* were burnt and used to fumigate longhouses and “drive away ghost’s” by Coast Salish groups, including the Cowichan, Saanich, and Songish (Moerman, 1998; Turner & Bell, 1971). As antifungal activity against indoor moulds was observed from the *L. nudicaule* seed-pod extract, it points to that fumigation by burning seeds may have had a functional role in acting against indoor moulds. The significance of observing antifungal activity of the *Lomatium nudicaule* seed-pod extract on indoor moulds is that solutions are still being sought to the pressing issue of indoor moulds in First Nation communities.

Perhaps the antifungal activity of *Lomatium nudicaule* seed-pods could provide an avenue for investigation and contribute to finding local and culturally relevant solutions to indoor moulds in First Nations communities, such as through fumigation. Research on fumigation and mould control has shown successful antifungal activity of essential or volatile oil extracts. For example, research on the effects of essential oils on *Aspergillus fumigatus* has exhibited partial inhibitory, fungistatic and fungicidal bioactivity of essential oils in vapour state (Inouye et al., 2000). Also, recent research showed that volatile oils generally have higher inhibitory effect in vapour phase than in liquid phase (Tullio et al., 2007). As well, small volatile molecules, such as monoterpenes found in *L. nudicaule*, work particularly well in fumigation, whereas larger molecules work better with direct application (Suhr & Nielsen, 2003). Future research directions investigating the role of volatile oils and its possible role in fumigation could include the use of vapour contact assay (Inouye et al., 2000; Suhr & Nielsen, 2003; Tullio et al., 2007).

### **c) Nutritional Analysis and First Nation’s Health**

This nutritional analysis connects with the traditional use of *Lomatium nudicaule* as a food plant, and provides insight from a scientific perspective to its nutritional contributions. The analysis produced new information on the macro and micro nutrient make-up of *L. nudicaule* leaves, and in more detail than has been previously published. This new nutritional data on the macro and micronutrient content of *L. nudicaule* can be added to databases on nutritional

constituents of traditional food plants and contribute toward greater understanding of traditional diets.

The nutritional analysis also showed that this traditional Nlaka'pamux food plant has noteworthy nutritional qualities. For example, *L. nudicaule* is an excellent source of fibre, calcium, and vitamin A, each of these providing a high percent daily value of 33, 35, and 45% respectively. It is also a source of protein, polyunsaturated plant fats, vitamin C, potassium and iron. Each of these nutrients contributes toward human health and also has specific benefit for First Nation communities such as Boston Bar First Nation. As well, the nutritional comparison with a total of nine other local traditional and market vegetables showed that the nutritional qualities of *L. nudicaule* were exceptional. *L. nudicaule* ranked highest in more nutrient categories than any other compared food plant, especially for fiber, food energy, mineral and vitamin content.

Aboriginal peoples' Elders universally relate that that they view traditional foods as healthier than market foods, and would like to see the younger generations relying more on Indigenous foods (H. V. Kuhnlein & Turner, 1991). This nutritional analysis on Tseweta supports this claim by providing evidence for its nutrient qualities and nutritional value. In specific, it provides evidence that Tseweta is a good source for fibre, vitamin C and calcium with known related health benefits. For example:

- Diets high in fibre reduce risk factors associated with diseases such as metabolic syndrome, diabetes, heart disease, diverticulosis, and constipation (Anderson, Smith, & Gustafson, 1994). This is particularly important for Indigenous people's health, as Indigenous communities in Canada and around the world are affected by chronic diseases such as obesity and diabetes at epidemic levels (Gittelsohn et al., 1998; Young, Reading, Elias, & O'Neil, 2000).
- Calcium is important for supporting vital body processes, and is essential for healthy bones and teeth development (National Institutes of Health, 2006a). *L. nudicaule* provides a higher amount of calcium per 100 g than other sources of calcium listed as

high by Health Canada (2002) as excellent or good sources of calcium, including milk products (yoghurt, milk, cheese), fish, and sesame seeds.

- Vitamin A is important for healthy cell reproduction, the regulation of the immune system, and in preventing and fighting infections (National Institutes of Health, 2006b). *L. nudicaule* is high in Vitamin A containing 4440 IU per 100 g. It should be noted that beyond 10 000 IU of vitamin A per day toxicity can occur (Olson, 1996). Therefore, *L. nudicaule* should be consumed in daily moderation not exceeding more than 200 g per day to avoid potential vitamin A toxicity.

Raising awareness on the health benefits of local Indigenous or traditional foods could promote positive health effects within Indigenous communities. This nutritional information on Tseweta can be used in ongoing community education initiatives to bring awareness to the health benefits of consuming traditional foods, for the BBFN and other Indigenous groups. As well, providing data that further demonstrates the excellent nutritional quality of Indigenous foods gives importance in the effort to revitalize traditional food systems. For Boston Bar First Nation the results of this research may help to stimulate interest on the revitalization of this plant food due to its high nutritional quality assessed in this study. Other Indigenous groups for whom Tseweta has traditional significance may also be interested in the results of this research, and to use them in their communities in nutritional education and health promotion.

## **5. Conclusion**

Connecting Our Roots showed that the benefits of revitalizing traditional plant knowledge and usage are numerous and connected. This research documented the wisdom of local plant experts, particularly community Elders. Three of the Elders who participated have now passed on, and this research is part of their legacy for future generations. Traditional food plant gathering provided a social and intergenerational experience which encouraged and promoted learning about the land and resources, as well as physical activity. It also provided opportunities to reconnect or discover traditional plant knowledge. The laboratory research on Tseweta provided new data that can be used by the community to support the use of Tseweta, particularly the nutritional analysis. The study also supports local food security efforts through



wild harvest or cultivation of plants. Overall, revitalizing traditional food systems has the capacity to rebuild cultural continuity, strengthen links to the land, contribute to local food security, and provide a holistic and culturally relevant approach to health in Aboriginal communities.

#### **D. COR Education:**

Objective four of the COR research was to: Support traditional plant use revitalization efforts through being actively engaged in increasing the community's education and research capacity. When this objective was created neither I nor BBFN community members had imagined how this goal would be reached or how powerfully it would be expressed. Education emerged as a central component of Connecting Our Roots. Education is about an exchange of ideas and defined as "the act or process of imparting or acquiring particular knowledge or skills" (Dictionary.com Unabridged (v 1.1)). COR's education initiative developed through a mutual exchange of knowledge, or reciprocity. It was community mentors, such as Roy Campbell and Hilda Isaac, who shared their wisdom on traditional plant knowledge and local Indigenous worldview with me. It was through their sharing that I was able to give back to the community as a coordinator, facilitator and co-developer of local education initiatives for youth.

##### **1. Building Relationships – Creating Connections**

COR's education initiatives focused on youth engagement, building capacity and strengthening connections with their cultural heritage. Chapter II, section C: Community-based Education Initiatives describes this process and outcomes in detail. The education section in the thesis describes the journey of building youth education initiatives from 2003 to 2007. The development of a researcher-youth relationship based on respect and trust was important to foster youth engagement. Their engagement helped seed the idea for youth becoming active in the traditional plant research and revitalization efforts. In 2005 and 2006 Summer Programs were created that included scheduled activities for the months of July and August.

The 2005 Summer Program was a transformative process where youth became knowledge translators, could follow their own rhythm of learning, come together, and develop their sense of agency. The YCR gained greater competency in local Indigenous and academic knowledge systems and learned methods to translate, synthesize, and share information from multiple sources. This made them adept knowledge translators. The flexible, open learning environment fostered positive interactions and increased learning and productivity. From my observation learning styles in the group varied. Some youth liked to learn on their own, some students always wanted to work in teams, other students needed 'free time' to be able to focus again when needed. In their feedback youth mentioned that they especially liked the positive social environment that existed in the Program, such as "meeting new people", "being .. with all the kids", "talking with friends", and "being able to work with everyone". Important to YCR was also having "something to do" and "learning new things".

Overall, the 2005 Summer Program involved a core group of eight to ten regularly attending youth, ages 8 to 17, as Youth Community Researchers. I coordinated the Summer Program, however, the inception of the idea was created through engaging youth in brainstorming sessions at youth meetings and working with the Band Administration. Attendance was maintained throughout the summer signalling that the youth valued this education experience. By the end of the Program participating YCR had learned many research and publication skills and gained much knowledge on local plant resources. The 2005 Summer Program showed the youth how their intellectual capabilities were instrumental in revitalizing traditional plant knowledge and their agency in creating positive change in their community. That YCR valued the experience of 2005 was demonstrated by all of the youth of the 2005 program choosing to come back for the 2006 Summer Program.

The 2006 Summer Program built on the learning experience of 2005 and expanded in scope. In 2006 the focus shifted to the Heritage Village as a primary site for learning and activities. The 2006 summer program focused on youth developing as cultural ambassadors –empowering

BBFN youth to be 'knowledge' representatives of their community. Over the 2006 summer the youth were actively engaged in development initiatives at the Heritage Village, expanding the learning on cultural knowledge, and participating in a variety of capacity-building workshops. Cultural capacity was increased through workshops on traditional knowledge, values, technologies, and art led by local experts. Also, youth completed certificate courses, including First Host, True Colours, and First Aid.

Through the capacity-building workshops in the 2006 Program the Youth Ambassadors gained confidence and professionalism, which supported their role as knowledge translators. This was demonstrated at the end of the Program by youth giving a guided tour of the Heritage Village and Interpretive Trail to visiting guests from Sto:lo Nation exhibiting the cumulative knowledge and skills they had gained over the summer. The youth also continued synthesizing their learned knowledge through publishing. Publication outcomes of the 2006 Program included the Heritage Village Guide, a Jam Making Guide, and a youth supplement to the 2006 Summer Program Report to Band Council. When the Heritage Village Guide opens to the public the Heritage Village Guide will be an important asset to showcase Nlaka'pamux knowledge, as well as the youth may be offered employment opportunities as a result of their gained skills and accreditation.

## **2. Sense of a Bright Future**

The following section illustrate BBFN youth sense of direction at the end of the 2006 Summer Program captured in the youth made section of the 2006 Summer Program multi-media report to Council. The youth interviewed one another and recorded their responses in the supplement, such as about their favorite food, book, activities, and personal anecdotes. Below are the responses recorded by youth starting with their initials and ages (in brackets) completing the statements:

*If I could do anything I would ... , and In the future I dream to ....*

M.T. (10) – I would “become a vet”, and dream to “be rich.”

C.D. (11) – I would “fly to Miami and Hawaii to enjoy the beaches and shop”, and dream to “be a marine biologist!!”

V.D. (12) – I would “travel the world tropics exploring land and cultures”, and dream to “have a good paying job/ go to college/university.”

T.F. (14) – I would “be a rap star”, dream to “be an FBI agent – rap on stage.”

G.F. (14) – I would “get a good carrier and good job”, and dream to “be a hair stylist and maybe a nurse.”

J.C. (15) – I would “what wouldn’t I do?”, and dream to “move out of Boston Bar. Move to a city. Interested in hair dressing.”

### **3. Success Stories**

The community-based research and education components of Connecting Our Roots involved a majority of BBFN youth ages 8 to 24 during the research process from 2003 to 2007. As part of the research process there was a great emphasis to include and support youth in gaining educational aptitude and confidence, and there were some local educational success stories. In 2006, Boston Bar High School had one of the largest graduate classes in its history. Out of the ten graduates, four were from the Boston Bar First Nation community. Of these four BBFN graduates three were directly involved in COR community-based research. Tamara Campbell who was one of these graduates is currently pursuing higher education at the post-secondary level.

Participating directly in the 2005 and 2006 Summer Programs were younger BBFN youth ages 8 to 15. For them the educational program was a transformational experience. Before starting the Summer Programs there were few organized culturally-based educational initiatives available to youth. The 2005 and 2006 Summer Programs provided a full schedule of activities engaging youth in learning about their culture, building skills, gaining accreditation in certificate course, and learning knowledge translation methods. They also actively contributed to documenting and revitalizing traditional plant knowledge and usage. The work of the youth have left positive legacies in their community, including the traditional plant trail, development of the Heritage Village, and guides to the trail and Village. Together these activities contributed to the youth's sense of self and belonging. It also gave them the experience and encouragement to imagine having a role in creating a positive future for themselves and their community.

In 2007, the community-based education component of COR linked with the educational context of UBC. In August, I coordinated a field trip to UBC for youth involved in previous Summer Programs. They came for a day-long experience of the university environment with Councilor Christine Grafinger. Their visit to UBC was a first-time experience for all of them. They were welcomed by faculty and staff at the First Nations House of Learning and the Faculty

of Forestry, and participated in guided tours at the Xwi7xwa library and explored the Museum of Anthropology.

#### **4. Education and Knowledge Translation**

COR's transdisciplinary and culturally contextual approach supported an important process for knowledge translation. COR fostered culturally appropriate ways of transmitting knowledge, including intergenerational knowledge exchange, and mentorship, traditional activities, and hands-on learning. The effects of COR reached the greater BBFN community. For example, youth created publications as a result of their learning experiences that were shared among the community. BBFN is a small community and COR engaged most of the BBFN youth and their families throughout the years. This allowed knowledge translation to occur naturally as younger and older siblings, parents and grandparents became involved as mentors, co-learners, or students.

#### **5. First Nation Education & Health Context**

There is a real concern stemming from culturally inadequate education systems for First Nation students who attempt to pursue education. Statistics support this concern with First Nation youth in BC having disproportionately lower rates of academic success, despite modest improvements (Ignas, 2004). For example, the 2006 Census 'Fact Sheet' for Aboriginal demographics highlights that there is a distinct difference in education attainment between Canada's Aboriginal and non-Aboriginals (Indian and Northern Affairs Canada (INAC), 2008). The census data for the Aboriginal population aged 25-65 showed that 34% off-reserve and 50% on-reserve attained less than high school, and 8% had a university degree (INAC2008). This is in comparison to the non-Aboriginal population of the same age, for which 15% attained less than high school, and 23% had a university degree (INAC2008). Statistics for Boston Bar First Nation are similar to national data. Education statistics for Boston Bar First Nation from a 2001 census show that out of 70 surveyed above the age of 15, 45 had less than a high school certificate, 10 had some post-secondary schooling, and 10 had a diploma or degree below a bachelor's degree, with none reporting a bachelor's degree or higher (Department of Indian

and Northern Development, 2008). The reason for these statistics is complex, and underscores the need for viable solutions.

First Nation curriculum developer Veronica Ignas sees the colonial legacy in education and under representation of Indigenous knowledge “a key factor in limiting Indigenous peoples’ futures” (Ignas, 2004). Her research shows that valuing cultural context and local level knowledge is linked with improvements to educational outcomes (Ignas, 2004). In the case of the *Forest for the Future* (Orlowski & Menzies, 2004) program in Tsimshian territory a culturally situated science curriculum was created as a result of their community-based research activities and strategy for creating a lasting and positive impact. The *Forest for the Future* curriculum provided a meaningful link between new anthropological research and Tsimshian community educational needs (Ignas, 2004; Orlowski & Menzies, 2004). Orlowski & Menzies (2004) emphasize that: “Given the specific needs and experiences of First Nations communities, it is doubly important that knowledge stays in communities in ways that leave tangible results and benefits” (p. 7).

The CPAR process in COR led to the development of COR’s Summer Programs which embodied a ‘multi-science’ curriculum that recognized diverse ways of knowing. Science has many definitions from studying truths and facts to recognizing that science has plural origins and practices (Dictionary.com Unabridged (v 1.1); Kawagley, Norris-Tull, & Norris-Tull, 1998). *Scientia*, the root word of science, simply means “knowledge” (Dictionary.com Unabridged (v 1.1)). The COR education initiative put local Indigenous worldview and knowledge at the centre of learning activities. Academic knowledge and skills were also shared though in the context of providing an alternate perspective or complementing local Indigenous knowledge. This provided BBFN youth with an education viewpoint and methodology that acknowledged and valued their inherent cultural context. It also connected with their everyday lives, and that of their family and community members.

That BBFN youth were comfortable and confident in learning and using science is significant as this kind of successful progress is needed in science education. In North America, First Nations peoples are the least represented in science and technology careers (Aikenhead, 1997). Jegede (1999) proposes that the current alienation from this subject has its roots in a 'clash of cultures' characterized by the difference between the personal beliefs of First Nations students and the knowledge represented in standard classroom science. For First Nations students this means being faced with the task of managing difficult transitions each time they are compelled to cross cultural boundaries (Jegede & Aikenhead, 1999). COR addressed and contributed toward resolving these cognitive conflicts and dissonance by recognizing and managing the transition zones between science worldviews described as "cultural border crossings" by Aikenhead & Jegede (1999, p. 271). As the community-based researcher my role became what Aikenhead & Jegede (1999) call a "cultural broker". To be an effective 'cultural broker' Ignas (2004) recommends that curriculum content should both meet the student's individual needs in a culturally relevant manner and nurture individual strengths. The "learning processes should stress the use, rather than the acquisition of information" (Kanevsky, 1999, p. 60). The goal was to make science education accessible through providing the proper guidance and tools for BBFN youth to feel valued, learn science in culturally situated ways, while being able to cross cultural boundaries to readily access and use other ways of knowing.

## **6. Transformative Education**

### **a) Embracing 'Head, Hands and Heart' Learning**

The Connecting Our Roots education initiatives embraced what Sipos Randor (2001) calls "Head, Hands and Heart" transformation learning pedagogy. This process engages learners in critical thinking (heads-on), doing (hands-on), and being (hearts-in) (Sipos-Randor, 2001). For BBFN youth the learning process began with 'hearts-in', where their values and passion were nurtured through culturally contextual learning experiences. Examples of these are intergenerational activities with their community elders, including traditional food gathering and interviews. The 'hands-on' learning came from activities such as traditional gathering, trail-



building and contributing to the development and upkeep of the BBFN Heritage Village. The 'heads-on' component combined and critically assessed the entire learning experience, connecting hearts-in and hands-on with classroom based learning and research.

#### **b) Education, Cultural Continuity and First Nation Youth**

The role of cultural contextual and transformative education as a health strategy is gaining in recognition. Particularly for First Nation youth, cultural continuity has been identified as a factor promoting mental health and identified as "a hedge" or protective factor against youth suicide (Chandler & Lalonde, 1998). As part of COR, BBFN youth were engaged in many activities that fostered cultural continuity. This included learning about their cultural heritage participating in traditional food gathering and preparation, cultural knowledge workshops, daily ceremony in the pit-house, and overall being actively engaged in revitalizing traditional plant knowledge. The COR education initiative was also principally directed and implemented through a community-based collaborative process. This reflects exercising self-determination in education and providing youth with a culturally situated and appropriate education environment. The hope is that the increased self-determination in education and building community-based cultural continuity will contribute to the health of the BBFN community.

### **E. COR: Research Challenges**

#### **1. Managing Relationship**

Key to participatory research are relationships. Developing and maintaining healthy and functional relationships with diverse participants is of great importance for the research process, and can be challenging. For example, the academic researcher working within a community setting needs to be highly adaptable to ongoing social dynamics, which in the case of cross-cultural research can be unfamiliar. The researcher is responsible for maintaining good communication between research participants – academic and community-based. Often, micro-managing is involved to re-balance relationships where misunderstanding or conflict have arisen. From my personal experience it was very important to maintain neutrality and

open-mindedness. Prejudice and bias may arise from personal background or natural alliances that form as part of the research process. It is important to be aware of these and not get caught up in them. It was important to take the time to reflect on situations and refocus on personal and research intentions when necessary.

## **2. Long-term Commitment**

CPAR research typically requires a long-term time commitment. For one it takes time to develop trusting and effective working relationships with good communication essential for participatory research (Chino & DeBruyn, 2006). Especially in an Indigenous context honouring relationships is culturally very important. This involves taking the time to truly get to know community members. In the First Nation context of COR a high investment was given to relationships, in contrast to superficial connections found in other settings. Being genuine and responsible with people is necessary for creating strong relationships. This is a process that can require high personal commitment and be time intensive.

## **3. Implications for a Female Researcher**

There are research implications particular to being a woman. One major issue is safety. For this reason it is important to ensure that your local living situations suits personal needs for safety. In my experience it was challenging to live alone in a large house that also acted as a community centre at times, and a variety of people having access. Adding to my sense of security was having locks to partition the house so that I could have private areas, knowing who my local emergency contacts were, and having a dog. Also, I avoided social gatherings where alcohol or drugs were involved. Being an unmarried young woman also called for awareness on personal presentation and interacting with others, particularly men. For example, I found a conservative personal dress-code helpful. Of course, there were advantages to being a young woman. For example, it was helpful in naturally developing familiar relationships with female Elders and youth in their teens.

#### **4. Scope of Research**

The scope of this research initiative was comprehensive, which had advantages and limitations.

**Advantages** of the transdisciplinary approach were that it captured multiple perspectives through diverse research methodologies. It also promoted the integration of diverse methodologies to provide new understanding. In COR quantitative and qualitative research methodologies of various disciplines were used to pursue research questions. To provide answers for the health aspects of Tseweta methodologies from ethnobotany, plant chemistry, microbiology, and nutritional sciences were implemented. The overall research was guided by community-based participatory action research methodologies and Indigenous research principles. The 'action' component of COR contributed to community capacity building and positive transformation emerging from the meaningful integration of the research process and results. Overall, the synergy from going beyond boundaries allowed for new insights to emerge from multiple perspectives for a greater goal – strengthening community health through Connecting Our Roots.

**Limitations** of having a wide scope included compromising depth and clarity of the research inquiry. For example, had the research only focused on the nutritional component or working exclusively on intergenerational knowledge transmission, each discipline would have gained from greater exploration within this focus. As part of COR it was a difficult task to keep focused as so many interesting paths of investigation and exploration came up because of the reflexive (bidirectional) participatory research process. In retrospect, the research could have benefited from a narrower focus and simplified the research process and outcomes, as well as the thesis writing. It took considerable effort to learn methodology and methods across disciplines, and report on them. Though, the depth of this research is gained through the development of meaningful outcomes, and these were created through allowing a flexible research process that contributed to the comprehensive research scope.

## **F. Conclusion: An Ecological Approach to Indigenous Health**

The Connecting Our Roots research is part of a trend for Indigenous health approaches that are shifting their focus to population and community-based initiatives for promoting community-wellbeing and individual wellness. The disproportionate health concerns found in Canadian Indigenous populations are recognized to be largely the result of colonial history and its ill effects, rather than individual life-style choices (Kirmayer, Simpson, & Cargo, 2003). Important methods in healing intergenerational impacts and tensions in Canadian Indigenous communities include renewing and reconciling “family and community roots”, with “language, land and legacy lie at the heart of culture” (Advisory Group on Suicide Prevention, 2005). Sources of resilience have been cited as “living on the land, community, connectedness, and historical consciousness” (Kirmayer et al., 2003).

COR’s focus on revitalizing traditional plant knowledge and usage within a culturally appropriate research environment supported cultural continuity and knowledge translation between and within the Indigenous and academic research communities. Cultural competency facilitated for knowledge translation to bridge communication between cultures. The community-based participatory approach allowed for the research to unfold naturally based on the reciprocal relationships of research participants and the convergence of their interests and skills. Transformative outcomes were generated through traditional plant research and education research components. The culturally contextual education initiative built capacity and directly contributed to identity and cultural continuity of BBFN youth. The traditional plant research gives testament for the nutritional, social and cultural benefits of traditional food systems. It also provides evidence about the significance of traditional food systems in contributing to local food security and community well-being.

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## **Appendices**

Appendix I: Glossary

Appendix II: BREB Certificate of Approval

Appendix III: BBFN- UBC IAH Code of Research Ethics

Appendix IV: Charter of Transdisciplinarity

Appendix V: Hilda Isaac Interview Consent Form

Appendix VI: Youth Night Invitational Poster (2005)

Appendix VII: Youth Night Summer Program Ideas

Appendix VIII: Youth Night Summer Program Ideas (2005)

Appendix IX: 2005 Summer Program Calendar

Appendix X: YCR Huckleberry Picking Poster Notification

Appendix XI: YCR Huckleberry Theatre (2005)

Appendix XII: YCR Interpretive Trail Publication (2005)

Appendix XIII: 2005 Summer Program YCR Feedback

Appendix XIV: 2005 Band Council Feedback

Appendix XV: 2006 Summer Program Calendar

Appendix XVI: Questionnaire – Envisioning 2006 Summer Program

Appendix XVII: Heritage Village Publication

Appendix XIX: Communication of Research

## Appendix I: Glossary

Term	Definition	Source(s)
Aboriginal Health	An Indigenous concept of health and survival that is both a collective and individual intergenerational continuum encompassing a holistic perspective incorporating four distinct shared dimensions of life: the spiritual, intellectual, physical, and emotional. Linking these four fundamental dimensions, health and survival manifests itself on multiple levels where the past, present, and future coexist simultaneously from the <i>Declaration on the Health and Survival of Indigenous Peoples</i>	(Committee on Indigenous Health, 1999; Durie, 2004)
Aboriginal Peoples	Aboriginal peoples are defined by the Canadian Constitution (1982) as First Nations, Métis, and Inuit recognizing each for having unique histories.	(National Aboriginal Health Organization (NAHO), 2007)
Capacity Building	The current literature identifies various dimensions of capacity, such as participation, leadership, social supports, sense of community, access to resources, and skills, and their importance in developing and empowering local coalitions. Other parallel constructs have informed the literature on community capacity, such as empowerment, the readiness of a community to work to improve existing conditions, and the social capital <sup>8</sup> necessary for communities to move forward and collaborate.	(Chino & DeBruyn, 2006)
Community	A specific group of people, often living in a defined geographical area, who share a common culture, values and norms, are arranged in a social structure according to relationships which the community has developed over a period of time. Members of a community gain their personal and social identity by sharing common beliefs, values and norms which have been developed by the community in the past and may be modified in the future. They exhibit some awareness of their identity as a group, and share common needs and a commitment to meeting them.	(Kickbusch & Nutbeam, 1998)

Term	Definition	Source(s)
Community-Based Participatory Action Research	Collaboration, education, and action are the three key elements of participatory research. Such research stresses the relationship between researcher and community, the direct benefit to the community as a potential outcome of the research, and the community's involvement as itself beneficial.	(Macaulay et al., 1999)
Cultural competency	Involves developing cross-cultural awareness, attitude, knowledge, and skills, and requires reflecting on one's own cultural perspective while developing sensitivity to others.	(Diller et al., 2005; McAllister & Irvine, 2000; Rogerson, 2006; Sue, 2001)
Health	Defined as: a state of complete physical, social and mental well-being, and not merely the absence of disease or infirmity.	(Kickbusch & Nutbeam, 1998), WHO constitution of 1948
Health education	Comprises consciously constructed opportunities for learning involving some form of communication designed to improve <i>health literacy</i> , including improving knowledge, and developing <i>life skills</i> which are conducive to individual and community health.	(Kickbusch & Nutbeam, 1998)
Knowledge Translation	The exchange, synthesis and ethically-sound application of knowledge - within a complex system of interactions among researchers and users.	(Canadian Institutes of Health Research (CIHR), 2008).
Indigenous Peoples	Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system.	(Cobo, 1986)

Term	Definition	Source(s)
Indigenous Knowledge	Indigenous knowledge thus embodies a web of relationships within a specific ecological context; contains linguistic categories, rules, and relationships unique to each knowledge system; has localized content and meaning; has established customs with respect to acquiring and sharing of knowledge (not all Indigenous peoples equally recognize their responsibilities); and implies responsibilities for possessing various kinds of knowledge.	(Battiste, 2005)
Indigenous People	Indigenous people are people who, on account of their descent from the populations that inhabited the country or a geographical region to which the country belongs at the time of conquest or colonization or the establishment of present state boundaries and irrespective of their legal status, retain some or all of their own social, economic, cultural, and political institutions.	(International Labour Organization, 1989)
Traditional Food Systems (TFS)	Traditional food systems (TFS) include all foods within a culture that are “from local natural resources and culturally accepted”, and are interwoven in a cultural process that provides the framework for use, including harvesting and processing techniques, food composition, and nutritional consequences of using the food.	(Kuhnlein & Receveur, 1996)
Traditional Ecological Knowledge and Wisdom (TEKW)	Knowledge and wisdom “derived from generations of experimentation and observation, leading to an understanding of complex ecological and physical principles.”	(Turner, 2000)
Traditional Plant Knowledge and Usage (TPKU)	Part of traditional ecological knowledge (TEK) that refers to the knowledge system and usage of plants in a particular culture.	(Kuhnlein & Turner, 1991; Kuhnlein & Receveur, 1996; Turner, 2000)
Self-determination	The right of a people or a group of people to choose their own destiny without external compulsion. It is a right to be sovereign, to be a supreme authority within a particular geographical territory. Self-government is a term describing a group of people exercising significant choices concerning their own political, cultural, economic, and social affairs.	(Schnarch, 2004)

## Appendix II: BREB Certificate of Approval

From: **Thompson, Shirley** <Shirley.Thompson@ors.ubc.ca>

Date: Mon, Apr 27, 2009 at 3:52 PM

To: Sarah Antonia Martz <sarah.antonio@gmail.com>

Dear Sarah,

The original application and certificate of approval for this study have been archived; but I can confirm for you that the study was reviewed and approved by the UBC Behavioural Research ethics Board.

I have attached a print-out from our old database indicating that the study was approved on July 16, 2004.

Best regards,

Shirley

Shirley Thompson

Manager, Behavioural Research Ethics Board

University of British Columbia

102-6190 Agronomy Road

Vancouver, B.C. V6T 1Z3

(604) 827-5112

+ ORSIL101 ----- ETHICAL REVIEW MAINTENANCE ----- 2009-04-27 +

File No. : B04-0260 Entry : 2004-04-07 |  
Researcher : Jovel ,Eduardo ,E. 822-7615 |  
Appointment : Land & Food Systems |  
Co Pi : 4 Institution/Site : 1 Reviewer : 2 Part : 0 Term : 1 |  
Application : 1 |  
Contact : Jovel ,Eduardo ,E. 822-7615

+ Title----- Agency -----+  
Y Community-Based Capacity Building in Traditional Nu CIHR Canadian Inst |  
Y Community-Based Capacity Building in Traditional Nu |

+--- ACTION ----- DATE --- CONTENT -----+  
Y F Follow-up 2006-07-18  
Y TN Terminated 2005-12-15  
Y F Follow-up 2005-09-12  
Y F Follow-up 2005-06-07  
N A Approved 2004-07-16  
N Y Comment 2004-07-16  
N T Amendment 2004-07-10  
N P Proviso 2004-04-26  
N M Meeting 2004-04-22  
+-----+  
+-----+

### **Appendix III: BBFN – UBC IAH Code of Research Ethics**

#### **BOSTON BAR FIRST NATION (NLAKA'PAMUX) AND THE UNIVERSITY OF BRITISH COLUMBIA INSTITUTE FOR ABORIGINAL HEALTH**

#### **Code of Research Ethics**

#### **INTRODUCTION**

Located in the interior of British Columbia (BC), Boston Bar First Nation (BBFN), member of the Nlaka'pamux Nation Tribal Council, have a total reserve land base of 556 ha. Historically, Nlaka'pamux people collected and preserved foods and medicine plants from their territory. Traditional diets consisted of many varieties of food plants and high quality fish and animal proteins. Within the last few decades, the departure from traditional diets to foods mainly composed of processed starches and sugars has lead to a drastic decline in the health status of many Aboriginal people.

The BBFN people, the University Of British Columbia (UBC) Institute for Aboriginal Health (IAH) and BC Aboriginal Capacity and Developmental Research Environments (BC ACADRE) are co-researchers in an innovative research project, *Community-based Capacity Building in Traditional Nutrition and Science-based Knowledge Focusing on Diabetes Prevention*. This research partnership was initiated by BBFN, and through an ongoing collaboration process the research focus was identified. The proposed research project aims to link traditional plant uses, nutrition and diabetes prevention. The Chief and Council represent the Boston Bar First Nation.

This interdisciplinary collaborative approach applying Community-Based (CB) research principles contributes to a new era of research. A CB approach will guide this research process and contribute towards building respectful and mutually empowering relationships, while producing sound academic research results. The foundations of this research are based on communication and understanding between all research partners, including the development of protocols outlining ethical, legal and practical aspects of the research.

To ensure the protection of the BBFN traditional knowledge and to address issues of intellectual property rights this project applies the research and scholarship guidelines of the National Sciences and Engineering Research Council (NSERC) *Tri-Council Policy: Section 6, Research Involving Aboriginal People*; BC ACADRE 4Rs: *Respect, Relevance, Reciprocity and Responsibility* (Kirkness & Barnhardt, 1991); and the National Aboriginal Health Organization (NAHO) principles of *Ownership, Control, Access, Possession*, (OCAP; Schnarch 2002).

## **PURPOSE OF THE CODE OF RESEARCH ETHICS**

This code of ethics is necessary to establish a set of mutually agreed upon principles and protocols that will guide the research process and contribute toward building a community-based collaborative research environment. This is accomplished by:

1. **Outlining the expectations and obligations** of each research partner in all phases of research from the development of the research design to the communication of results. This includes expectations over the nature of the research relationship between partners, and steps to ensure that the research is culturally relevant and will effect the improvement of the health of BBFN people.
2. **Addressing issues of protecting BBFN knowledge and territory**, ensuring culturally appropriate, economical integrity and environmentally friendly research.
3. **Fostering a clear understanding between research partners** ensuring the research is academically sound, respectful of the concerns and needs of each research partner, and culturally appropriate.

## **OVERALL GUIDING PRINCIPLES**

In this research collaboration both Boston Bar First Nation and the University of British Columbia Institute for Aboriginal Health are recognized as full research partners, actively contributing towards these common and agreed upon research principles.

### **A. Nature of Research Relationship**

1. Boston Bar First Nation people are recognized as holding the rights and obligations to control their cultural and intellectual properties and knowledge.
2. Boston Bar First Nation people are acknowledged as the guardians and interpreters of the culture and knowledge system in past, present, and future.
3. Boston Bar First Nation community researchers and UBC IAH researchers will work collaboratively on all phases of the research including involvement in mutual decision-making process characterized by on-going communication and feedback between research partners at all phases of the research.
4. UBC IAH will engage in an ongoing consultation process with BBFN to facilitate clear communication between researchers and community and to empower the Nlaka'pamux community decision-making concerning the proposed research, including research design, data collection, analysis, interpretation and dissemination of results.
5. All research conducted with Boston Bar First Nation must serve the interest of the community and to contribute in its overall health, social, education and economic goals.
6. Research partners shall ensure a research environment that is equitable, life enhancing and free of oppression.
7. All research partners must show respect for language, traditions, protocols of the community, and for the highest standards of scholarly research.
8. UBC IAH will ensure research continuity with emphasis on research capacity building of the Boston Bar First Nation people, the strengthening of links with research institutions, and supporting future research activities.

## **B. Research procedure with participants**

1. Informed, written consent must be obtained from community members who volunteer to participate in this study.
2. The consent form should include a description of the study, including objectives, anticipated benefits and risks, and contact information of those responsible for the conduct of the study.
3. No form of coercion or undue inducement shall be used to obtain consent.
4. For persons under the age of majority, consent will be sought from a legal guardian and assent from the participant.
5. The right to withdraw without repercussions will be made clear to participants.
6. Confidentiality will be maintained using a coding system, unless a participant gives written request to be publicly noted.
7. Participants shall be recognized and engaged as equals in the research conducted instead of as “informants” or “subjects”.

## **C. Analysis, interpretation and communication of results.**

1. The Boston Bar First Nation community and UBC IAH will be involved in the process of analysis, interpretation and communication of results. This will be important for cross checking and triangulating data supporting its accuracy.
2. The research partners must first approve any communication of results, including written or oral presentations.
3. Proper acknowledgment for those involved in producing and disseminating research results is facilitated by listing authors in order of contribution.

## **D. Protection of knowledge derived from BBFN community during research.**

1. All research, study, or inquiry into Boston Bar First Nation knowledge, culture, and traditions, involving any research partner, belongs to the community and must be returned to that community as grouped results.
2. To ensure fair and equitable sharing of economic benefits that may arise as a result of this study suitable economic benefit-sharing agreements will be established. These will observe international agreements such as found in article 27.3 (b) of the WTO TRIPS and article 8 (j) of the Convention of Biological Diversity (CBD), as well as agreements and laws the BBFN and UBC IAH are bound to.
3. In specific, the principles of Ownership, Control, Access, Possession (OCAP; Schnarch 2002) will be used to define intellectual property rights.



## RESEARCH PROTOCOL

### A. Expectations and Obligations of Research Partners and their Researchers

#### Boston Bar First Nation

1. To ensure the community's integrity and autonomy is not jeopardized through the research.
2. To ensure the research is culturally relevant and contributes toward the overall health and economic aspirations of the Nlaka'pamux community.
3. To inform UBC IAH immediately if, following internal consultation, the community decides to withdraw from research project. This should include reasons for the decision.
4. To serve as the guardian of returned data and results once the research project is completed. This includes making decisions as to who will have access to data.
5. To approve or give written disagreement to the interpretation or communication of research results.
6. To achieve the long-term goal of creating economic and educational opportunities for the community members.

#### UBC Institute for Aboriginal Health

1. To ensure the full participation and vision of BBFN community members is integral in the research process and definition of research agreements.
2. To ensure the design, implementation, analysis, interpretation, and communication of results are in agreement with standards of competent research.
3. To uphold the highest standard of research ethics by following the BBFN agreements and the UBC Behavioural Ethic Review which include adherence to the guidelines assuring confidentiality of each research participant's identity.
4. To inform the Boston Bar First Nation community immediately if for some unexpected reason the original objectives, or the foreseen benefits cannot be met.

### B. Researchers: Community and Academic

#### Community

1. To maintain a dual role as researcher and steward/educator, with the community needs given priority in the decision-making process.
2. To communicate with the academic researcher and community research partner in all phases of research.

#### Academic

1. To do no harm in the BBFN community.
2. Assume responsibility to learn and respect Boston Bar First Nation protocols and traditional knowledge, and exercise sensitivity to cultural practices and issues.

3. To conduct research with the intention of providing the community with a community-based participatory research process that will be meaningful to them.
4. To promote active participation of community members in the research project and to facilitate building research capacity within the community.
5. To have a long-term commitment to supporting the community with research capacity building which addresses health or social issues that may arise from research questions.
6. To be the guardian of data until the completion of the research project when the data and results will be transmitted to the community for safekeeping.
7. To promote and participate in the translation and diffusion of academic and traditional knowledge gained through research initiatives. This may include communicating results in oral or written form.

## **DEFINITIONS**

### Aboriginal peoples

Aboriginal people are the descendants of the original inhabitants of North America. The Canadian Constitution recognizes three groups of Aboriginal people – [Status, Non-status people], Métis people and Inuit. (INAC 2000)

### Community Based (CB)

Community-based research develops a collaboration between a community group(s) and researchers for the purpose of creating new knowledge or understanding about a practical community issue in order to bring about change. The issue is generated by the community and community members participate in all aspects of the research process. Community-based research therefore is collaborative, participatory, empowering, systematic and transformative (Hills & Mullett, 2000).

## **ACKNOWLEDGEMENTS**

This Code of Research Ethics was drafted using established research ethics principles and protocols available on the Internet, including the Association of Canadian Universities for Northern Studies Council (1997), Kateri Memorial Hospital Center (1997), and the Mi'kmaq College Institute (2004). As requested on the website, written permission was sought and granted by Kahnawake Schools Diabetes Prevention Project to use their developed code of research ethics as a primary template.

## REFERENCES

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## SIGNATURE PAGE

We agree to follow the code of ethics as outlined in the document ***Boston Bar First Nation and UBC Institute for Aboriginal Health Code of Research Ethics*** while participating in the research project titled: *Community-based Capacity Building in Traditional Nutrition and Science-based Knowledge Focusing on Diabetes Prevention*.

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Dr. Eduardo Jovel  
Director, Institute for Aboriginal Health

---

Dr. Richard Vedan, Director, First Nations House of Learning

---

Dr. John Gilbert  
Principal, College of Health Disciplines

---

Dolores O'Donaghey  
Chief, Boston Bar First Nation

---

Councilor, Boston Bar First Nation

---

Councilor, Boston Bar First Nation

Date

---

Witness

## **Appendix IV: Charter of Transdisciplinarity**

(Source: de Freitas, Morin, & Nicolescu, 1994; Nicolescu, 2005)

(adopted at the First World Congress of Transdisciplinarity, Convento da Arrábida, Portugal, November 2-6, 1994)

### **Preamble**

Whereas, the present proliferation of academic and non-academic disciplines is leading to an exponential increase of knowledge which makes a global view of the human being impossible;

Whereas, only a form of intelligence capable of grasping the cosmic dimension of the present conflicts is able to confront the complexity of our world and the present challenge of the spiritual and material self-destruction of the human species;

Whereas, life on earth is seriously threatened by the triumph of a techno-science that obeys only the terrible logic of productivity for productivity's sake;

Whereas, the present rupture between increasingly quantitative knowledge and increasingly impoverished inner identity is leading to the rise of a new brand of obscurantism with incalculable social and personal consequences;

Whereas, an historically unprecedented growth of knowledge is increasing the inequality between those who have and those who do not, thus engendering increasing inequality within and between the different nations of our planet;

Whereas, at the same time, hope is the counterpart of all the afore-mentioned challenges, a hope that this extraordinary development of knowledge could eventually lead to an evolution not unlike the development of primates into human beings;

Therefore, in consideration of all the above, the participants of the First World Congress of Transdisciplinarity (Convento da Arrábida, Portugal, November 2-7, 1994) have adopted the present Charter, which comprises the fundamental principles of the community of transdisciplinary researchers, and constitutes a personal moral commitment, without any legal or institutional constraint, on the part of everyone who signs this *Charter*.

**Article 1 :**

Any attempt to reduce the human being by formally defining what a human being is and subjecting the human being to reductive analyses within a framework of formal structures, no matter what they are, is incompatible with the transdisciplinary vision.

**Article 2 :**

The recognition of the existence of different levels of reality governed by different types of logic is inherent in the transdisciplinary attitude. Any attempt to reduce reality to a single level governed by a single form of logic does not lie within the scope of transdisciplinarity.

**Article 3 :**

Transdisciplinarity complements disciplinary approaches. It occasions the emergence of new data and new interactions from out of the encounter between disciplines. It offers us a new vision of nature and reality. Transdisciplinarity does not strive for mastery of several disciplines but aims to open all disciplines to that which they share and to that which lies beyond them.

**Article 4 :**

The keystone of transdisciplinarity is the semantic and practical unification of the meanings that *traverse* and *lay beyond* different disciplines. It presupposes an open-minded rationality by re-examining the concepts of "definition" and "objectivity." An excess of formalism, rigidity of definitions and a claim to total objectivity, entailing the exclusion of the subject, can only have a life-negating effect.

**Article 5 :**

The transdisciplinary vision is resolutely open insofar as it goes beyond the field of the exact sciences and demands their dialogue and their reconciliation with the humanities and the social sciences, as well as with art, literature, poetry and spiritual experience.

**Article 6 :**

In comparison with interdisciplinarity and multidisciplinary, transdisciplinarity is multireferential and multidimensional. While taking account of the various approaches to time and history, transdisciplinarity does not exclude a transhistorical horizon.

**Article 7 :**

Transdisciplinarity constitutes neither a new religion, nor a new philosophy, nor a new metaphysics, nor a science of sciences.

**Article 8 :**

The dignity of the human being is of both planetary and cosmic dimensions. The appearance of human beings on Earth is one of the stages in the history of the Universe. The recognition of the Earth as our home is one of the imperatives of transdisciplinarity. Every human being is entitled to a nationality, but as an inhabitant of the Earth is also a transnational being. The acknowledgement by international law of this twofold belonging, to a nation and to the Earth, is one of the goals of transdisciplinary research.

**Article 9 :**

Transdisciplinarity leads to an open attitude towards myths and religions, and also towards those who respect them in a transdisciplinary spirit.

**Article 10 :**

No single culture is privileged over any other culture. The transdisciplinary approach is inherently transcultural.

**Article 11 :**

Authentic education cannot value abstraction over other forms of knowledge. It must teach contextual, concrete and global approaches. Transdisciplinary education revalues the role of intuition, imagination, sensibility and the body in the transmission of knowledge.

**Article 12 :**

The development of a transdisciplinary economy is based on the postulate that the economy must serve the human being and not the reverse.

**Article 13 :**

The transdisciplinary ethic rejects any attitude that refuses dialogue and discussion, regardless of whether the origin of this attitude is ideological, scientific, religious, economic, political or philosophical. Shared knowledge should lead to a shared understanding based on an absolute *respect* for the collective and individual Otherness united by our common life on one and the same Earth.

**Article 14 :**

*Rigor, openness, and tolerance* are the fundamental characteristics of the transdisciplinary attitude and vision. *Rigor* in argument, taking into account all existing data, is the best defense against possible distortions. *Openness* involves an acceptance of the unknown, the unexpected and the unforeseeable. *Tolerance* implies acknowledging the right to ideas and truths opposed to our own.

**Article final :**

The present *Charter of Transdisciplinarity* was adopted by the participants of the first World Congress of Transdisciplinarity, with no claim to any authority other than that of their own work and activity.

In accordance with procedures to be agreed upon by transdisciplinary-minded persons of all countries, this *Charter* is open to the signature of anyone who is interested in promoting progressive national, international and transnational measures to ensure the application of these Articles in everyday life.

**Convento da Arrábida, 6th November 1994**

*Editorial Committee*

Lima de Freitas, Edgar Morin and Basarab Nicolescu

*Translated from the French by*

*Karen-Claire Voss*

## Appendix V: Hilda Isaac Interview Consent Form

	<b>The University of British Columbia Institute for Aboriginal Health</b>  Division of Community Liaison 403 - 2194 Health Sciences Mall Vancouver, BC V6T 1Z3	<b>Boston Bar First Nation Band</b> SS #1, Green Ranch Road, Boston Bar, BC V0K 1C0 Tel: (604) 867-8844 Fax: (604) 867-9317
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### Consent Form

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**Food Is Our Medicine:  
Community-Based Participatory Action Research  
Focused on the Health Aspects of Traditional Food Plants  
and the Revitalization of Traditional Food Practices**

**Principal Investigator:** Dr. Eduardo M. Jovel, Director of the UBC Institute for Aboriginal Health, and Assistant Professor, UBC Faculty of Land and Food Systems. Telephone: UBC Vancouver (604) 822-7615.

**Co-Investigator(s):**

1. Dolores O'Donaghey, Chief Boston Bar First Nations Band, Elder.
  - Telephone: Band Office, North Bend (604) 867-8844
2. Dr. Shannon Binns, Assistant Professor, UBC Faculty of Land and Food Systems
  - Telephone: UBC, Vancouver (604) 822-2941
3. Sarah Martz, UBC Faculty of Land and Food Systems, M.Sc. Plant Science candidate.
  - Telephone: Learning Lodge, North Bend (604) 867-9039; Cell (604) 761-0340

Attention: This research is part of a thesis and therefore a public document, however, information protected within the **Code of Research Ethics** established by Boston Bar First Nation and the University of British Columbia's Institute for Aboriginal Health are protected for their confidentiality. The Code of Research Ethics can be viewed at the BBFN Band Office.



**Purpose:**

This research initiative is about reconnection. Its goal is to conduct participatory and community-based research as part of culturally relevant health initiative linking plants, people and health. The Boston Bar First Nation (BBFN) initiated this collaborative research partnership with the University of British Columbia's Institute for Aboriginal Health (UBC IAH) to assist them in their efforts to document, maintain and revitalize traditional food practices for increased health and education capacity, as well as resource management. This consent form is required for any interview to proceed.

**Study Procedures:**

The purpose of the interviews is to document ethnobotanical knowledge existing in the Boston Bar First Nations community. The interview style will be semi-structured (open-ended, partially guided questions) and may include expert led botanical surveys. The interview will focus on plant ecology and traditional medicinal and nutritional uses, including harvesting and preparation.

Plant visuals or reference material (fresh, herbarium specimen, or books) may be used to enhance discussion and assist in plant identification. The participation of community research assistants and/or family members in interviews is encouraged. The location, time, duration and frequency of the interview will be agreed on by consensus between researcher and interview participant(s). If permission is granted by interview participants the interview will be digitally recorded (video/audio), for the purpose of archiving community knowledge, an ongoing project the BBFN is pursuing. Prior to interviewing or recording the expressed written consent is required from interview participants. Persons not able to give legal consent, such as minors, will require to have a consent form signed on their behalf by a parent or legal guardian, and sign an assent form themselves. Individuals who do not want to be interviewed and/or recorded will not be. There is absolutely no obligation to participate and no repercussions for choosing not to.

**Confidentiality:**

Identity of interview participants will be kept strictly confidential. This will be accomplished by using a code instead of an identity when recording information. We will store data in either a password protected computer or locked filing cabinet. The participant's identity will only be revealed upon their request accompanied by a signed formal statement from them affirming that they wish their identity to be public.

**Remuneration/Compensation:**

There is no remuneration involved in this study.

**Contact for information about the study:**

If you have any questions or desire further information with respect to this study, you may contact Dr. Eduardo Jovel the principal investigator, or one of his associates at (604) 822-7615.

**Contact for concerns about the rights of research subjects:**

If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

**Consent:**

Your participation in this study is entirely voluntary and you may refuse to participate in any part of this study or withdraw from the study at any time without repercussions.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

---

Participant Signature

---

Date

---

Printed Name of the Interview Participant signing above.

**Appendix VI: Youth Night Invitational Poster (2005)**

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**Boston Bar First Nation Youth  
Looking for Something to Do?!**



**\* Movie Night w/ Pizza, Snacks and Drinks\***

**\* Youth Summer Planning \*  
Creating Your Summer Vision Together**

**Wednesday, July 13th  
6:00 pm at the Learning Lodge  
(i.e. North Bend)**

**Bring Pillows/Blankets to get Comfy**

**Questions?! Call Zarah @ 604 867 9039**

## Appendix VII: Youth Night Summer Program Ideas (2005)

2005 July 13<sup>th</sup>

### Boston Bar First Nation Youth Night Create your Own Summer – Youth Brainstorming Session

#### Weekly Ideas

Drumming Lessons  
Dancing Lessons  
Youth Nights: Hacky, Soccer, Movies, etc...  
Youth Res Baseball League  
Breakdancing Lessons  
Glow and Bowl  
Activities at the Pool

#### Infrastructure

Fix-up Basketball Court (idea for youth job development)  
Build Gazebo, or covered area for break-dancing sessions  
Place for youth to buy snacks on the N. Bend reserve: Idea – Vending Machine  
Place to post notices at Anderson (Gas Bar) and the North Bend Res  
Calendar of Events at Gas Bar

#### Other Activities

Monkey Days (Jadan's Idea)  
Pond Science Day  
Interpretive Trail Building  
\*\*Paintball (Interest by All the Youth and Younger Kids)  
Golf

**Special Activities:** PNE, Wonderland, Waterslides

#### Job Creation

Yard Maintenance, Helping Elders, Interpretive Trail Building, Making Things to Sell in the Interpretive Village and Gas Bar (Dreamcatchers), Fix-up Basketball Court (idea for youth job development), Build Gazebo, or covered area for break-dancing sessions

#### Youth Leaders and Coordinator

Youth Leader Coordinator: Curtis Florence  
Youth Leaders: J.J. Campbell, Tamara Campbell, Tina Campbell, Tara Campbell, others...

## Appendix VIII: Youth Community Researcher Posting (2005)

!! Job Opportunity !!

Community Researchers

Looking for **Youth** Interested in **Participating** in the

**Boston Bar First Nation**

**Traditional Food Plant Revitalization Project**

You will be paid to learn, have fun, and participate in community and university research.

**Community Researchers** will learn research skills in:

- How to find scholarly information on the internet and from texts.
- Botanical Training: Plant ID, Traditional Use, Medicinal and Nutritional Qualities.

Planned **Activities Include:**

- Participating in Traditional Food Plant Activities and Interviews with Experts and Elders
  - Building a Community Plant Library (Herbarium)
  - Creating a Traditional Food Plants Website
  - Working on an Interpretive Trail at Anderson

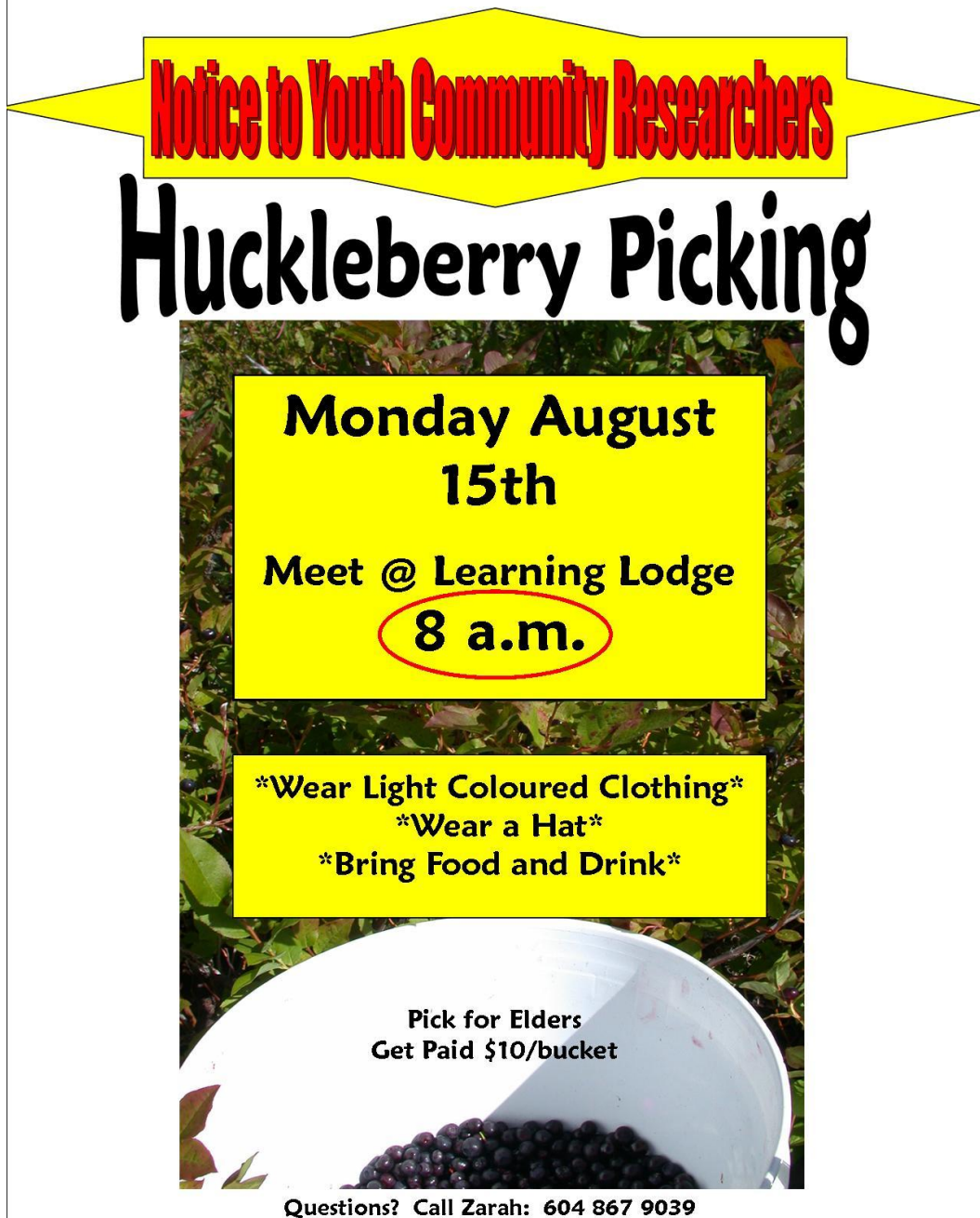
You don't need experience – Just be motivated!

And I look forward to working with you and will make an effort to create flexible summer schedules.

If you're interested or have questions please leave name below  
or call Zarah at the Learning Lodge: 867-9039

# Appendix IX: 2005 Summer Program Calendar

<div>  <div> Youth Community Researchers  Boston Bar First Nation Traditional Food Plant Revitalization Project </div> </div>						
August 2005						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
<div> <div>1</div> <div>Community Researchers Will Gain:</div> <ul style="list-style-type: none"> <li>*Knowledge &amp; Skills in Academic and Traditional Plant Science</li> <li>*Experience with University Research</li> <li>*Able to lead cultural plant walks.</li> <li>*Teaching Experience.</li> <li>*Computer &amp; Internet Skills—website building, online research, etc...</li> <li>*and more .....</li> </ul> </div>	<div> <div>2</div> <div>participate</div> </div>	<div> <div>3</div> <div>Learn</div> </div>	<div> <div>4</div> <div>First Meeting: 10 am @ the Learning Lodge. Call Zarah if you have trouble finding a ride</div> </div>	<div> <div>5</div> <div>Day at the Water-slides!!!</div> </div>	<div> <div>6</div> <div>*Plant Trail - Introduction - Flag Trail</div> </div>	<div> <div>7</div> <div>  </div> </div>
<div> <div>8</div> <div>Huckleberry Picking for Elders</div> </div>	<div> <div>9</div> <div>YCR Meeting</div> <ul style="list-style-type: none"> <li>*Intro to Project</li> <li>*Skill Building</li> </ul> </div>	<div> <div>10</div> <div>Developing Huckleberry Play for Youngsters at Headstart</div> </div>	<div> <div>11</div> <div>Practice research skills</div> <ul style="list-style-type: none"> <li>*Perform Huckleberry Play</li> </ul> </div>	<div> <div>12</div> <div>Worked on herbarium</div> <ul style="list-style-type: none"> <li>*Plant Trail Research</li> </ul> </div>	<div> <div>13</div> <div>  </div> </div>	<div> <div>14</div> <div>  </div> </div>
<div> <div>15</div> <div>Lesson: Poisonous Plants &amp; Healing Herbs</div> </div>	<div> <div>16</div> <div>Plant Trail Publication and Practice guiding on trail</div> </div>	<div> <div>17</div> <div>Plant Trail Publication and Practice guiding on trail</div> </div>	<div> <div>18</div> <div>Zarah out of town to help her dad move!!</div> </div>	<div> <div>19</div> <div>Interviews</div> <ul style="list-style-type: none"> <li>*Debrief Summer Learning Experience</li> </ul> </div>	<div> <div>20</div> <div>  </div> </div>	<div> <div>21</div> <div>  </div> </div>
<div> <div>22</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>23</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>24</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>25</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>26</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>27</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>28</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>
<div> <div>29</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>30</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>31</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>32</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>33</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>34</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>	<div> <div>35</div> <div>Plant Library</div> <ul style="list-style-type: none"> <li>*Interviews</li> <li>*Interpretive Trail</li> </ul> </div>
<div> Youth Community Research Coordinator—Zarah Antonia Martz—Contact: Learning Lodge (604) 867-9039 </div>						
<div> <div>Hourly Pay: 15¢ Under: \$6.75</div> <div>16 &amp; Over: \$9</div> </div>						

A poster for huckleberry picking. At the top, a yellow banner with a pointed right side contains the text "Notice to Youth Community Researchers" in red, bold, sans-serif font. Below this, the words "Huckleberry Picking" are written in a large, black, stylized font. The background of the poster is a photograph of green huckleberry bushes with small, dark berries. In the center, a yellow rectangular box contains the text "Monday August 15th" in bold black font, followed by "Meet @ Learning Lodge" and "8 a.m." (the latter is circled in red). Below this box, another yellow rectangular box contains three lines of text, each preceded by an asterisk: "\*Wear Light Coloured Clothing\*", "\*Wear a Hat\*", and "\*Bring Food and Drink\*". At the bottom of the poster, a white bucket filled with dark huckleberries is shown. Overlaid on the bucket is the text "Pick for Elders" and "Get Paid \$10/bucket". At the very bottom, in a small black font, is the text "Questions? Call Zarah: 604 867 9039".

**Notice to Youth Community Researchers**

# Huckleberry Picking

**Monday August  
15th**

**Meet @ Learning Lodge  
8 a.m.**

**\*Wear Light Coloured Clothing\***  
**\*Wear a Hat\***  
**\*Bring Food and Drink\***

**Pick for Elders  
Get Paid \$10/bucket**

Questions? Call Zarah: 604 867 9039

## Appendix XI: YCR Huckleberry Theatre (2005)

### Huckleberry Theatre for Headstart

Presented by BBFN Youth Community Researchers: August 18<sup>th</sup>, 2005

**Narrator:** It is berry season in Nlaka’pamux territory and the people meet at Quayome, the place to pick berries, which today is known as Boston Bar, BC. The huckleberry pickers are getting their baskets ready. Yeye or grandma’s basket is made of cedar roots. It is a long way taken by foot or horseback. Today people also use their vehicles to get into the mountains. But like in the old days going huckleberry picking is a special time for individuals, families, and the whole community. Let us share a story about huckleberry picking.

**The People:** “We are hungry and want to eat delicious huckleberries.”

**Narrator:** So the people went high up into the mountains where the huckleberries grow on mountain slopes where wildfires once cleared patches in the woods. They brought their gifts of tobacco, stories and song – because when you take you should also give. The huckleberry pickers came to the huckleberry patch and said:

**The People:** “Spirits of the Huckleberry bushes, we are the Thompson or Nlaka’pamux people who have come to pick huckleberries for food and medicine. Please accept our gifts in exchange for your gifts – the black huckleberry – in our language known as Tsal Tsala.”

**Narrator:** The Huckleberry bushes returned

**Huckleberry bushes** (each youth taking a turn to speak):

“We accept your gift. And we will teach you our medicine.”

“Know that our berries are good for you”

“We are high in Vitamin C. Vitamin C is very important for your bodies – it helps you stay healthy.”

“Our leaves are also good for your health. You can make tea with them to help treat diabetes – a serious illness affecting many First Nations people today.”

“Huckleberry bushes can be used for many medicines, and also food.”

**Narrator:** The people gathered many huckleberries from the huckleberry bushes to bring as food and medicine to their people the Nlaka’pamux. There they shared the huckleberries to eat them raw, to use in baking like to make yummy huckleberry pies, and to dry or freeze them for future use.

And as one dear Nlaka’pamux elder, the late Anni York from Spuzzum, described it huckleberries are “the head of all the fruits”, they “are an official fruit”. They are a great gift of honour. “If somebody gave you a little handful of huckleberries, you have to give ... the old people always tell you .. something in return.”



## Appendix XII: YCR Interpretive Plant Trail Publication (2005)

### Tuckkwiowhum Interpretive Ethnobotanical Trail



Exploring traditional Nlaka'pamux  
wisdom and usage of local plants.



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### Tuckkwiowhum Interpretive Ethnobotanical Trail

Exploring traditional Nlaka'pamux  
wisdom and usage of local plants.

In 2005, Boston Bar First Nation youth participated in a summer program led by UBC MSc student Sarah Martz and developed a local interpretive plant walk. The purpose of this initiative was for the youth to learn local Indigenous knowledge of their Nlaka'pamux heritage, and for them to be able to pass on this knowledge in the future.

The youth started by choosing a trail that connected to the Boston Bar First Nation Heritage Site. They flagged a trail they wanted to clear and identified plants of cultural importance along it. Once some of the manual labour was done in clearing the trail the youth went to their classroom at the Learning Lodge.

At the Learning Lodge and with the support from their project leader Sarah Martz, the participating youth researched each of the plants for their traditional and contemporary significance from books and web references.

The information gathered during this time is compiled in this booklet. Please enjoy reading it and taking it with you on the Tuckkwiowhum Interpretive Ethnobotanical Trail.

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### Tuckkwiowhum Interpretive Ethnobotanical Trail

Youth exploring traditional Nlaka'pamux  
wisdom and usage of local plants.



Chrissi & Aaron Connor  
flagging the trail at 40 C heat.

Youth researching and learning  
local Indigenous plant knowledge  
at the Learning Lodge.



Leaders of Tomorrow: Learning  
and sharing their knowledge on  
the plant trail.

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### Tuckkwiowhum

Interpretive Ethnobotanical Trail

Common Name: **Saskatoon Berry**, June Berry, etc..  
Scientific Name: *Amelanchier alnifolia*  
Nlaka'pamux Name: **Chuk'um**

#### Cultural Significance

#### **Food:**

**Very Important Food Item** used by all Interior First Peoples.

- \***Dried Saskatoons common trading item**, especially between Interior and Coastal First Nations.
- \*Fruits eaten fresh, dried like raisins, or mashed and dried, or even steamed in spruce bark vats.
- \*Mashed and cooked berries used to make **15 pound cakes**, or dried berries mixed with meat and fat to make **pemmican**.
- \*Berries were often added to soups and stews.



Local Youth  
Tonya Campbell  
picking Chuk'mums

#### **Medecine:**

- \***Juice** given to relieve **upset stomach** or boiled to make **eardrops**.
- \***Root tea** to **prevent miscarriage**.
- \***Inner bark tea** given to women to help **pass afterbirth**.

#### **WARNING!**

Leaves and Pits contain Cyanide like compounds!  
These are eliminated by cooking or drying.



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## Appendix XIII: 2005 Summer Program YCR Feedback

Sharing our Experiences – Reflections on Summer 2005



BBFN \* YCR  
Boston Bar First Nation \* Youth Community Researchers



**Please tell me as much as you can! Be honest! This information will only be used to make our 2006 summer as best as possible.**

**Please list as many activities as you participated in last summer**

(example: research, trail building, plant library collections, berry picking, huckleberry play).

- \*(#2) research, trail building, plant library collections, berry picking, huckleberry play
- \*( T.F 13) trail building (this year and last), berry picking, peeling bark, drying bark, making baskets.
- \*( M.T 9) research, berry picking, trail building, plant library collection, huckleberry play
- \*(V.C 11) research, trail building, plant library, berry picking, huckleberry play
- \*( D.C 12) berry picking
- \*( G.F 13) plant research, trail building, huckleberry play, traditional work (village, trail)

**What were your favourite activities and why?**



- \*(#1) huckleberry play – I love acting
- \*(#2) research – it was fun to be learning a lot about diff plants and what they do
- \*( M.T 9) huckleberry picking – never gone before, went with all friends
- \*(V.C 11) huckleberry play
- \*( D.C 12) berry picking because it was my only activity
- \*( T.F 13) My fav were trail, berry picking, and making the baskets – those were my fav
- \*( G.F 13) just showing up everyday to work with Zarah and the rest of the crew. Because there all FUN!

## Sharing Our Experiences – continued ...

### What were your least favourite activities and why?



- \*(#1) trail building – to bushy
- \*(#2) berry picking it got to slow
- \*( M.T 9) research – people (“yelling”) at me, did know what 2 do
- \*(V.C 11) berry picking, research
- \*( D.C 12) I had nun
- \*( T.F 13) my least fav we peeling bar, drying the bark, those were the worst cause the were hard work
- \*(J.C 13) berry picking because it was yummy
- \*( G.F 13) When we did not go to work, because I had to stay at home and be bored.

### Overall, what did you like the most about the summer youth program?



- \*(#1) eating berries and meeting new people
- \*(#2) just being ther with all the kids
- \*( M.T 9) being payed, huckleberry picking, being able to see Zarah
- \*(V.C 11) learning knew things, being paid to work, something to do
- \*( D.C 12) talking with friends
- \*( T.F 13)the most that I like about berry pickin ... they were good and we had a berry war
- \*(J.C 13) doing research because I’m not very good at that
- \*( G.F 13) being able to work with everyone expecuallly Zarah because I barely see her (only in the summer)

### Do YOU have ideas about improvements that can be made? (like more swimming breaks, cultural activities, better times to meet, etc...)



- \*(#1) It’s fine the way it is.
- \*(#2) it be cool to go up the mountain more
- \*( M.T 9) Anderson creek/pit house to meet, more swimming breaks, camping trips
- \*(V.C 11) camping, swim activities, better place to meet
- \*( D.C 12) I would like more swimming breaks
- \*(J.C 13) pretty much told you already
- \*(G.F 13) I like everything the way it is but we could have more cultural activities!

**!! Important to give your feedback to Zarah !!**

## Appendix XIV: 2005 Band Council Feedback



Sarah Antonia Martz <sarah.antonio@gmail.com>

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## Your Advisory Committee Meeting

2 messages

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**Boston Bar First Nation** <bbarBandd@uniserve.com>

**Tue, Oct 25, 2005 at 6:26 PM**

To: Sarah Antonia Martz <sarah.antonio@gmail.com>

Sarah

Thank you for the invitation to attend your committee meeting on Wednesday. I would have liked to attend but I am tied up with Band matters here in Boston Bar.

Please express to the committee members how pleased the Band Council is with the work you and the youth completed this summer. It was very gratifying to see our young people involved with learning about and collecting our traditional plants. You were able to tutor and encourage them to work together. They had fun working with you while they learned a great deal of basic science. They also had the experience of being out on the land to collect plants and the satisfaction of giving them to our elders.

The herbarium and the interpretive trail at the Nlaka'pamux Village are important community assets that are key parts of our whole project. The youth will be able to earn a wage next summer taking the public out on nature walks and talking to them about our history and culture.

Your research on our foods will also create important benefits for the health of our members.

We will be organizing an appreciation dinner for the community to acknowledge the work that has been achieved and I look forward to seeing you there.

Dolores O'Donaghey  
Chief

## Appendix XV: 2006 Summer Program Calendar

### (1) 2006 July Program

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	26	27	28 <b>BBFN GRADUATION</b> Anderson Creek Campsite	29	30 1* Mtg w/ Youth	1
2	3	4	5 Mtg w/ Youth Pithouse (PH) *Cleaned PH -PH Smudge/Fire *Swimming	6 *Gary Florence - Kekuli Ceremony And Cultural Walk *Journalling	7 *Heritage Site Youth Mtg, journalling, organization	8
9	10	11	12	13	14	15
16	17 Community members and youth pick Cedar Bark from live and dead trees.	18 The outer bark is used for summer house siding and inner bark rolled and hung to dry.	19 <b>CEDAR</b> Facilitator: Cindy MacNeil Youth learned basic cedar prep and weaving.	20 <b>CEDAR</b> Youth Mtg Cedar Prep – Soak & Split	21 <b>CEDAR</b> Youth Mtg Cedar Prep – Soak & Split	22
23 30	24 31	25 <b>CEDAR</b> Weaving: headbands, bracelets, baskets, etc.	26 <b>CATTAIL</b> Collect & weave	27 Heritage Site *Learn Slahal *Plant research *Journalling	28 Heritage Site *Youth Meeting *Organization *Journalling	29

(2) 2006 August Program

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 <b>Native Art &amp; Carving</b> ~James Mack & Gary Florence	2 3 4 <b>Zarah with Flu</b>			5
6	7	8 <b>Native Art &amp; Carving</b> ~James Mack & Gary Florence	9 Heritage Site Work, Journals	10 <b>First Host Training @ the Cinlic</b> ~Jackie Bandura	11 <b>True Colour @ Learning Lodge</b> ~Jackie Bandura	12
13	14	15 <b>RED CROSS EMERGENCY FIRST AID</b> ~Kevin from Worksafe	16 <b>BLACKBERRY JAM MAKING WORKSHOP</b> ~Christine Grafinger	17 <b>TOUR OF BBFN WATERWORKS</b> ~Herman Philip	18 Journal Writing & Organization	19
20	21	22 23 Practice for Heritage Village Hosts and Guides		24 <b>Youth Ambassador Finale with Guests from Stolo Nation &amp; FNEC Fund</b>	25	26

## Appendix XVI: Questionnaire – Envisioning 2006 Summer Program

### Envisioning Summer 2006

BBFN \* YCR

#### Boston Bar First Nation \* Youth Community Researchers

Here are some of the activities that need to be done for the summer. Please look through them and then tell me what activities you want to participate in on the next page. For you to start work I will need your feedback given back to me. I will not be leading all activities, rather I will help you create your own work and help you supervise yourself.

#### **Cultural Ambassador**

Will be responsible for being knowledgeable about the Tukkwihiohum Heritage site, welcome visitors, and lead guided walks explaining local culture and plants.

#### **Heritage Site Creation and Maintenance**

Outside work creating trails, doing landscaping – this activity will be led by Bernard the landscaping supervisor of the heritage site.

#### **Website Development**

Work on developing web publishing skills, such as work on developing the Band's website and other projects.

#### **Researcher (interviews, online and book research...etc)**

A lot of research will have to be done for finding information for the heritage site and other projects. This will include doing book and online research on information about Nlaka'pamux culture, interviewing community members, and help in designing signs for the heritage site.

#### **Data Entry – Community Plant Library (North Bend)**

Work night and day at putting data into computer

#### **Design and Painting Teepees**

There are two teepees that need to be painted. This work includes researching a design lay-out, and the painting the teepees, as well as design signs explaining artwork on the computer.



#### **Leader: Take on a leadership role in some of these activities**

WE NEED LEADERS!!!! Feel like you can be shining example. Don't be shy – your courage will be rewarded 😊

**These ideas are not set in stone – Your input and ideas are valuable and always welcomed. Think for yourself and do good things will be our summer mantra.**

**All the best YCR Crew Leader – Zarah - Call me anytime if you have questions!!**

**(Learning Lodge: 604 867 9039)**



**Envisioning 2006 Summer Program (continued)**



**Boston Bar First Nation \* Youth Community Researchers**



So what do you want to do this summer?

1. Please list the activities you feel you want to participate in most. For each activity please brainstorm what most interests you about the work experience, what you see yourself doing, and what you want to learn.

Examples:

**Cultural Ambassador** – I want to learn about my traditional culture and be able to share this knowledge with visitors to the heritage site. When you teach you learn twice.

**Researcher** – I like doing research. I want to do both book and online research that needs to be done. I also want to do interviews with community members, as I really enjoyed doing this activity last year. This knowledge will help me be a better Cultural Ambassador.



2. How much are you committed to work this summer? Please check circle for the choice that fits you most:

As Much as Possible ☐ Easy Going ☐ Very Relaxed (ie sometimes) ☐

3. Please describe the best way to contact you:



**!!! For you to start work I need this feedback back as soon as possible !!!**



Appendix XVII: Heritage Village Publication





This Publication was created by youth from the  
**2006 Boston Bar First Nation Youth Excellence Program**  
Special Recognition to Jodi Campbell  
Editor & Co-creator: Program Coordinator Sarah Martz

Special Thanks to:

***Gary Florence*** for his time and teaching the youth  
about the Heritage Site and its structures.

***Bernard Gilchrist*** for his teachings and patience  
so that the youth could effectively learn at the Heritage Site.



## BBFN Youth Jam Making



### Blackberry Jam Instructions

**1#** in large saucepan stir together prepared Fruit, sugar & lemon juice if listed in recipe

**2#** bring to a boil over high heat for **1 min.**

**3#** remove from heat. Stir in liquid pectin.



**4#** boil lids for **5 min**

**5#** stir and skim for **5 min.** to prevent floating fruit

**6#** ladle into warm sterilized jars to  $\frac{1}{4}$  inch from rim.

**7#** Clean the top of the rim **well** cover with lid and screw on finger-tight .



**Well Done!**

**Tasty Blackberry jam!!**

**2006 Jam Making Crew**

Curtis G., Victoria D., Jodi C.  
Trevor, F. Geraldine F., Christine G., Chrissi C., & Megan T.  
(photography—Zarah Martz)



## Appendix XVIII: CANTEST Nutritional Test Results

### Nutritional Analysis (As Received) in Food

CLIENT SAMPLE IDENTIFICATION:		Cteweta (2005)	DETECTION LIMIT	UNITS
CANTEST ID:		605030560		
Protein	2.7	0.1		g/100 grams
Fat Anal. for Nutrition Label	0.74	0.01		g/100 grams
Saturated Fat	0.14	0.01		g/100 grams
Monounsaturated Fat	0.11	0.01		g/100 grams
Polyunsaturated Fat	0.49	0.01		g/100 grams
Trans Fatty Acids	<	0.01		g/100 grams
Cholesterol	<	0.25		mg/100 grams
Moisture	85.2	0.1		g/100 grams
Ash	2.2	0.1		g/100 grams
Carbohydrates	9.2	0.1		g/100 grams
Total Sugars	<	0.2		g/100 grams
Dietary Fibre	8.3	0.4		g/100 grams
Energy	54	1		Cal./100 g
Energy	226	1		kJ/100g
Calories from Fat	7	1		Cal./100 g
Vitamin A (Retinol)	<	33.3		IU/100g
Calcium Ca	364	0.02		mg/100 grams
Iron Fe	1.12	0.04		mg/100 grams
Potassium K	366	0.25		mg/100 grams
Sodium Na	2.33	0.02		mg/100 grams

g/100 grams = grams/100 grams (as received)

Cal./100 g = Calories per 100 grams

IU/100g = International Units/100 grams

< = Less than detection limit

mg/100 grams = milligrams per 100 grams

kJ/100g = kilojoules per 100 grams

### Nutritional Analysis in Food

CLIENT SAMPLE IDENTIFICATION:	CANTEST ID	Beta Carotene
Cteweta (2005)	605030560	4440
DETECTION LIMIT		5
UNITS		IU/100g

IU/100g = International Units/100 grams

### Fatty Acid Profile per Serving Size in Food

CLIENT SAMPLE IDENTIFICATION:	CANTEST ID	Total Omega-3 Fatty Acids	Total Omega-6 Fatty Acids
Cteweta (2005)	605030560	0.36	0.13
DETECTION LIMIT		-	-
UNITS		g/serving	g/serving

g/serving = grams per serving

## **Appendix XIX:      Communication of Research Summary**

### **Presentations / Panel Speaker / Research Poster**

#### **Indigenous forum**

- Aboriginal Health Research Network (Fall 2004)
- BC Aboriginal Peoples' Health Research Network – Community Hall Meeting
- Advancing Indigenous Health Research Ethics Forum (Jan 2005)
- Sustainable Forest Management Aboriginal Field School (Fall 2005)
- Aboriginal Mental Health Conference (Fall 2005)
- Academic Warrior Indigenous Graduate Student Symposium, Vancouver (Feb 2006)
- Following the Seasons – Indigenous Traditional Foods Conference hosted by the Nlaka'pamux Nation, Merritt, BC (Mar 2006)
- Sharing Indigenous Ways of Knowing: A forum on integrating Indigenous knowledge into educational curricula (Nov 2006)
- International Network Indigenous Health Knowledge and Development (INIHKD) Third Biennial conference in Rotorua (New Zealand) (Oct 2007)

#### **Natural Sciences**

- UBC Botany Grad Symposium (Mar 2004)
- UBC Plant Science Graduate Student Seminar (Nov 2004)
- Natural Health Products Research Society Conference, Montreal, QC (Jan 2005)

#### **Classroom Presentation**

- UBC AgSci 501, Participatory Research Methodology Class (Spring 2004 and 2005)
- UBC Anth 460/515, Anthropological Study of Ecological Knowledge Class (Spring 2005)