Evolving Co-Management Practice: Developing a Community-Based Environmental Monitoring Framework With Tl'azt'en Nation on the John Prince Research Forest

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B.Sc., University of British Columbia, 2004

Thesis Submitted in Partial Fulfillment of

The Requirements for the Degree of

Master of Natural Resources and Environmental Studies

in

Natural Resources and Environmental Studies

The University of Northern British Columbia

August 2009

ABSTRACT

This thesis describes a community-based research project that was conducted in partnership with Tl'azt'en Nation and the co-managed John Prince Research Forest. The purpose of the research was to identify, develop, and verify Tl'azt'en environmental measures for five traditional use activities: *talo ha'hut'en* - fishing salmon (*Oncorhynchus spp.*), *huda ha'hut'en* - hunting moose (*Alces alces*), *tsa ha tsayilh sula* - trapping beaver (*Castor canadensis*), *duje hoonayin* - picking huckleberries (*Vaccinium membranaceum*), and *yoo ba ningwus hunult'o* - gathering soapberries (*Shepherdia canadensis*) for medicinal use. The process of developing Aboriginal environmental measures was participatory and iterative. I worked in partnership with two teams of Tl'azt'en community members, including Elders and traditional land users. The central methods used in our framework included: focus groups, workshops, one-on-one interviews and Photovoice. Our participatory research approach was evaluated throughout the course of the project and comprehensively at the end of the project by Tl'azt'en team members, researchers, and research assistants. This iterative evaluation process fostered an adaptive outlook and ensured that our methodology was culturally appropriate and meaningful. Evaluation results revealed how participant satisfaction, personal development, independence, and the building of relationships contributed to sustained participation and to the achievement of project objectives. Overall, 252 Tl'azt'en environmental measures were developed in this project for our five focal traditional use activities and two inductively identified environmental monitoring themes: monitoring environmental change across Tl'azt'en Nation traditional territory and monitoring community adherence to Tl'azt'enne traditional environmental land use

methods and principles. A prioritized subset of these measures will be applied in the future through a Tl'azt'en community-based environmental monitoring initiative on the John Prince Research Forest. Applying these Aboriginal environmental measures through community-based environmental monitoring can strengthen the co-management partnership between Tl'azt'en Nation and the University of Northern British Columbia; community-based environmental monitoring builds the community into management and decision-making processes- ultimately contributing to co-management success.

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LIST OF ACRONYMS

BC	British Columbia
C&I	Criteria and Indicators
CBEM	Community-Based Environmental Monitoring
CBR	Community-Based Research
CD	Compact Disc
CIAC	Criteria and Indicators of Adaptive Co-Management
CLV	Critical Local Values
CPDW	Community Product Development Workshop
CRC	Chuzghun Resources Corporation
CURA	Community University Research Alliance
DVD	Digital Video Disc
ET	Elders Team
FPE	Final Project Evaluation
FT	Forest Team
FTFG1	Forest Team Focus Group 1
FTFG2	Forest Team Focus Group 2
FTFG3	Forest Team Focus Group 3
JPRF	John Prince Research Forest
NGO	Non-Governmental Organization
NR	No Response
SBRM	Science Based Resource Management
SSHRC	Social Sciences and Humanities Research Council of Canada
TEKMS	Traditional Environmental Knowledge and Management System
UNBC	University of Northern British Columbia
USA	United States of America

ACKNOWLEDGEMENT

Snachailya to Tl'azt'en Nation. *Snachailya* to Forest and Elders team members: John Alexis, Elizabeth 'Lizzie' Alexis, Michael Aslin, Doreen Austin, Harry Austin, Betsy Dennis, Isaac Felix, Marie Hanson, Mary Ann Hanson, Pierre John, Gloria Johnnie, Helen Johnnie, Geraldine Joseph, Mary Lebrun, Seraphine Mattess, Joseph 'Willie' Mattess, George Morris, Violet Prince, Celestine Thomas, and Nathaniel Tom. Without the dedication and commitment of the Forest and Elders team members, this project would not have been possible. The knowledge, experiences, and teachings that each of you shared with me and this project will forever enrich my life. S*nachailya* to Mr. Bruce Mckay's 2007-2008 grade 5, 6, 7 class at Eugene Joseph Elementary School for your participation and contributions to this project.

I would like to deeply thank my two supervisors, Dr. Christopher Johnson and Dr. Erin Sherry, for their support, expertise, and never ending energy. From helping to design project vest logos, to persevering through long distance thesis editing and countless hours of data analysis, Chris and Erin have demonstrated relentless commitment and dedication. I am extremely grateful to have had the opportunity to work with and learn from each of them.

I would like to sincerely thank my amazing research team for their hard work and unwavering support. This team includes Annie Anatole, Theresa Austin, Susan Grainger, Dexter Hodder, Dr. Christopher Johnson, Beverly Leon (nee John), Dr. Erin Sherry, and Amelia Stark. Annie and Theresa were amazing research assistants who surpassed all expectations with their work ethic, enthusiasm, and effort. Bev and Amelia were

exceptional community researchers and mentors; their professionalism, perseverance, kindness, and dedication were integral to this project.

I am also extremely grateful to my committee members, Karyn Sharp and Dr. Pamela Wright, for their innovative feedback and thoughtful guidance. Each of you played an instrumental role in this project's success and accomplishments. I would also like to thank the Tl'azt'en Nation - University of Northern BC (UNBC) Community University Research Alliance (CURA) team for their inspiring work and CURA graduate students, Christopher Gall, Shane Hartman, Diana Kutzner, and Leona Shaw, for all of their help, good times, and office fun over the past 3 years. I would like to acknowledge and thank the Social Sciences and Humanities Research Council of Canada (SSHRC) through their CURA program, the BC Real Estate Foundation Partnering Fund Grant, and the John Prince Research Forest for their financial contributions to this research.

And last, but definitely not least, I would like to express my sincere gratitude to my family and friends. Thanks so much for all the phone calls, visits, and get togethers! My mom and dad, Carol-Anne and Alex Yim, have encouraged and believed in me for every moment of this experience. They have taught me to work hard, pursue my dreams, and laugh along the way. I am so thankful for your incredible generosity and support. From the bottom of my heart, I would like to extend my loving thanks to my partner Douglas Higginson for his constant support and for always being able to see the bigger picture. This journey would not have been the same if I had not been able to share all of its challenges and accomplishments with you.

CHAPTER 1- INTRODUCTION

1.1 Thesis Topic Introduction

An international mobilization of Indigenous rights has furthered the role of Indigenous peoples in the management of their traditional lands and resources (Natcher and Hickey 2002). The Tsawwassen First Nation made history on April 3rd, 2009, when the first modern treaty negotiated under the British Columbia Treaty Commission process took effect (Office of the Premier April 3, 2009). This precedent is significant to resource management in Canada, as the assertion of Aboriginal and treaty rights contributes to the increased participation and involvement of Aboriginal peoples (Bombay 1996: 14). Such treaty rights and other shared management relationships are also environmentally significant; the participation of Indigenous people in natural resource management has been established as a fundamental factor for the achievement of sustainability (Brundtland 1987). Considering that over 80% of Aboriginal communities in Canada are situated in productive forest areas, this development is particularly important for Aboriginal forestry (Bombay 1996). Parsons and Prest (2003) state that an integral component of furthering the development of Aboriginal forestry in Canada is understanding, respecting, and applying the cultural values of Aboriginal people.

The meaningful inclusion of Aboriginal peoples in resource management requires cross-cultural understanding and respect of Aboriginal values and knowledge systems. Traditional environmental knowledge and management systems (TEKMS) are the dynamic and unique knowledge systems that each Aboriginal community has evolved and uses as a basis for their resource management decision making and planning (Berkes

1999b; Hawley *et al.* 2004). The TEKMS differs from science based resource management (SBRM) as the latter uses "the application of the scientific method to address issues involving a wide range of species and environmental features, their ecosystems, the underlying ecological processes, and the working of humans" (Hawley *et al.* 2004: 38). Furthermore, TEKMS is not just a type of management system, it also represents a Aboriginal philosophical approach to life. To appropriately use these two knowledge systems in complement requires more than an understanding of their operative definitions; it requires that supporting social and cultural structures are also considered and incorporated (Wyatt 2008).

Resource management paradigms are increasingly adopting a combination of traditional and science-based knowledge systems to achieve the goal of environmental sustainability (Keith 1994; Parsons and Prest 2003; Durie 2004a; Allen 2005). Future resource management initiatives should focus on the linkages between TEKMS and SBRM (Freeman and Carbyn 1988; Michel and Gayton 2002). The traditional use practices and governance systems embodied in TEKMS offer teachings and knowledge that can enhance aspects of SBRM (Roberts 1996). Likewise, TEKMS can benefit from an exchange of SBRM knowledge. Integrating complementary aspects of traditional and science-based knowledge systems in resource management promotes the use of multiple perspectives, methods, values, and ethics to generate new knowledge without compromising the integrity of either system (Durie 2004a, b). Ecologically and socially progressive resource management is being facilitated by an array of progressive management arrangements that respect and support the complementary use of these two systems. Specifically in Canada, co-management has become one of the recognized

types of forest management for incorporating TEKMS and SBRM (Sherry 2002; Grainger *et al*. 2006).

Co-management is an institutional relationship between local and state-level management systems (Rusnak 1997; Mulrennan and Scott 2005). Co-management regimes facilitate the sharing of power, responsibility, and control of natural resources between Aboriginal communities, non-aboriginal resource users, and government in a particular geographic area (Berkes 1994; Roberts 1996; Sherry and Myers 2002; Goetze 2005). Co-management offers communities the ability to incorporate their local knowledge, worldview, values, and beliefs into the management regime (Roberts 1996). This approach allows cross-cultural partnerships to use the complementary features of TEKMS and SBRM, while maintaining each individual knowledge system. However, an examination of co-management in practice, reveals that a spectrum of arrangements and complexities exist (Rusnak 1997; Sherry 2002; Mulrennan and Scott 2005; Berkes 2007).

Co-management partners are faced with the challenge of working together to identify a common vision and then of developing a process to judge the achievement of shared goals (Sherry 2002). One identified requirement for proper implementation and continual improvement of co-management is effective monitoring and evaluation (Natcher and Hickey 2002). This may be achieved by decentralizing the role of the state and engaging the involvement and knowledge of local communities, through community-based environmental monitoring systems (Pomeroy and Berkes 1997).

Community-based environmental monitoring (CBEM) is a community-centered approach by which local knowledge, observations, and experiences are systematically recorded and used to inform land management processes and decisions (Kofinas *et al.*

2002a; Nickels *et al.* 2002). These CBEM systems are useful for evaluating and supporting the development of effective co-management partnerships (Figure 1.1; Berkes 1995; Natcher and Hickey 2002; Moller *et al.* 2004).

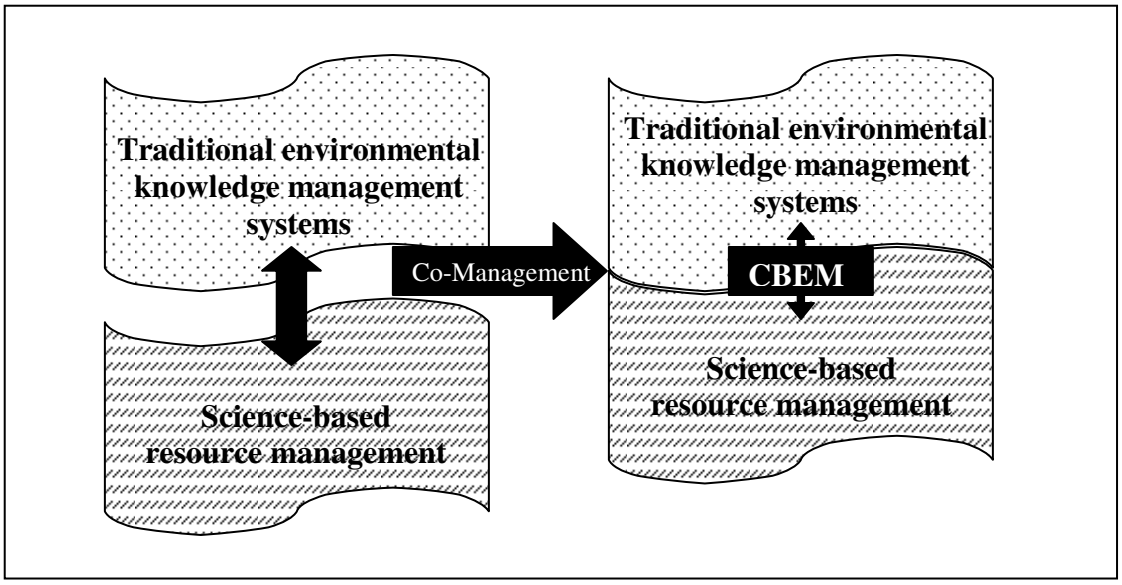


Figure 1.1- Community-based environmental monitoring (CBEM) can foster the complementary use of TEKMS and SBRM in cross-cultural co-management partnerships.

CBEM systems also serve as frameworks for developing visions of local and regional sustainability (Berkes *et al.* 2000; Parkins *et al.* 2001; Parlee *et al.* 2005a; Pagdee *et al.* 2006). The Inuit Tapirrit Kanatami, a national Inuit organization explains why they are using CBEM as a tool in their response to climate change in the Arctic:

> through individual's time on the land and discussions among each other, this monitoring and oral record is already in place. However, in order to ensure the recording and sharing of this knowledge in a manageable way and to collect information on critical aspects of the environment that are changing, some formalization of this process is helpful to allow collective understanding and action to occur (Nickels *et al.* 2002: 325).

Establishing CBEM systems allow communities to systematically evaluate environmental conditions to ensure that local socio-economic and biophysical processes are maintained to meet current and future needs (Parkins *et al.* 2001; Natcher and Hickey 2002; Prince

2002; Moller *et al.* 2004; Parlee *et al.* 2005b). The incorporation of Aboriginal TEKMS, values, and beliefs in CBEM frameworks demonstrates bottom-up natural resource management; this can promote environmental stewardship, community empowerment, and cross-cultural understanding (Rusnak 1997; Santiago-Rivera *et al.* 1998; Berkes 2004; Parlee *et al.* 2005b). Although the benefits are substantial, few formal studies have explored, assessed, and recommended appropriate methods for developing community-based monitoring, and even fewer have involved the participation of First Nation communities (Rusnak 1997; Carr and Halvorsen 2001; Natcher and Hickey 2002).

1.2 Case Study Description

1.2.1 Tl'azt'en Nation

Tl'azt'en Nation is located in north central British Columbia, approximately 65 km north of Fort St. James (Figure 1.2). Translated, the word *Tl'azt'en* means "people by the edge of the bay" (Tl'azt'en Nation 2009a). Tl'azt'enne identify themselves as *Dakelhne*, but are also known as 'Carrier' (Tl'azt'en Nation 2009a). Hall (1992: 4) explains that the term, 'Carrier' is a translation from *Aghelh Ne* which means "ones who pack," and was originally adopted to describe how Carrier people traditionally transported goods. Hall (1992: 4) also explains that *Dakelh* means "on water travel." The *Dakelh* language is the traditional language of Tl'azt'en Nation and is a part of the Athapaskan Language group (Tl'azt'en Nation 2009a).

Since time immemorial, Tl'azt'en Nation's 651,600 ha of traditional territory has sustained and provided for their needs. Justa Monk recounts that

> unlike some of the Carrier bands [who] had to travel many miles from their villages to reach their hunting territory and their traplines, our traditional hunting grounds were all around us. The animals - moose, deer, bear, marten, lynx, coyote - were just outside our door (Moran 1994: 35).

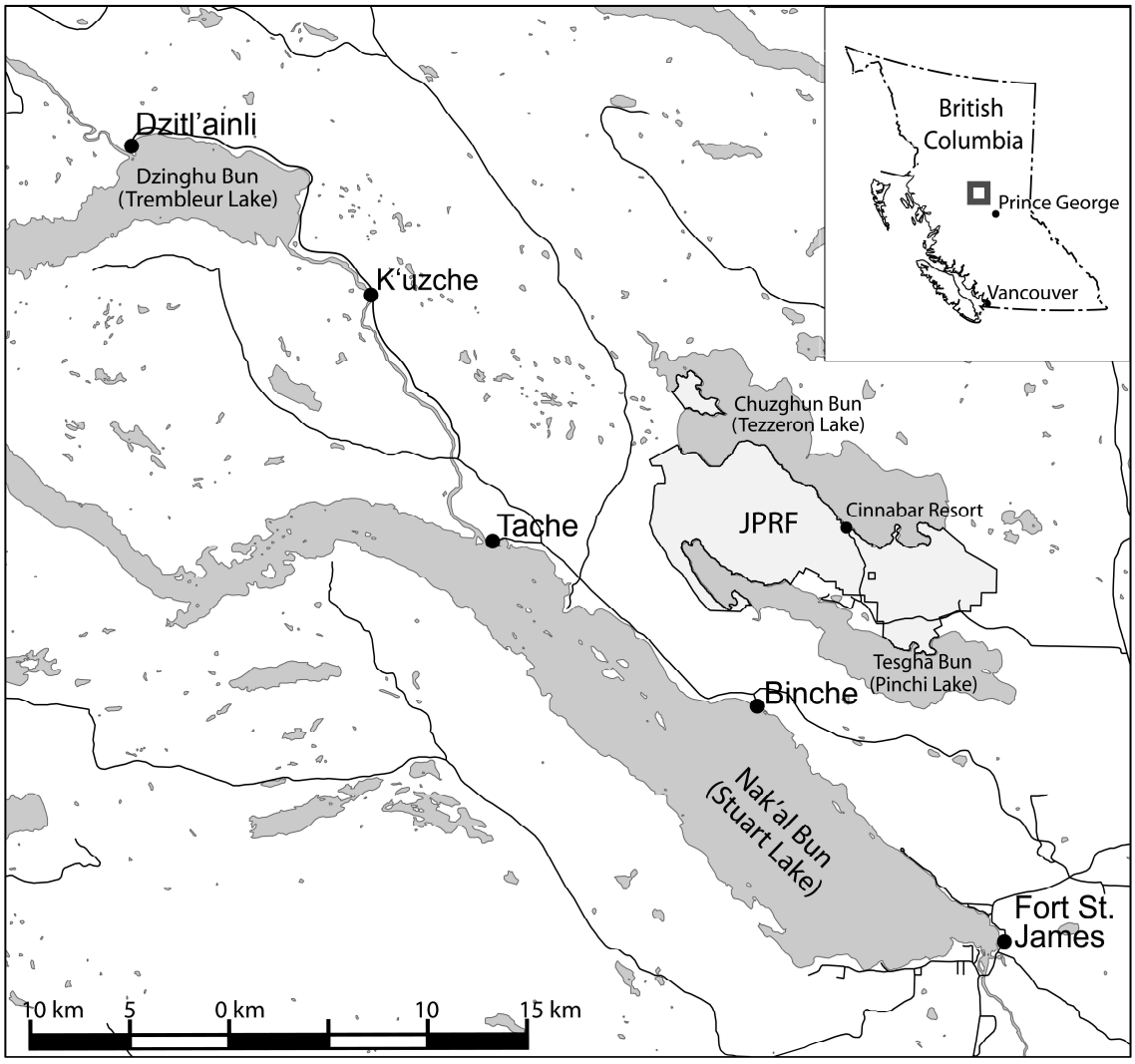


Figure 1.2- A portion of Tl'azt'en Nation traditional territory including the four communities of *Tache* (Tachie), *Binche* (Pinchi), *Dzitl'ainli* (Middle River), and *K'uzche* (Grand Rapids), and the co-managed John Prince Research Forest (JPRF)

Historic events, such as the establishment of Fort St. James as a trading post in 1806 had a fundamental influence on Tl'azt'en Nation and their traditional way of life (Moran 1994). From the introduction of tea and sugar into the Tl'azt'enne diet to the monthly publication known as "The Paper that Relates", or *Test'les nauhwelnek,* by Father Morice in 1891, Fort St. James brought many profound changes to Tl'azt'en Nation (Johnnie and O'Hara 1992; Moran 1994). For instance, Hall (1992) discusses how the Hudson's Bay Company at the Stuart Lake Post contributed to changing the practice of hunting; it

became an activity that was no longer solely concerned with sustenance, as Tl'azt'enne were offered money in exchange for furs (Hall 1992: 70).

More recently, over the past 50 years, Tl'azt'en Nation has seen many significant changes as a result of the hard work of community leaders, such as Sebastion Anatole, Edward John, Justa Monk, and Harry Pierre (Moran 1994). Some of the developments that resulted from their efforts are the installation of electricity and a water and sewage system in Tache (Moran 1994). In the 1960's, the government provided funding for a road from Fort St. James to Tache (Moran 1994). The direct access that this road offered was the first of its kind on Tl'azt'en territory; "when the road was built everything changed" (Moran 1994: 20).

Today, Tl'azt'en Nation has a total population of approximately 1500 people living in its three main communities: *Tache (*Tachie*)*, *Binche* (Pinchi*)*, *Dzitl'ainli* (Middle River), and one seasonal village, *K'uzche* (Grand Rapids) (Figure 1.2; Moran 1994; Quinn 2007; B. Leon and A. Stark, personal communication, July 2009). The largest village, Tache, is located on the shores of Stuart Lake and is where Tl'azt'en Nation's elementary school, health centre, and administrative offices are located. The Tl'azt'en Natural Resource/Treaty Office is the administrative department that oversees issues related to resource management. Traditionally, natural resources were managed solely through local governance systems such as *balhats* (potlatch), *keyohs* (family territories) and the clan system (Morris and Fondahl 2002). Justa Monk's statement, "every family had its territory - its reef or sand bar for fishing, its area for hunting and trapping, its meadow for hay," illustrates how Tl'azt'enne TEKMS worked to organize resource use (Moran 1994: 33).

The territory and people of Tl'azt'en Nation were significantly affected by industrial developments in the latter half of the 20th Century including: the establishment of a mercury mine on Pinchi Lake in the 1940's; the construction of a railroad line by the Pacific Great Eastern Railway company in the 1970's; and, the development of the forestry industry (Morris and Fondahl 2002). Despite the broad-scale changes that these developments have brought, Tl'azt'en Nation is striving to achieve environmental sustainability. Tl'azt'en Nation states "we, Native people, will carry out our tradition of doing what is good and right for the land and its resources that is for us to use and not abuse" (Tl'azt'en Nation 2009b: http://www.tlc.baremetal.com/Treaty.htm). Tl'azt'en Nation's co-managed research forest is an example of one partnership that is contributing to its ecological and social sustainability objectives.

1.2.2 The John Prince Research Forest

The John Prince Research Forest (JPRF) was officially established in 1999, six years after the co-managed research forest was initially envisioned by a University of Northern British Columbia (UNBC) administrator and the Tl'azt'en Nation band manager (Grainger *et al.* 2006). The JPRF is comprised of 13,000 ha of forestland in north central British Columbia, and is the only First Nation-University co-managed research forest in North America (Grainger *et al.* 2006). The JPRF is located on the traditional territory of Tl'azt'en Nation, and UNBC acknowledges that Tl'azt'en Nation asserts Aboriginal title and other rights to this area (Figure 1.2; Richard B. Krehbiel Consulting 2000). The JPRF aims to be "internationally recognized…for both its ecological approach to forest stewardship and its leadership in building successful partnerships between Aboriginals and non-Aboriginals" (Grainger *et al.* 2006: 486). The broad objective of the JPRF is to

"learn to bring together different ways of understanding and using the land as a means to integrate multiple resource values and to enhance the ecological and social sustainability of the region" (Grainger *et al*. 2006: 485). Aside from serving as a research and educational facility for the Tl'azt'en community and UNBC, the JPRF is also a working forest (Grainger *et al.* 2006).

Chuzghun Resources Corporation (CRC) was established in 2001 to manage and direct the activities of the research forest (Grainger *et al.* 2006). The CRC is a self-supported, non-profit organization that is equally owned by Tl'azt'en Nation and UNBC. The CRC Board of Directors has six voting members and two alternates, and is comprised equally of Tl'azt'en Nation and UNBC representatives. Tenured through a Special Use Permit[1], the CRC oversees the logging of 13,000 m^3 of softwood annually (Tl'azt'en Nation and the University of Northern British Columbia CURA 2009). Logging on the JPRF provides local employment and is the primary funding source for the research forest's management, research, and educational programs; these programs are contributing to the JPRF's co-management success.

Sherry and Fondahl (2004) identified nine criteria of successful forest co-management partnerships: institutional structure, decision-making, capacity, co-management representatives, communication, community support, partnership building, knowledge and planned process. The JPRF explicitly identified four of these elements as being of particular importance in the initial development of the Research Forest: partnership building, institutional structure, decision-making, and capacity (Grainger *et*

[1] The co-management partnership between Tl'azt'en Nation and UNBC is a condition of the Special Use Permit held by the JPRF, enshrined in schedule B of the tenure. In the case that this co-management partnership dissolves, tenure of the land will revert to the Crown. (British Columbia Special use Permit No. S22194, date: August 23, 2001)

al. 2006). Within each of these elements, sub-categories were identified with specific provisions to ensure that important details of this partnership were not overlooked. For example, under 'decision making', the rights, involvement, and benefits for those Tl'azt'enne who hold their *keyohs* on the JPRF landbase were discussed and formalized. This example demonstrates how the JPRF is promoting the integration of multiple values, worldviews, and management approaches to achieve a balanced co-management partnership. Implementing CBEM complements the JPRF's recognition that co-management processes are adaptive. Monitoring can provide the JPRF with valuable feedback to assess co-management goals and to adjust programs and processes to ensure future co-management success.

1.3 The Tl'azt'en Nation – University of Northern British Columbia Community University Research Alliance Project

The Tl'azt'en Nation – UNBC Community University Research Alliance (CURA) project (http://cura.unbc.ca), "Partnering for Sustainable Resource Management," was a collaborative, five-year project (2004-2009) funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) (Fondahl *et al.* 2009). The four streams of research involved in this project were Improved Partnerships, Tl'azt'en Traditional Ecological Knowledge, Tl'azt'en Ecotourism, and Science/Environmental Education. The Improved Partnership stream focused on strengthening the existing co-management partnership between Tl'azt'en Nation and UNBC. This thesis was conducted within the Improved Partnership stream and contributed to the overarching purpose of CURA:

> to enhance the capacity of Tl'azt'en Nation to effectively engage in culturally and ecologically sustainable natural resource management, and to enhance the capacity of

UNBC researchers and their students to effectively contribute to First Nation community needs through collaborative research (Tl'azt'en Nation and the University of Northern British Columbia CURA 2007).

1.4 Tl'azt'en Nation Criteria and Indicators Framework

The local-level Tl'azt'en criteria and indicators (C&I) framework (Figure 1.3) was the product of numerous years of research conducted in partnership between Tl'azt'en Nation, UNBC, and the JPRF (Booth 1998; Morris 1999; Karjala 2001; Karjala and Dewhurst 2003; Karjala *et al.* 2003; Sherry and Fondahl 2003; Karjala *et al.* 2004; Sherry *et al.* 2004; Sherry *et al.* 2005; Quinn 2007).

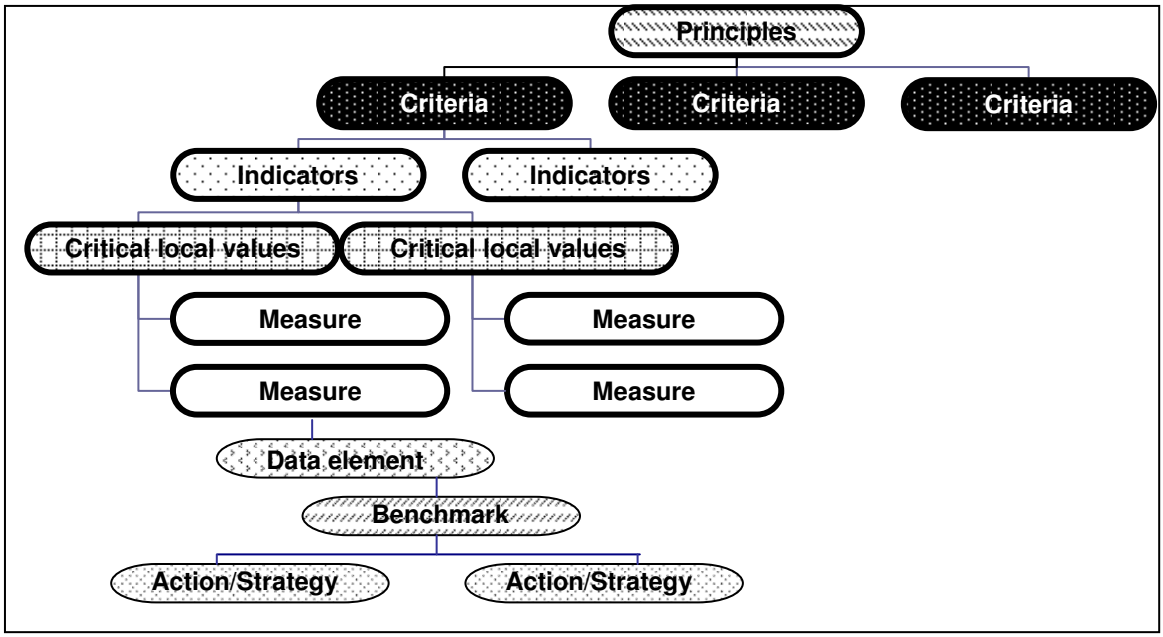


Figure 1.3- Hierarchical structure of the local-level Tl'azt'en Nation C&I framework (Sherry *et al*. nd-a.)

Booth's (1998; 2000) research with Tl'azt'en Nation investigated First Nation community forestry and initiated many research projects concerned with improving Aboriginal and community-based natural resource management processes, including the co-management arrangement with the JPRF. Of those works, Karjala's (2001) thesis research and follow-up studies are noteworthy. She worked with Tl'azt'en Nation and

explored methods for integrating local Aboriginal values into forest planning processes. Karjala et al. (2003) developed an associated community-based planning framework, The Aboriginal Forest Planning Process. In a following project, five Tl'azt'en and two university researchers conducted a grounded theory content analysis of more than 100 interviews with Tl'azt'en Nation members; this resulted in the development of the local-level Tl'azt'en C&I framework (Sherry *et al.* 2005).

The Tl'azt'en C&I framework has served as the foundation for a number of proceeding studies, including the Tl'azt'en Nation - UNBC CURA project. The adaptive Tl'azt'en C&I framework represents a bottom-up process that invokes meaningful community involvement and recognizes critical local values (CLV) (Sherry *et al.* 2004; Sherry *et al.* 2005). This framework differs from other local-level C&I frameworks as it seeks to direct, monitor, and evaluate co-management; furthermore, it fully incorporates local values (Sherry *et al.* 2005). The inclusion of CLV in the Tl'azt'en C&I framework reifies its bottom-up approach that seeks to involve the community in a management role, as compared to top-down, state-directed resource management (Sherry *et al.* 2004). There is a growing recognition that top-down, broad scale monitoring approaches do not translate well to the local level (Wright *et al.* 2002). Contributing to this C&I framework, Quinn's (2007) thesis research developed Tl'azt'en measures of cultural revitalization for the JPRF.

My research builds on the on-going study, Criteria and Indicators of Adaptive Co-Management (CIAC), led by Dr. Erin Sherry, Ms. Susan Grainger, and Ms. Beverly Leon. The original purpose of the CIAC project was to develop and evaluate methods for local-level C&I development and to generate an adaptable C&I framework used to direct,

monitor, and evaluate forest co-management arrangements, particularly those involving First Nations (Sherry *et al*. 2004: 4). The CIAC project identified CLV of co-management success and then categorized results into processes and outcomes; these were further organized into principles, criteria, indicators, and critical local values (Sherry *et al.* 2004). I used these CIAC findings in my thesis research to develop Tl'azt'en environmental measures for the Tl'azt'en traditional use activities of hunting, trapping, fishing, medicinal plant gathering, and berry picking.

1.5 Rationale for Researching the Process and Development of Tl'azt'en Nation Environmental Measures

Many previous research endeavors have contributed to the Tl'azt'en Nation C&I framework (Booth 1998; Morris 1999; Karjala 2001; Karjala and Dewhurst 2003; Karjala *et al.* 2003; Sherry and Fondahl 2003; Karjala *et al.* 2004; Sherry *et al.* 2004; Sherry *et al.* 2005; Quinn 2007); however, only the top four hierarchical levels have been developed with a specific environmental focus. Through the development of Tl'azt'en environmental measures, the local-level C&I framework will be further realized. In addition, these measures will provide the basis for establishing an applied Tl'azt'en CBEM initiative that will further the community's involvement in JPRF co-management. The process of working in partnership with Tl'azt'en Nation will also be investigated and evaluated in order to assess appropriate and effective methods for engaging the community in co-management and CBEM.

1.6 Research Purpose and Objectives

The purpose of this thesis was to further the Tl'azt'en C&I framework through the development of Tl'azt'en environmental measures for application on the co-managed JPRF. The four central objectives of this study were to:

Objective 1 - develop and evaluate a community-based process for identifying Tl'azt'en environmental measures;

Objective 2 - identify and verify Tl'azt'en environmental measures;

Objective 3 - select representative measures for each of the five traditional use activities and implement a set of corresponding measures for field testing through the development of an applied environmental monitoring method; and,

Objective 4 - assess the challenges and opportunities involved in community-based environmental monitoring and recommend improvements for the future implementation of Tl'azt'en CBEM and other cross-cultural partnerships.

1.6 Thesis Structure and Overview

This thesis was written in an article-based format. Chapters 2 and 3 were each written as independent articles; thus, such redundancies as definitions and case study introductions were inevitable. Each of these chapters is currently being submitted to journals for publication. I am the primary author of both articles, which were co-authored by my supervisors Dr. Christopher Johnson and Dr. Erin Sherry. The plural voice was used in these chapters to represent my co-authors and the project's research team (Annie Anatole, Theresa Austin, Susan Grainger, Dexter Hodder, Beverly Leon (nee John), Amelia Stark). *Dakelh* words are italicized throughout the thesis.

Chapter 2 presents the study's methodology and addresses the first research objective. This chapter describes the community-based research framework and an analysis of the successes and limitations of the methodological approach. Chapter 3 represents the Tl'azt'en environmental measures that were developed and verified in this study. The results and discussion for this chapter address the second research objective. In Chapter 4, I address the third research objective by presenting applied Tl'azt'en CBEM prototypes and corresponding examples for each traditional use activity. These were evaluated by Tl'azt'en project team members. I use the prototype evaluation results and associated discussion of the challenges and opportunities for Tl'azt'en Nation and other Aboriginal communities in developing and implementing CBEM initiatives to address the fourth and final research objective. Community products from this research are presented in Chapter 5. These products were integral to this project's successful achievement of our four central research objectives, and to upholding a community-based research approach. This thesis draws to a close with a concluding chapter that summarizes major thesis results and outcomes.

CHAPTER 2- EVALUATING THE PROCESS OF DEVELOPING ABORIGINAL ENVIRONMENTAL MEASURES FOR A CO-MANAGED FOREST

2.1 Abstract

To facilitate effective cross-cultural CBEM, participatory methods and processes need to be developed in partnership with Aboriginal communities. This research was designed to develop Tl'azt'en environmental measures and contribute to the successful co-management of a First Nation – university research forest. In partnership with two teams of Tl'azt'en Nation community members, we used four participatory methods, focus groups, workshops, one-on-one interviews, and Photovoice, to structure a community-based research process. In this paper, we report the results of a series of iterative participatory evaluations designed to assess the strengths and weaknesses of the environmental measures development process. Results illustrated how key indicators of success, participant satisfaction, personal development, independence, and the building of relationships, were supported by the research process we developed. Significant achievements included sustained participation of Tl'azt'en community members through the 15-month project, the development of 252 Tl'azt'en environmental measures, and the adaptation of culturally relevant methods to facilitate successful cross-cultural collaboration. Outcomes of the project were applied to a prototype for an applied community-based environmental monitoring system, and collaborative research products captured the knowledge and experiences of participants and communicated the goals and outcomes of the research to the broader community. The Tl'azt'en Nation environmental measures development framework is a tested, community-centered approach for engaging cross-cultural partners in community-based environmental monitoring.

Keywords: Aboriginal; community-based environmental monitoring; community-based research; cross-cultural research partnerships; First Nation; participatory evaluation; Photovoice; Tl'azt'en Nation

2.2 Introduction

Natural resource managers are tasked with monitoring and evaluating environmental change while balancing multiple values and involving local communities in the management process (Westley 2002). The complexity of these objectives require managers to use tools that will integrate both environmental and social considerations (Blumenthal and Jannink 2000; Beckley *et al.* 2002; Olsson *et al.* 2004). These tools must work to identify and evaluate environmental change, and to apply resultant information within a broader socio-ecological context (Selin and Chavez 1995). Although managers increasingly appreciate the value of adopting interdisciplinary approaches to environmental monitoring, few applied examples of such tools exist (Fox 2002; Bennett and Zurek 2006).

Community-based environmental monitoring (CBEM) is an approach to documenting trends in environmental indicators, which explicitly recognizes important local values and knowledge, and engages communities as partners in the monitoring process. In doing so, CBEM contributes detail to local, regional, and national scale sustainability directives and enhances our understanding of these complex inter-relationships (Berkes 1999a; Kofinas *et al.* 2002a). Community-based environmental monitoring can capture valuable local information, thereby facilitating a better understanding of socio-ecological phenomena (Nickels *et al.* 2002). The adaptive, iterative nature of CBEM frameworks allow managers to tailor this tool to a community's unique character and to its current and future management goals (Natcher and Hickey

2002). Specifically, government and industry can use CBEM frameworks to work with Aboriginal communities and their cultural values, knowledge, and beliefs (Parlee and Lutsel K'e First Nation 1997; Lutsël K'e Dene First Nation-Wildlife, Lands & Environment Department 2005).

Aboriginal communities, like all communities, are continually evolving and adapting to the present ecological, social, and economic circumstances (Pinkerton 1998; Berkes 2004; Fast *et al.* 2005). Through CBEM, Aboriginal communities can realize local visions of environmental health and contribute to the sustainable management of resources through culturally relevant means (Manseau *et al.* 2005; Parlee *et al.* 2005b). Community-based environmental monitoring promotes the active involvement of communities in local and regional resource management decision-making and planning processes (Roberts 1996; Berkes 2004; Manseau *et al.* 2005; Parlee *et al.* 2005a). Furthermore, local knowledge collection and ownership provides Aboriginal communities with the opportunity to decide how to best complement their Traditional Environmental Knowledge and Management System (TEKMS) with Science Based Resource Management (SBRM) to meet their resource management objectives and community goals (Tipa and Teirney 2003; Hawley *et al.* 2004; Moller *et al.* 2004; Berkes and Seixas 2005). In this paper, we use the term TEKMS to describe the dynamic and unique knowledge system that each Aboriginal community has evolved and uses as a basis for resource decision making and planning (Hawley *et al.* 2004). We define SBRM as the "the application of the scientific method to address issues involving a wide range of species and environmental features, their ecosystems, the underlying ecological processes, and the working of humans" (Hawley *et al*. 2004: 38).

Past efforts at developing environmental monitoring focused almost exclusively on non-indigenous communities, top-down approaches, and the use of science-based monitoring protocols (Usher 2000; Nicholson *et al.* 2002). As the vast majority of community environmental monitoring programs occur in southern, developed regions of North America with non-Aboriginal communities, there is a need to develop, apply, and evaluate cross-cultural CBEM frameworks appropriate for northern communities (Michel and Gayton 2002; Canadian Community Monitoring Network 2004). Though applied examples of CBEM which demonstrate effective methods of engaging and working with Aboriginal communities are beginning to emerge (e.g., Lutsel K'e First Nation 1997; Krupnik and Jolly 2002; Parlee *et al.* 2005d, 2006; Łutsël K'e Dene First Nation-Wildlife, Lands and Environment Department 2005; Arctic Borderlands Ecological Knowledge Co-op 2008), few have been systematically evaluated (Estrella and Gaventa 1998; Carter 2008).

In this paper, we describe and evaluate the ability of a community-based, participatory research framework to meaningfully engage project team members in the process of developing Aboriginal environmental measures based on Tl'azt'en Nation TEKMS. Participants from Tl'azt'en Nation and community researchers iteratively identified the strengths and weaknesses of our framework through written and oral evaluations. We used focus groups, interviews, workshops, and Photovoice to facilitate mutual learning, trust-building, and the development of environmental measures (Hoare *et al.* 1993; Santiago-Rivera *et al.* 1998; Berkes 2004; Castellano 2004; Kirby *et al.* 2006). A Digital Video Disc (DVD), book, newsletters, and open meetings allowed us to

communicate the objectives, successes, and results of the research project and engage the broader community in the process of initiating Tl'azt'en CBEM.

2.3 Tl'azt'en Nation and Study Area

Tl'azt'en Nation is located in north central British Columbia Canada. Members of Tl'azt'en Nation identify themselves as *Dakelhne* but they are also known as Carrier (Hudson 1983; Tl'azt'en Nation 2009a). The current population of Tl'azt'en Nation is approximately 1500, with half of its members living in three main communities: *Tache* (Tachie), *Binche* (Pinchi), *Dzitl'ainli* (Middle River), and one seasonal village, *K'uzche* (Grand Rapids) (Figure 1.2; Moran 1994; Quinn 2007; Tl'azt'en Nation 2009a; B. Leon and A. Stark, personal communication, July 2009). Tl'azt'en Nation's 651,600 ha of traditional territory has always been rich with natural resources:

> unlike some of the Carrier bands that had to travel many miles from their villages to reach their hunting territory and their traplines, our traditional hunting grounds were all around us. The animals- moose, deer, bear, marten, lynx, coyote- were just outside our door (Moran 1994: 35).

Located on two percent of Tl'azt'en Nation traditional territory is the 13,000 ha John Prince Research Forest (JPRF) (Grainger *et al*. 2006). The JPRF was officially established in 1999 and is co-managed by Tl'azt'en Nation and the University of Northern British Columbia (UNBC) (Figure 1.2). This partnership was further strengthened in 2004 through a Community-University Research Alliance (CURA) project (http://cura.unbc.ca/), of which this study was affiliated. Research completed by the JPRF and the CURA project has promoted the JPRF's vision to use multiple values and knowledge systems in the collaborative management of the land (Grainger *et al.*

2006). The Aboriginal environmental measures developed in this study furthered the use of the Tl'azt'en TEKMS in directing, applying, and evaluating JPRF management plans.

2.4 Methods

Development of Tl'azt'en Nation environmental measures was a three-phase process. A participatory, community-based research approach shaped all facets of the framework, including research methods, events, and community products (Figure 2.1). The initial phase of the framework, personal transformative process, involved the period of time that the lead researcher spent in the community prior to beginning research. This was followed by two research phases that led to the generation and verification of Tl'azt'en environmental measures and included five rounds of evaluation. The Tl'azt'en Nation Chief and Council formally approved this research design with a Band Council Resolution (Appendix F).

This project builds on research with Tl'azt'en Nation, by considering the challenges and strengths of previous methods used for delineating local criteria, indicators, values, and measures and by utilizing the Tl'azt'en Nation C&I framework (Karjala *et al.* 2004; Sherry *et al.* 2005; Quinn 2007; Fondahl *et al.* 2009). The Tl'azt'en environmental measures developed in this project extend from and correspond with this C&I framework. As all Aboriginal communities are inherently unique, this present measures development process cannot be transposed onto other communities. Rather, our detailed methodological description and evaluation provides insight for those communities and resource managers working to develop their own Aboriginal environmental measures and community-based processes.

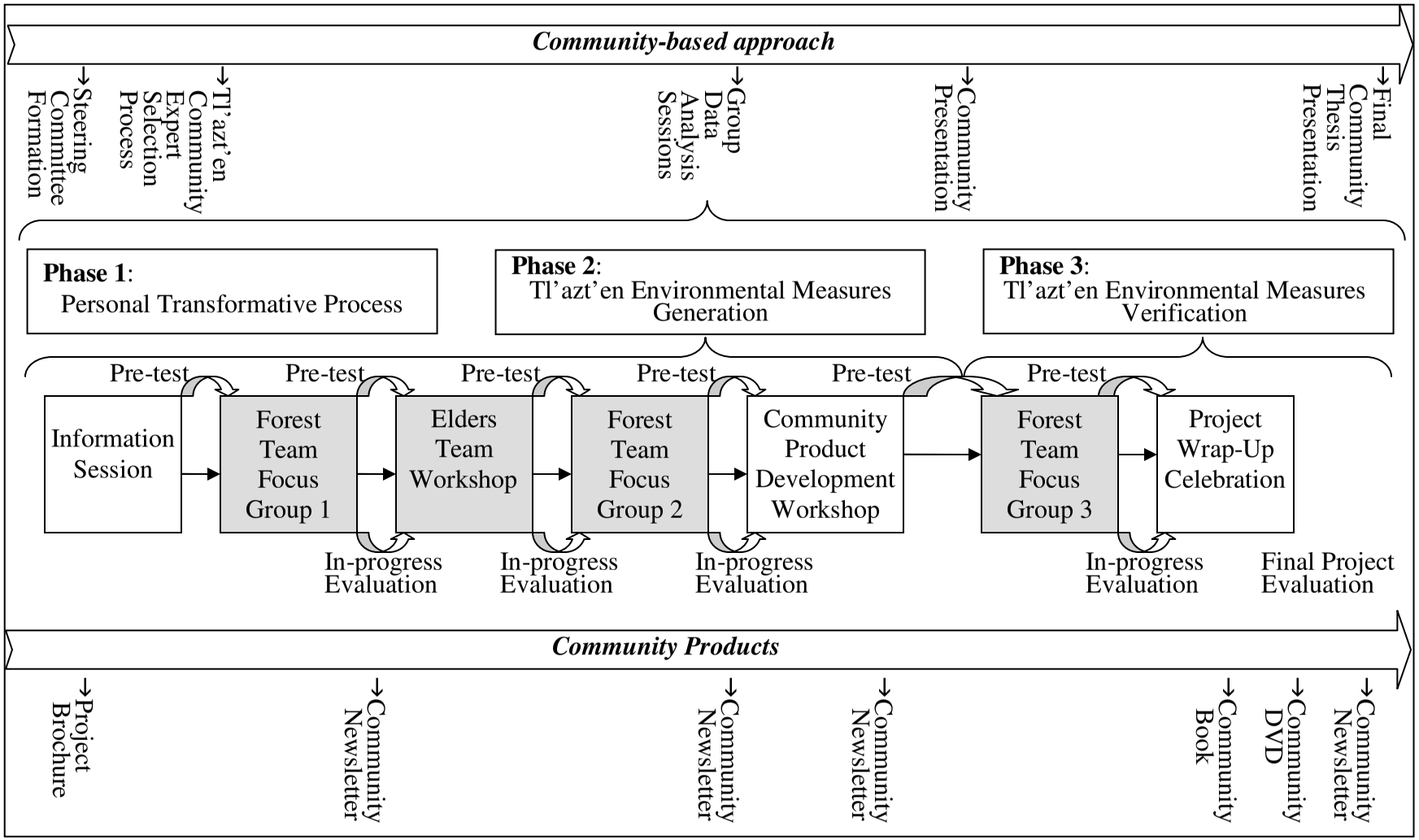


Figure 2.1- Three phases of the Tl'azt'en Nation environmental measures development framework. Research events highlighted in grey indicate where information was collected, for analysis purposes, through audio and video recordings. All phases maintained a community-based approach and contributed to the development of community products.

2.4.1 Community-Based Approach

Transparency, respect, and reciprocity are three attributes of a legitimate and meaningful research process (Wondolleck and Yaffee 2000a). Collaboration with project partners was initiated from the outset with the formation of a project steering committee (Figure 2.1). The steering committee consisted of equal numbers of representatives from UNBC, Tl'azt'en Nation and the JPRF. This ensured that each partner's goals and needs were represented in the project design, implementation, evaluation, and results. This committee also worked to ensure that our research process coincided with Tl'azt'en Nation norms, values, and protocols (Magninn 2007). Project initiatives that demonstrated our community-based approach included: holding a project information session for the community; selecting experts based on community criteria and peer nomination; producing newsletters that updated the broader community of project progress; working iteratively with Tl'azt'en Nation researchers and participants to direct our framework through participatory evaluations; involving community members as partners in the data analysis and verification process; holding a final community thesis presentation; and, publishing a community book (Tl'azt'en Nation and Yim 2008b) and DVD (Figure 2.1; Tl'azt'en Nation and Yim 2008a). This community-based approach contributed to evolving an effective cross-cultural partnership that fostered mutual learning and knowledge generation (Zamparo 1996).

2.4.2 Tl'azt'en Nation Environmental Measures Development Approach

2.4.2.1 Phase 1- Personal Transformative Process

Establishing a genuine rapport with the community is a necessary component of successful research processes (Suzuki *et al.* 2007). The lead researcher became critically conscious that such personal traits as being female, non-Aboriginal, and having a SBRM background were shaping her research perspective. Becoming critically conscious of, familiar with, and situated in the Tl'azt'en Nation community enabled the lead researcher to appropriately adjust her cultural lens (Kidd and Kral 2005; Savin-Baden and Wimpenny 2007). Examples of actions undertaken during the transformative process were: spending time in the community through repeated visits and extended stays, participating in community activities, attending community events, and developing personal and working relationships with community members. Phase 1 fostered a dialogue and the beginning of a meaningful relationship between the lead researcher and the Tl'azt'en Nation community prior to the project's first research event in Phase 2.

2.4.2.2 Phase 2- Tl'azt'enne Environmental Measures Generation

2.4.2.2.1 Establishing the Research Teams

A systematic, peer-reference method was used to identify and nominate Tl'azt'en experts to participate in the project (Davis and Wagner 2003). The term 'expert' was used to describe an individual actively involved in one of five Tl'azt'en traditional use activities in either the past or present: hunting, fishing, trapping, medicinal plant gathering, and berry picking (Sherry and Fondahl 2003; Sherry and Fondahl 2004; Sherry *et al.* 2004; Sherry *et al.* 2005; Sherry *et al*. nd-a.). Non-probabilistic, purposive sampling methods were used to nominate team members (Palys 1997; Kirby *et al.* 2006;

Sherry *et al.* nd-a.). This involved working with Tl'azt'en community researchers and assistants to identify Tl'azt'en community members who could fulfill four participant selection criteria. First, participants had to be a member of Tl'azt'en Nation. Second, participants had to demonstrate knowledge, through teaching and/or practice, of one or more of the focal traditional use activities. Third, participants were recognized as authorities or experts by a minimum of two other Tl'azt'en community members. Lastly, participants were representative. For hunting and trapping, this meant that a participant was recognized as a representative *keyoh*[2] holder. For fishing, medicinal plant gathering, and berry picking, this meant that a person was representative of the pool of experts within the Tl'azt'en Nation community. As familiarity with and details of our project were introduced to the Tl'azt'en Nation community through the information session, the project brochure, and word of mouth, the snowball technique worked to foster additional participant interest (Côté-Arsenault and Morrison-Beedy 1999; Sherry and Myers 2002; Kirby *et al.* 2006; Sherry *et al.* nd-a.). Individuals identified through the snowball technique were also required to fulfill the four participant criteria.

Project participants were invited to join one of the two research teams: the Elders Team (ET) or the Forest Team (FT). Invitations included a detailed information package describing the project's purpose, timeline, number and nature of research events, and participation expectations. The ET included only Tl'azt'en Elders, whereas the FT was comprised of any individual who met the four participant criteria. We use the term Elder to describe Aboriginal community members who hold traditional knowledge, wisdom, and experience and are willing to share and teach others (Cajete 2000). The community

[2] *Keyoh* is a *Dakelh* word that describes traditional family territories passed on paternally from generation to generation. *Keyoh*s are now legally recognized in Canada as traplines.

denotes the deeply respected designation of Elder, which is usually associated with an individual's age.

2.4.2.2.2 Information Session

The research project and research team were introduced to the Tl'azt'en Nation community at the information session (Figure 2.1). It served as a forum for interested community members to ask questions, prior to committing to participate. A community lunch was provided after the information session.

Each prospective participant reviewed the project's written informed consent with the lead researcher before joining one of the research teams. Forest Team members also orally reviewed and signed a separate commitment letter to the FT (Appendix D). During the information session, researchers explained that participants could not be compensated for the true value of their time, but they would receive gifts in appreciation of their commitment and contributions to the project. Forest team members received a digital camera and accessories. Elders team members received honoraria. All team members received a vest embroidered with the project's logo, a copy of the project's final products, and publications. Team members were thanked for their contributions with a handwritten, handmade card following every research event.

2.4.2.2.3 Pre-Testing Research Events

We intended to pilot test each research event to ensure that the methods would achieve the proposed objectives (Côté-Arsenault and Morrison-Beedy 1999); however, given the small size of the Tl'azt'en Nation community it was not possible to pilot test materials on a representative group of non-project participants. Pre-testing was

conducted by the lead researcher with two Tl'azt'en Nation community researchers and a research assistant (except for the third FT focus group where only two Tl'azt'en community researchers were available). In each pre-testing session, Tl'azt'en community researchers and assistants reviewed and suggested modifications to research questions, methods, materials, and/or research event plans, if necessary. In addition to constructive methodological feedback, pre-testing established a common, clear understanding of research materials, methods, and goals amongst research team members (Vissandjée *et al.* 2002; Halcomb *et al.* 2007).

2.4.2.2.4 Recording Methods

All focus groups and workshops were audio and video recorded for data analysis (Sim 1998). Researchers discussed the recording devices at each event, and asked participants if they were comfortable with the recording methods. Audio recordings were used to create verbatim transcripts. Video recordings aided transcription and were used for community products. Audio and video recording research events can make participants feel uncomfortable; however, video recording focus groups was particularly valuable for including the inputs of less vocal participants (Joseph *et al.* 2000). As per Tl'azt'en community norms, team members expected research events to be recorded for archival and educational purposes. All audio and video recordings were archived at the Tl'azt'en Nation and UNBC archives (Sherry and Fondahl 2004).

2.4.2.2.5 Forest Team Focus Groups

Tl'azt'en community researchers and assistants played a significant role in coordinating focus groups. Coordination responsibilities included announcing focus

groups with detailed letters delivered to the homes of team members, coordinating transportation, and providing reminders to team members. Forest team focus groups took place in Tache at the Elders Center. All focus groups were co-facilitated by the lead and Tl'azt'en community researchers using a semi-structured group interview format (Fisher and Ball 2003). Focus groups consisted of morning and afternoon sessions separated by a one-hour break. Refreshments, snacks, and lunch were provided. Seating and tables were arranged in a U shape to promote a team oriented atmosphere (Strickland 1999). A prayer led by a Tl'azt'en team member signified the beginning and end of every FT focus group. At each focus group, team members received their own binder of materials providing all of the event's information (i.e. agenda, objectives), feedback and results of previous participant evaluations, and instructions to collectively guide the team through the research event.

2.4.2.2.6 Forest Team Focus Group 1

The three main objectives of the first FT focus group (FTFG1) were to select representative species for the five focal traditional use activities, to identify each FT member's area(s) of expertise, and to train FT members in the Photovoice method (Figure 2.1). The FT selected moose (*Alces alces*), beaver (*Castor canadensis*), salmon (*Oncorhynchus nerka* and *Oncorhynchus tshawytscha*), soapberries (*Sherpherdia canadensis*), and huckleberries (*Vaccinium membranaceum*) as species of particular importance. Forest team members then self identified the traditional use activities in which they were experts. Each FT member focused on developing environmental measures for their identified area(s) of expertise. We used the participatory research

method known as Photovoice (Wang *et al*. 1996) to engage FT members in a process that allowed them to share their expertise in a culturally relevant manner.

Photovoice uses photography to engage the knowledge and creativity of participants (Wang *et al.* 1996; Wang *et al.* 2000; Wang and Redwood-Jones 2001; McIntyre 2003; Wang *et al.* 2004). Photovoice has three main goals (Wang and Burris 1997). The first two goals of Photovoice allow "people to record and reflect their community's strengths and concerns" and "promotes critical dialogue and knowledge about important community issues through large and small group discussion of photographs" (Wang and Burris 1997: 369); like Moffitt and Vollman (2004), this study only focused on these two Photovoice goals. Photovoice has been applied in other Aboriginal community-based participatory studies and was found to be a culturally appropriate method (Moffitt and Vollman 2004; Department of Justice Canada 2007; Castleden *et al.* 2008). This method has also been used in the field of participatory monitoring and evaluation (Estrella and Gaventa 1998).

At the first FT focus group, team members received Photovoice equipment (e.g., digital camera, digital memory card, camera accessories) and approximately three hours of training in the use of digital cameras and the Photovoice method (Figure 2.2). Forest team members were given seven weeks to use Photovoice to capture images on the land related to the environmental health of the plant(s) or animal(s) representing their areas of expertise. Participants were instructed to take as many photographs as necessary, but to select a minimum of three photos to discuss in detail at the second FT focus group.

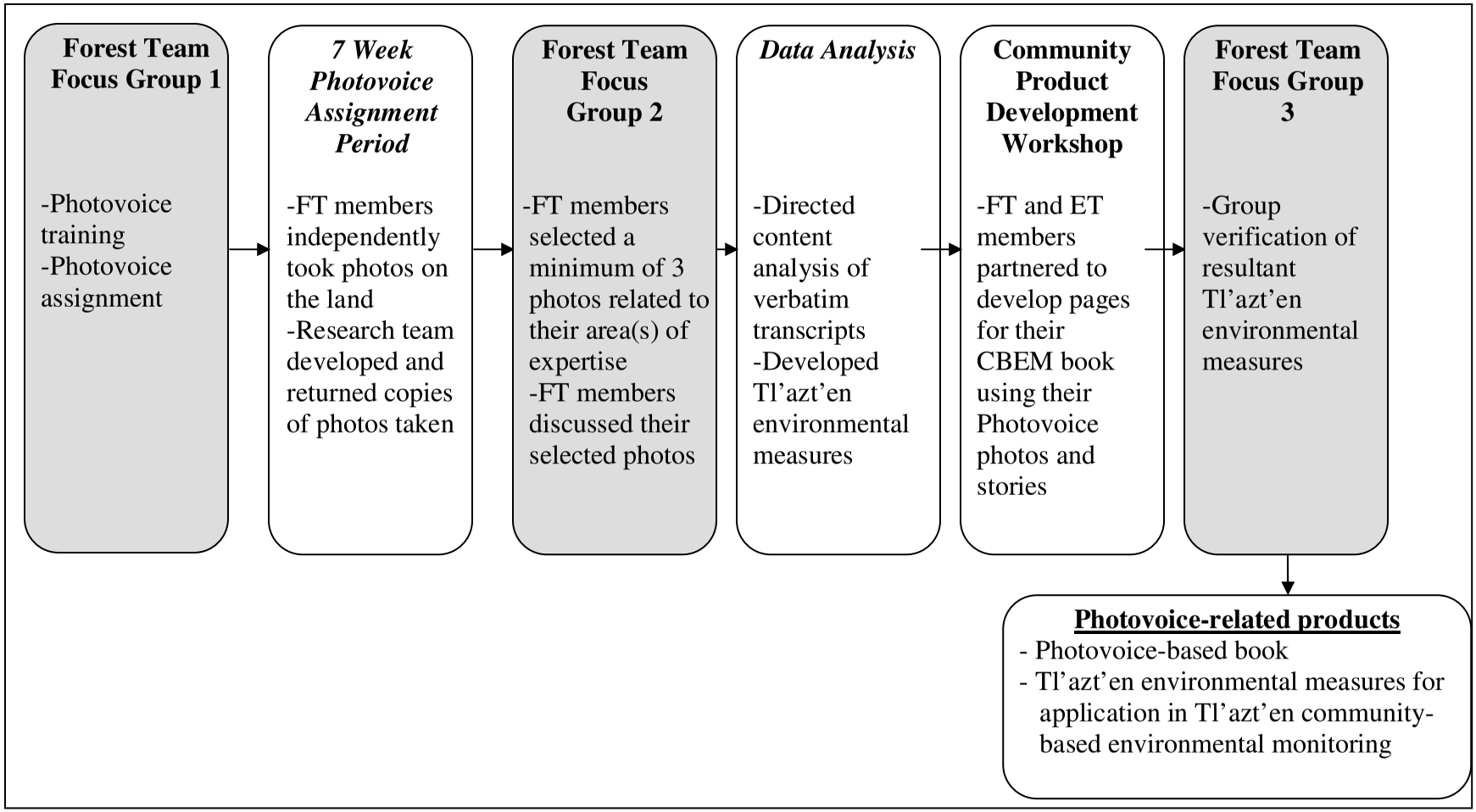


Figure 2.2 - Sequential timeline and process for using Photovoice to complete the Tl'azt'en Nation Environmental Measures Development Framework. Caption headings appearing in italics indicate an event not associated with the explicit collection of data.

We provided a Photovoice logbook for each FT member to record the date, location, focus and importance of each photo taken.

During this seven-week period, research team members met periodically with FT members. At these brief informal meetings, researchers borrowed the digital memory cards of FT members in order to print their photos. The lead researcher kept digital copies of all FT photos in a secure password protected computer file (Moffitt and Vollman 2004). These digital copies were used in the data analysis, in the development of community products, and to provide each FT member with a compact disc (CD) copy of their photos. All FT members received printed copies of their Photovoice photos and a one-page newsletter prior to the second FT focus group (Appendix E.1). This newsletter reminded FT members that assistance with Photovoice was available from the research team, and introduced the objectives for the second FT focus group.

2.4.2.2.7 Elders Team Workshop

The ET workshop was held at a small, rustic research station located on the JPRF (Figure 1.2). This workshop occurred over two days and consisted of six one-hour, semi-structured, group interviews specific to each traditional use activity and the importance of CBEM. The four main objectives of the ET workshop were to: further our understanding of Tl'azt'en Nation's culture, beliefs, and values related to each traditional use activity and their representative species; explore reference values, such as benchmarks, norms, and standards, for each representative species; discuss if and how Elders have observed environmental change related to each of the representative species; and, document the CBEM goals that Elders would like to achieve. Food, refreshments, and

accommodations were provided. Each day began and concluded with an Elder leading a prayer in *Dakelh*.

Every ET member received a booklet with written information that included copies of the informed consent, the agenda, and the workshop objectives. A projector continuously displayed photographs throughout each of the group interviews, as a non-verbal means of stimulating and focusing discussions. The lead researcher co-moderated the group interviews with Tl'azt'en community researchers. This ensured that the interviews were culturally appropriate and respectful of Elders (Fisher and Ball 2003). For instance, moderators kept interjections to a minimum during group interviews in order to allow Elders to discuss topics in a culturally meaningful way (Strickland 1999). Conducting portions of the ET group interviews in *Dakelh*, serving such traditional foods as salmon and bannock, and going out on the land for a group activity also contributed to the cultural relevance of our methodology. The ET workshop also provided an opportunity for team members to informally spend time together.

2.4.2.2.8 Forest Team Focus Group 2

During the second FT focus group (FTFG2), FT members selected a minimum of three photos that best demonstrated important aspects of the representative plant or animal's environmental health (Figure 2.1). Forest Team members were asked to reflect on and describe each of their selected photos. While presenting their photos, FT members addressed three topics: the subject of the photo; the importance of the photo; and, the depicted signs and/or signals that illustrated the environmental condition of the featured plant, animal, or environment in the photo.

Due to scheduling difficulties, only five FT members attended the second FTFG2. The remaining seven FT members met with the lead researcher at a later date to conduct one-on-one, semi-structured interviews using the same Photovoice procedure as outlined above. Interviews began with a review of other FT member's Photovoice results. This review process kept all FT members informed of team developments and helped to maintain a cohesive team atmosphere.

2.4.2.2.9 Community-Product Development Workshop

The community product development workshop (CPDW) was a joint ET and FT event (Figure 2.1). The primary objective was to provide an opportunity for both teams to collaboratively work on the development of a book and DVD that chronicled their TEKMS in the context of CBEM. The workshop was conducted during the analysis phase of the project to maintain project momentum amongst team members. Pairs of FT and ET members worked together to select Photovoice photos and to write corresponding stories or descriptions for inclusion in the book. Each page was arranged on a poster board and presented at the workshop. These presentations promoted group discussions, learning, and the verification of presented results. A class of students from the local Eugene Joseph Elementary School were invited to take part in the presentation portion of the workshop. The participation of these students contributed to the intergenerational transmission of Tl'azt'en TEKMS and initiated their involvement in the project; the project's book included pictures drawn by students from this class.

2.4.2.3 Phase 3- Tl'azt'en Environmental Measures Verification

2.4.2.3.1 Data Analysis

Verbatim transcripts of FTFG1, FTFG2, and the ET workshop were transcribed manually by the lead researcher and Tl'azt'en research assistants. When *Dakelh* was spoken, the *Dakelh* words and English translations were included in the transcript. A team of *Dakelh* language experts were hired to ensure that translations were accurate and correctly spelled. Contextual information was also incorporated during the transcription process. All transcripts were edited for accuracy by the lead researcher or Tl'azt'en research assistants before they were returned to FT and ET members for verification. This verification process gave team members the opportunity to modify and confirm their contributions prior to analysis. Team members either reviewed their written transcripts independently or orally with a research team member. Any changes were incorporated.

Our content analysis used a bottom-up, grounded theory approach (Sherry *et al*. 2004; Dick 2005). The lead researcher conducted the initial content analysis manually without computer software (Mosavel and Thomas 2009). A coding framework provided the basis for the identification of Tl'azt'en environmental measures, as codes were the unit of analysis used to inform measure development. From each code, one or more Tl'azt'en environmental measures were identified. Codes were characterized by a description, measurement method, and other related environmental information, such as data elements, benchmarks and attributes (i.e., type, source). The description was a short directive statement that specifically defined the focus of subsequent measures. The measurement method provided the specific protocols to inform each measure. The data element described the expected data, including measure type that would result from each

measure. The five measure types used to describe the evaluative character of each measure were: presence/absence, opinion, quantitative, qualitative, and mixed quantitative/qualitative (Quinn 2007). Benchmarks are a reference value that a measure can be evaluated against. All resultant Tl'azt'en environmental measures were developed in consideration with the previously established characteristics of effective Tl'azt'en measures (Quinn 2007); for example, mixed methods (qualitative/quantitative) were used in the design of measurement approaches (Appendix A.1, A.2, A.3). These characteristics also provided confidence that our resultant environmental measures would be effective and appropriate for the Tl'azt'en community.

We also conducted a parallel analysis of methodological evaluation comments. A methodological evaluation comment was a remark made by a FT or ET member in reference to an aspect of our methodology or research process. This analysis also followed a grounded theory approach (Sherry *et al*. 2004; Dick 2005) using a separate coding framework. Methodological evaluation comments were used in combination with in-progress and final evaluation results to assess our Tl'azt'en Nation environmental measures development framework.

Other types of information identified in our analysis included the *Dakelh* language and Tl'azt'en TEKMS-related knowledge. *Dakelh* words and phrases were translated and included in a glossary in the project's book. This promoted the use of the *Dakelh* language- a priority for Tl'azt'en Nation. Tl'azt'en TEKMS-related knowledge was identified for community product content; thus, facilitating the transmission of some Tl'azt'en TEKMS knowledge outside of the project's focus and scope.

To ensure rigor, quality, and validity, inter-rater reliability testing was conducted with Tl'azt'en Nation community researchers and members of the project steering committee (Kolbe and Burnett 1991; Lombard *et al.* 2002; Marques and McCall 2005). Coded transcripts were randomly selected for inter-rater reliability testing by type (i.e., FT member one-on-one interviews, FT focus groups, ET workshop). Of the 15 transcripts, one was used to pilot our group content analysis procedure and 10 were tested. Due to time and budget constraints, the remaining four transcripts were only tested by a subset of our group analysts. A percent agreement index [(number of agreements) ÷ (number of agreements + number of disagreements)] was used to calculate a coefficient of reliability for each transcript (Lombard *et al.* 2002). A 90% coefficient of reliability was our minimum acceptable level of power (Palys 1997). All transcripts with an initial coefficient of reliability below 90% were re-coded through group analysis until consensus was achieved. In this reflexive group analysis procedure, every coding difference was discussed extensively amongst analysts (Barry *et al.* 1999). These discussions promoted an exchange of knowledge, the development of shared understanding, and ultimately, coding consensus.

2.4.2.3.2 Forest Team Focus Group 3

Results of the content analysis were presented and given to team members for review and verification at the third FT focus group (FTFG3). Team members validated the resultant Tl'azt'en environmental measures as a group (Barbour 2001). An overhead projector was used to add, remove, and clarify information related to each environmental measure. Every traditional use activity's environmental measures were verified at this focus group. The environmental measures developed for monitoring environmental

change across Tl'azt'en Nation traditional territory and adherence to Tl'azt'en traditional environmental land use methods and principles were not verified due to time and budget constraints.

2.4.2.3.3 Project Wrap-Up Celebration

The project wrap-up celebration brought participants together to celebrate their contributions and accomplishments. At this event, team members completed a final project evaluation. Applied CBEM prototypes with corresponding mocked examples for each representative plant and animal were also provided for evaluation and feedback. These prototypes applied the most frequently identified codes from each traditional use activity in a CBEM format. Corresponding mocked examples were also provided to demonstrate how prototypes might be used in the field. Each team member was then presented with a copy of the book (Tl'azt'en Nation & Yim 2008b) and DVD (Tl'azt'en Nation & Yim 2008a) that highlighted the contributions of the team members. Following the project wrap-up, complimentary copies of the book and DVD were given to Tl'azt'en community members, Tl'azt'en Nation's Eugene Joseph Elementary School, and to the JPRF's culture and science education camp program- the *Chuntoh* Education Society.

2.4.3 Research Framework Evaluation

Tl'azt'en Nation FT and ET members, community researchers and assistants evaluated the methods and outcomes through in-progress evaluations, evaluation comments shared during research events, and a comprehensive final project evaluation (Figure 2.1). We used a process of empowerment evaluation to increase the success of the project and enhance the capacity of team members to "plan, implement, and evaluate

their own programs" (Wandersman *et al.* 2005: 27). The 10 principles of empowerment evaluation are: improvement, community ownership, inclusion, democratic participation, social justice, community knowledge, evidence-based strategies, capacity building, organization learning, and accountability (Wandersman *et al.* 2005; Fetterman and Wandersman 2007). These 10 principles shaped the development of this study's six empowerment evaluation topics: participant satisfaction, independence, personal development, conduct of researchers, relationship building, and needed improvements. We used five formal participatory evaluations to assess these six empowerment evaluation topics throughout the course of the project.

Participant satisfaction was a broad evaluation topic which identified possible factors contributing to continued project participation. Evaluating participant satisfaction is important, as dissatisfaction may result in attrition. The evaluation topic, independence, is related to the empowerment evaluation principle of democratic participation. This topic allowed us to assess if participants had the opportunity to meaningfully and appropriately participate to their desired capacity. The third evaluation topic, personal and professional development, was correlated with the empowerment evaluation principle of capacity building. Personal development and capacity building are important components of culturally appropriate frameworks (Lafrance 2004). The fourth evaluation topic, conduct of researchers, allowed us to assess the delivery and implementation of the research. Reviewing research practices is important for conducting culturally grounded evaluation (Lafrance 2004). We used the topic relationship building to identify if participants felt valued as members of the project. A team oriented approach in interdisciplinary, collaborative research can provide social and

methodological benefits (Barry *et al.* 1999). Lastly, the evaluation topic, needed improvements, allowed participants to provide constructive feedback to the research team leading to improved processes (Fetterman 2001; Conley 2003).

2.4.3.1 In-Progress Evaluations

The one-page, written in-progress evaluations followed a yes/no response format and provided space for team members to include additional comments. Responses not marked as 'yes' or 'no' were considered as a 'non-response.' Written in-progress evaluations were completed anonymously. If preferred, team members conducted the evaluation orally with a community researcher who anonymously noted their responses.

Elders evaluated their workshop orally as a group, facilitated by community researchers. In response to evaluation questions, the ET responded with a consensus 'yes' or 'no' response; ET members identified this to be the most appropriate and comfortable evaluation format for them. Both teams evaluated the same six evaluation topics described above, with the exception of an additional set of questions related to translation for the ET. This topic was added because the *Dakelh* language was commonly used throughout the ET workshop.

In-progress evaluation results were immediately summarized following every research event. Results and any subsequent modifications were then presented to FT and ET members at the following event. This oral presentation was accompanied by written handouts summarizing the results. Results of the participatory evaluation were used to inform project management, instill organizational learning, and improve co-management partner understanding (Estrella and Gaventa 1998; Estrella 2000).

2.4.3.2 Final Project Evaluation

The three-page final project evaluation (FPE) allowed us to examine the six evaluation topics, our central research methods, and the overall project. The three response formats used for this evaluation were yes/no, short answer, and a Likert scale (i.e., 1-unsatisfactory, 2-slightly unsatisfied, 3-satisfied, 4-very satisfied, 5-extremely satisfied, or 6-did not use).

2.4.3.3 Methodological Evaluation Comments

Feedback related to aspects of our research methods and process was inductively identified from FT and ET transcripts during the content analysis. These methodological evaluation comments complimented the results of the in-progress and FPE. Methodological evaluation comments were organized according to empowerment evaluation topic or participatory method.

2.5 Results

The environmental measures development process resulted in 252 Tl'azt'en environmental measures. Specifically, 39 measures were developed for salmon, 69 measures for moose, 31 measures for beaver, 26 measures for soapberries, and 33 measures for huckleberries. In addition to the environmental measures for monitoring the health of representative plant and animal species, 36 measures were developed for monitoring environmental change across Tl'azt'en Nation traditional territory and 18 measures were developed for monitoring adherence to Tl'azt'en traditional environmental land use methods and principles.

We also evaluated the participatory methods and processes that constituted the research framework throughout the course and at the end of the research project. These results were grouped across evaluation events and summarized by empowerment evaluation topic and central participatory method. As a further finding supporting the success of our methodological framework, we also summarized the attendance of team members at research events and the project's overall attrition rate.

2.5.2 Participation Rates

A total of 19 community members took part in this project, and three Elders participated as members on both teams. All eight community members who committed to joining the FT participated in FTFG1. The FT grew by 33% (n=4), to a total of 12 FT members, between FTFG1 and FTFG2 due to the snowballing technique. All 12 FT members participated in one of the two formats of FTFG2, achieving a 100% participation rate. The participation rate for FTFG3 was 58% (n=12); participants were unable to participate in this third focus group for a variety of personal reasons unrelated to the project, including work and appointments. The average participation rate for all three FT focus groups was 86%. A 100% participation rate (n=10) was achieved at the ET workshop. No FT or ET members withdrew from the project, resulting in a 0% rate of attrition. At our two non-data collection research events, the CPDW (63% participation rate, n=19) and the project wrap-up celebration (42% participation rate, n=19), lower participation rates were achieved.

2.5.3 Empowerment Evaluation

2.5.3.1 Satisfaction

The satisfaction of ET and FT members was evaluated throughout the course of the project (Table 2.1, Table 2.2). Team members revealed that they were highly satisfied with all FT focus groups (FTFG1: 100%; FTFG2: 92%; FTFG3: 100%), the ET workshop (ET workshop: yes), and with being a member of the project (FPE: 100%). Team members consistently felt valued at all research events and throughout the project (FTFG1: 100%; FTFG2: 92%; FTFG3: 89%; ET workshop: yes; FPE: 100%). Their expectations were also consistently met at research events and throughout the project (FTFG1: 100%; FTFG2: 92%; FTFG3: 78%; ET workshop: yes; FPE: 100%). When asked if satisfied with the amount of time given to complete a meeting's activities, FT members indicated that they were (FTFG1: 100%; FTFG2: 100%). All 14 respondents were satisfied with the project's community products. Elders team members indicated that they were satisfied with the format of group interviews, their ability to participate and engage extensively in the group interviews, and, how group interviews were controlled and directed by the team and researchers (Table 2.1). Though 9 of 13 team members felt that participating in this project required a large time commitment, all 14 respondents felt that the benefits of participation were worthwhile (FPE: 100%). These results are further supported by our FPE, where the 10 respondents rated project satisfaction as 4.44 out of 5, between the categories of 'very satisfied' and 'extremely satisfied.'[3]

[3] Four respondents did not respond (NR) to this question.

Table 2.1- In-progress evaluation results examining six empowerment evaluation topics from the research events: FTFG1 (n=7), FTFG2 (n=12), FTFG3 (n=9) and ET Workshop (n=10). Dashes indicate questions that were not asked at a particular research event. Responses not marked as 'yes' or 'no' are indicated as non-response (NR).

Topic Area	In-Progress Evaluation Questions	FTFG1			FTFG2			FTFG3			ET Workshop	
		Yes	No	NR	Yes	No	NR	Yes	No	NR	Yes	No
Satisfaction	Satisfied with meeting/workshop?	7	0	0	11	0	1	9	0	0	10	
	Feel valued as a team member?	7	0	0	11	0	1	8	0	1	10	
	Expectations met?	7	0	0	11	0	1	7	0	2	10	
	Enough time to complete today's activities?	7	0	0	12	0	0	-	-	-	-	-
Independence	Able to express your ideas?	7	0	0	12	0	0	8	0	1	10	
	Have the freedom to participate when, where and how you wanted to?	7	0	0	12	0	0	8	0	1	10	
Personal and Professional Development	Learn anything new?	7	0	0	12	0	0	9	0	0	10	
	Any skills/knowledge learned or used today useful to you for the future?	7	0	0	12	0	0	9	0	0	10	
Relationship Building	Feel valued as member of the team?	7	0	0	12	0	0	9	0	0	10	
Researchers	Satisfied with the facilitation and co-ordination provided by the community and/or principal researcher?	7	0	0	12	0	0	9	0	0	10	
	Researchers clearly communicate the events objectives?	7	0	0	12	0	0	8	0	1	10	
	Comfortable with recording methods? (e.g., audio, video)	7	0	0	12	0	0	9	0	0	10	
Improvements	Have any suggestions to improve the next meeting?	1	3	3	1	11	0	0	9	0	-	-

Table 2.2- Final project evaluation results examining five empowerment evaluation topics. Responses include both ET and FT member responses (n=14). Responses not marked as 'yes' or 'no' are indicated as non-response (NR).

Topic Area	Final Project Evaluation Questions	Yes	No	NR
Satisfaction	Were you satisfied with being a team member on this project?	14	0	0
	Did you feel valued as a team member throughout this project?	14	0	0
	Were your expectations for participating in this project met?	14	0	0
	Did you feel that participating in this project required a large time commitment on your part?	9	4	1
	Were you satisfied with the community products developed in this project?	14	0	0
	Did you feel that the benefits of being a part of this project were worth your time commitment?	14	0	0
Independence	Did you feel that you were able to express your ideas appropriately and fully throughout the project?	13	0	1
	Did you feel that you had the freedom to participate when, where, and how you wanted to throughout this project?	13	0	1
Personal and Professional Development	Did you learn anything new through your involvement in this project?	13	0	1
	Do you think that any skills learned or used throughout the project would be useful to you in the future?	13	0	1
Researchers	Were you satisfied with how the lead researcher maintained contact with you throughout the project?	13	0	1
	Were you satisfied with the facilitation and co-ordination provided by the community researchers and/or the lead researcher throughout the project?	13	0	1
Relationship Building	Did you feel like you were working as a valued member of a team throughout the project?	13	0	1
	Did you feel that you built stronger working relationships with team members throughout the project?	12	0	2

2.5.3.2 Independence

We posed two questions to evaluate the perceived independence of FT and ET throughout the project. First, team members revealed that they were able to express their ideas at the FT focus groups (FTFG1: 100%; FTFG2: 100%; FTFG3: 89%), at the ET

workshop (ET workshop: yes), and throughout the course of the project (FPE: 100%, n=13). Second, participants indicated that throughout the course of the project they felt free to take part when, where, and how they wanted (FPE: 100%, n=13), including FT focus groups (FTFG1: 100%; FTFG2: 92%; FTFG3: 89%), and the ET workshop (ET workshop: yes).

2.5.3.3 Personal and Professional Development

In terms of personal and professional development, when asked if they had learned anything new at project research events, FT and ET members responded positively (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; ET workshop: yes). Learning was voiced as an important component of the research framework. Thirteen team members also indicated that they had learned something new from their overall involvement in the project (FPE: 100%). One team member wrote, "I learned a lot from the Elders and other FT members." Another team member stated that they learned about "different [traditional] medicines." All FT and ET members indicated that they had either used or learned skills at each FT focus group that would be useful to them in the future (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; ET workshop: yes). This result was echoed in the FPE, with 100% (n=13) of team members affirming that individual learning resulted from their participation. The capacity of our collaborative community products to promote learning, to involve the larger Tl'azt'en community, and to share our project with other Aboriginal communities were also identified as important elements of the project. Involving youth in the development of our collaborative book was satisfying for team members and was an important component of the research framework that team members would like to see expanded in future phases of the project.

2.5.3.4 Relationship Building

Participants reported a strong sense of relationship building with research and fellow team members. All FT and ET members responded that they felt valued as members of the team (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; ET workshop: yes; FPE: 100%, n=13). In the FPE, 100% (n=12) of team members reported that they had built strong working relationships with all of the team members throughout the course of the project. For the ET, the use of *Dakelh* contributed to relationship building. The ET in-progress evaluation revealed that having conversations in *Dakelh* helped members to better express their knowledge, to better understand discussions, and to participate more actively in group interviews. Through the methodological evaluation comments, team members also revealed that building relationships and developing trust amongst participants was important. Achieving consensus amongst team members in decision-making processes was identified as an important component of relationship building.

2.5.3.5 Conduct of Researchers

All team members indicated that they were satisfied with the facilitation and co-ordination provided by both the lead and Tl'azt'en Nation community researchers at each FT focus group, the ET workshop, and throughout the overall project (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; FPE: 100%, n=13). Team members also indicated that they felt researchers had clearly communicated the objectives of each FT focus group and the ET workshop (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; ET workshop: yes). All team members were comfortable with how information was audio and video recorded (FTFG1: 100%; FTFG2: 100%; FTFG3: 100%; ET workshop: yes). In the FPE team members were asked if they were satisfied with the amount of contact that the lead

researcher had maintained with them throughout the 15-month project; all respondents indicated that they were satisfied.

Methodological evaluation comments provided further insight into the conduct of researchers and the development and application of the research process. Team members reported that they were satisfied with the interpersonal skills, flexibility, and organization of research team members. The use of culturally appropriate research methods, such as land-based activities (e.g., boat ride at ET workshop), were also identified as an area of satisfaction. The facilitation of research events could be improved by using more *Dakelh* (via translators and interpreters), by having maps available to facilitate discussions, and by using audio equipment to aid those with hearing difficulties. Team members revealed their satisfaction with how project progress was continually shared with the community through newsletters and amongst team members through in-progress evaluation and summaries of Photovoice results.

2.5.3.6 Recommended Improvements

The nature of recommended improvements varied across research events. Many recommendations were acted upon during the course of the project to improve the research process. For example, at FTFG1 some participants suggested that future research events should be open to members of both teams; at FTFG2, team members suggested that Photovoice photographs should be shared with youth in the community. Team members also suggested that research events should be open to youth in the community to promote further intergenerational learning. Elders team members remarked that overall we should, "improve everything as we go," and specifically that involving more youth and hiring translators would improve future research events. When

asked how future events could be improved, Tl'azt'en Nation community researchers and research assistants suggested that a full-time translator could be employed for ET members and that a consistent start time be adopted for all research events.

Additional improvements were identified from the methodological evaluation comments. Team members expressed the importance of conducting research related to CBEM activities during each activity's appropriate season, rather than during one short-term period in the summer.

2.5.4 Evaluation of Central Participatory Methods

In the FPE, team members used a Likert Scale to rate their overall satisfaction with the four central participatory research methods. These participatory methods were FT focus groups, one-on-one interviews, ET workshop, and Photovoice (Table 2.3). Forest team focus groups received a mean satisfaction score of 4.1 (n=10), close to the satisfaction score of 4- *Very satisfied.*. The ET workshop received a mean satisfaction score of 4.43 (n=7) between 4- *Very Satisfied* and 5- *Extremely Satisfied*. The research method, one-on-one interviews, received a mean satisfaction score of 4.2 (n= 9). Of the five research methods, Photovoice received the lowest mean satisfaction score of 3.33 or *Satisfied*, from the relatively small sample of six respondents. However, satisfaction with the Photovoice method was reported as high amongst FT members at the second FT focus group (FTFG2: 100%, n=12).

Most FT members liked the format of the photo sharing circle (FTFG2: 92%, n=11) and were comfortable using Photovoice to share their knowledge, expertise, stories, and photos (FTFG2: 100%, n=11).

Table 2.3- Evaluation results related to the central participatory methods: Photovoice, FT focus groups (FTFG), one-on-one interviews, and the ET workshop. Dashes indicate questions that were not asked at a particular research event. Questions left blank by respondents are indicated as non-response (NR).

Topic Area	Evaluation Questions	FTFG2 (n=12)			Final Project Evaluation (n=14)						
		Yes	No	NR	1- Unsatisfactory	2- Slightly unsatisfied	3- Satisfied	4- Very Satisfied	5- Extremely Satisfied	6- Did not use	NR
Photovoice	Satisfied with the Photovoice method?	12	0	0	-	-	-	-	-	-	-
	Like the Photo Sharing Circle format?	11	1	0	-	-	-	-	-	-	-
	Comfortable sharing knowledge, expertise, stories, & photos in the Photo Sharing Circle?	11	0	1	-	-	-	-	-	-	-
	Like working independently with the Photovoice method?	12	0	0	-	-	-	-	-	-	-
	Developed any skills by using Photovoice?	12	0	0	-	-	-	-	-	-	-
	Rate your satisfaction	-	-	-	0	1	3	1	1	4	4
FTFG	Rate your satisfaction	-	-	-	0	0	3	3	4	3	1
One-on-one interviews[4][5]	Rate your satisfaction	-	-	-	0	0	1	5	3	4	1
ET workshop	Rate your satisfaction	-	-	-	0	0	0	4	3	5	2

[4] A total of nine respondents rated their satisfaction with 'one-on-one interviews,' though only eight FT members used this method. The anonymous nature of our participatory evaluation prevents us from identifying and removing the evaluation that was accidentally completed.
[5] One FT member who attended FTFG2 also conducted a one-on-one interview; therefore eight one-on-one interviews were conducted.

All FT members enjoyed the independent nature of using Photovoice between FTFG1 and FTFG2 (FTFG2= 100%, n=12) and felt that they had developed new skills through the use of this method (FTFG2= 100%, n=12). During research events, participants spoke to the strengths and improvements of the Photovoice technique. For example, the photo sharing circle format and the intergenerational teaching capacity of Photovoice were areas of satisfaction for team members. However, participants reported that a verbal, rather than written, logbook for recording important environmental information would improve the Photovoice method. Team members also indicated that Photovoice guidelines should be clarified. In addition to our four central participatory methods, the CPDW was also evaluated. Its mean satisfaction score was 4.08 (n=11).

2.6 Discussion

A community-based research project's ability to achieve valid results depends on the qualities that characterize its processes, and the degree and quality of participation that it invokes (Hankins and Ross 2008). Effective collaborative processes are characterized by the ability to successfully achieve objectives, meaningfully engage partners, and institutionalize collaboration (Selin *et al.* 2000; Wondolleck and Yaffee 2000a). Cheng *et al.* (2008: 164) used the term "collaboration within collaboration" to describe how collaborative partnerships should utilize adaptive participatory processes to engage meaningful community participation and achieve shared goals. Community-based research approaches can facilitate this collaborative process.

2.6.1 Participation

The sustained participation of community members in cross-cultural environmental research projects is a sign of successful collaboration (Williams and Ellefson 1997; Carter 2008). High sustained FT (86%) and ET (100%) participation indicate that the participatory methods and processes involved in our Tl'azt'en Nation environmental measures development framework were meaningful and motivating to participants (Rotondi and Gustafson 1996). Our team member participation exceeded the 67% participation rate expected from expert-based participatory studies (Goldschmidt 1996). In the FPE, respondents unanimously (n=14) indicated that the benefits of participation were worth their time commitment (Table 2.2). The benefits of participation influence the quality and degree of a participatory process (Arnstein 1969; Wilmsen *et al.* 2008). Participant satisfaction, personal development, independence, and relationship building were four benefits that motivated participants and promoted their meaningful engagement in this research.

2.6.2 Qualities of a Meaningful Aboriginal Research Framework

Mutual reciprocity is an important component of native science (Cajete 2000) and Aboriginal collaborative research (Hankins and Ross 2008). This principle has guided the development of numerous applied Aboriginal research frameworks (Fox 2002; Jolly *et al*. 2002; Nickels *et al.* 2002; Thorpe *et al.* 2002). We used a number of tools and approaches to ensure reciprocity including facilitation of mutual learning, participant benefits, and community research products.

2.6.2.1 Satisfaction

Participant satisfaction is influenced by multiple factors. Furthermore, assessing participant satisfaction is challenging, as dissatisfaction is more commonly communicated (Rotondi and Gustafson 1996); thus, questions evaluating satisfaction were shaped by indicators of dissatisfaction (i.e., expectations not met). As Tl'azt'enne prefer to be asked questions with a positive focus (Quinn 2007), we adapted this orientation to best suit Tl'azt'enne and to assess an overall goal of participant satisfaction. Overall, during the FPE, project satisfaction was rated 89% by the 10 FT and ET respondents. Feeling valued, having expectations met at meetings, and participating in timely events contributed to participant satisfaction. Using a culturally relevant research approach was also identified as a factor contributing to participant satisfaction. One team member stated "I feel special, because I can show my talents in culture," and another member wrote, "I really enjoyed this. I am not employed at present and this makes me feel special to do something for Tl'azt'enne." Culturally relevant research methods foster satisfying and engaging processes.

Elders Team members also rated their participation and engagement as extensive. Three factors likely contributed to this result. First, the remote research station provided a retreat setting in the heart of Tl'azt'en Nation traditional territory, emphasizing the strong connection between team members and the land. Struthers (2001) described the significance that the research setting plays in the dynamic between team members and researchers, when working with Indigenous knowledge. For instance, during a boat tour of an adjacent lake, ET members guided researchers to specific locations, such as spawning areas, to share stories and knowledge out on the land; this was a rich learning

experience for all involved. Second, research methods were culturally appropriate (Association of Canadian Universities for Northern Studies 2003; Willgerodt 2003). Semi-structured group interviews were not heavily facilitated, which allowed for a more meaningful, culturally appropriate exchange of knowledge (Strickland 1999; Halcomb *et al*. 2007). Elders Team member, Joseph Mattess, remarked, "the Elders, they used to gather like this and talk." Also, by having portions of the group interview in *Dakelh,* ET members had an increased ability to share and understand. Sherry (2002) also found that translators and interpreters played an important role in meaningfully involving Elders. Lastly, scheduling time for informal interaction, discussions, and activities significantly contributed to a better understanding of one another and the development of lasting relationships (Gustafson *et al.* 1992; Napolitano *et al.* 2002; Huntington *et al.* 2006).

2.6.2.2 Personal and Professional Development

Personal development is a positive outcome and motivation for participation (Rotondi and Gustafson 1996). Meaningful participatory processes can facilitate opportunities for learning (Sinclair *et al.* 2008). In the FPE, 100% (n=13) of team members felt that they had learned new knowledge and/or skills that would be beneficial to them in the future. One team member explained that through their involvement in the project they "learned a lot about their culture." This finding is particularly significant as Abbot and Guijt (1998: 33) state that "community-based monitoring will only work if it contributes to local understanding and empowerment" Culturally relevant research frameworks can promote personal and collective cultural knowledge through their participatory processes (Sims and Sinclair 2008; Berkes 2009). Another team member expressed how valuable it was that, "all the knowledge of community members was

shared and used by all- this is a very important tool for keeping our culture." This exchange of information is a leading motivation for participation (Williams and Ellefson 1997) and an important mechanism for reinforcing collective learning (Sims and Sinclair 2008; Berkes 2009). Social learning is important for the cultural revitalization of Aboriginal communities, the development of social capital, and more effective cross-cultural co-management partnerships (Plummer and FitzGibbon 2007; Quinn 2007; Berkes 2009).

2.6.2.3 Independence

Participant independence requires space within a research process for members to participate in an autonomous and inclusive fashion (Narayan 2005). Through written evaluation comments, participants revealed how independence also contributed to the development of self-confidence and capacity. These attributes are important components of research frameworks that empower and facilitate community ownership. By fostering community ownership in a research process, more relevant results will likely be produced (Barnsley and Ellis 1992).

2.6.2.4 Relationship Building

Strong team relationships and cohesiveness amongst team members likely enhanced the value of participation and contributed to our framework's overall effectiveness (Buller and Bell 1986). DeCremer and vanVugt (1999) found that an increased group identity encourages individuals to contribute and cooperate. All team members (n=12) felt that they had built stronger working relationships through their involvement in the project (Table 2.2). Conducting numerous events throughout a project

has been found to strengthen participant commitment by increasing team cohesion and solidarity (Webler *et al.* 1995). Some team members remarked that attending research events was a highlight for them. In an in-progress evaluation, one team member wrote that their favorite part of the project was "meeting people and learning from Elders," while another remarked that they enjoyed "the FT meetings with Elders and spending time together as a team." The research approach played a strategic role in facilitating a conducive process for relationship building. Fostering strong relationships amongst project members added resilience to the research process and to future participatory environmental applications.

2.6.2.5 Participatory Methods

Photovoice was one of the four central participatory methods used in our study. This method facilitated and engaged the traditional knowledge of team members, but was rated with only a moderate satisfaction level. We suggest three improvements for increasing the overall satisfaction of participants in future applications of this method. First, the amount of Photovoice training and ongoing support provided to team members should be increased. We provided only one afternoon of training for team members. During this training, team members familiarized themselves with the concept of Photovoice, and with their new digital cameras and accessories. Second, the format of the 'Photovoice logbook' should be changed. The Photovoice logbook was developed and given to each FT member as a means of recording important information related to the photos that they took. Methodological evaluation comments revealed that the logbook could be improved by using an oral feedback format. Lastly, evaluation results suggested that Photovoice may be more satisfying if guidelines were clarified to allow

team members to take images of other environmental features or themes not directly related to the representative species of their focal traditional use activity. Our initial guidelines may have unintentionally limited participants as they worked to document and share their knowledge through photos. Though areas of improvement were identified, team members also recognized the utility and strength of Photovoice as an important intergenerational teaching tool for Tl'azt'en TEKMS. Sharing photos and knowledge through Photovoice was found to be highly satisfactory for FT members and an important source of content for the development of environmental measures and collaborative community products.

2.6.3 Building an Enduring Research Framework

An enduring research framework signifies successful collaboration (Wondolleck and Yaffee 2000a). Collaboration is institutionalized by establishing structures, motivating continued participation, and maintaining the interactions and benefits of partners (Wondolleck and Yaffee 2000a). Developing community products, involving the larger Tl'azt'en Nation community, and conducting participatory evaluations were three central institutionalizing structures critical to this research.

2.6.3.1 Developing Community Products

A collaboratively written book and DVD were our project's main community products. They were an innovative means of communicating about the project and its achievements to the larger community, as well as verifying results. Fox (2002) also found that using video recording was an effective means of communicating and teaching about CBEM. Other Aboriginal environmental studies have also used books and

audiovisual presentations to share TEKMS (Bonny and Berkes 2008). The development of community products provided opportunities to work with youth in the community and marked the cumulative achievements of all those involved, including the Tl'azt'en Nation community researchers and research assistants.

2.6.3.2 Involving the Community

Community centered research should demonstrate a transparent approach that involves the entire community (Parlee and Lutsel K'e First Nation 1997). This approach was applied throughout our framework by such initiatives as a project information session, project information brochures, and community newsletters. When FT members were asked if they liked being recognized through the community newsletters 100% of respondents (n=12) indicated that they did. Public recognition and appreciation is a source of pride for individuals (Wondolleck and Yaffee 2000b). The involvement of the Tl'azt'en community in our research strengthened our collaborative partnership.

2.6.3.3 Evaluating the Process

Participatory evaluation is a systematic process which collaboratively and iteratively assesses and guides the course of a project in order to foster continual improvement, learning, and capacity building (Narayan 1993). Cross-cultural participatory environmental research needs to be evaluated and directed in partnership with Aboriginal communities (Lewis 2004; Carter 2008). Aboriginal and non-Aboriginal partners may interpret the concept of 'meaningful' community participation differently; thus, research is best assessed by the community itself (Natcher and Hickey 2002). Such an assessment can improve project effectiveness, increase support and participation from

Aboriginal communities, promote researchers to be publicly accountable, contribute to a lateral power structure amongst researchers and participants, and facilitate the inclusion of project findings in decision making (Alzate 2000; Lafrance 2004).

The Tl'azt'en Nation environmental measures development framework was iteratively directed by ET and FT members through empowerment evaluation. This gave team members voice and power to explicitly influence the research process. In addition to the direct benefit of providing methodological feedback, in-progress evaluations characterized the framework's adaptive process of continual improvement (Fetterman 2001). Reporting all evaluation results and subsequent modifications to team members promoted project ownership, demonstrated equal partnership, fostered participant empowerment, and helped to maintain transparency. Tl'azt'en Nation community researchers and research assistants also completed in-progress evaluations; this worked to yield honest, reflexive perspectives from those who wore both community member and researcher hats (Guba and Lincoln 1989).

2.6.3.4 Recommendations for Collaborative Aboriginal Research Processes

We have drawn three central recommendations from our experience and evaluation results that can help guide collaborative Aboriginal research processes. First, research processes should be flexible and adaptive. It is important to be considerate of participants and community events. Efforts were made to schedule research events around such functions as salmon runs and the berry picking season. We also adaptively conducted one-on-one interviews in response to the changing schedules of participants.

Second, research processes should incorporate participatory evaluation. These evaluations allow the research team to continuously assess and adjust methods to ensure

that the research objectives are satisfied, and that the process is culturally appropriate and effective for participants. In-progress evaluations led to a number of adaptive changes for this project including the invitation for ET members to participate in FT events.

Lastly, research processes should engage the broader community. This is particularly important to CBEM related projects, as the eventual application of research results is dependent on the involvement of a larger number of community members. Our community products were particularly effective at engaging Tl'azt'en Nation. These products worked to educate community members about the objectives and outcomes of the project and future applications of the knowledge shared by participants.

2.7 Conclusion

Dynamic, innovative research processes need to co-evolve with the ever changing nature of communities. Through participatory evaluation, the evolving needs and goals of a community can be identified and addressed during the research process not after completion and summary of findings. The Tl'azt'en Nation environmental measures development framework offers an effective and enduring collaborative process for partnering with Aboriginal communities. Our research experience provides insight and understanding into the workings of effective collaborative partnerships. Results from our methodological evaluation demonstrate a robust and resilient approach for other partnerships to adapt in the process of shaping their own participatory research framework. As we demonstrated, cross-cultural, participatory research can be used to develop community-based environmental monitoring initiatives and shape shared natural resource management goals.

CHAPTER 3- ABORIGNAL ENVIRONMENTAL MEASURES: CONNECTING FIRST NATION COMMUNITIES AND CO-MANAGEMENT THROUGH COMMUNITY-BASED ENVIRONMENTAL MONITORING

3.1 Abstract

Aboriginal environmental measures are a tool for assessing environmental change, according to the traditional environmental knowledge management system of Aboriginal communities. In combination with community-based environmental monitoring, Aboriginal measures may improve the effectiveness of cross-cultural co-management partnerships by connecting Aboriginal communities to the co-management process. As a result, Aboriginal communities become a part of the co-management feedback loop that informs and guides management decisions. Using participatory research methods, we worked with two teams of Tl'azt'en Nation community members to generate and verify Tl'azt'en environmental measures for five traditional use activities and their representative species: fishing salmon (*Oncorhynchus* spp.), hunting moose (*Alces alces*), trapping beaver (*Castor canadensis*), picking huckleberries (*Vaccinium membranaceum*), and gathering soapberries (*Shepherdia canadensis*) for medicinal use. Tl'azt'en environmental measures were also inductively developed for monitoring environmental change across their traditional territory and monitoring community adherence to Tl'azt'en traditional environmental land use methods and principles. Working within the context of an existing local-level criteria and indicator framework, we developed and verified a total of 252 Tl'azt'en Nation environmental measures. The majority of these measures coincided with three critical local values: habitat quality and quantity; abundance of berries and populations of animals; and, the health and quality of representative species for consumption or use. The large number of measures requires

further field verification and prioritization. However, the framework we developed and the associated measures will serve as the foundation for community-based environmental monitoring to be applied across Tl'azt'en Nation's co-managed research forest.

Keywords: Aboriginal; co-management; community-based environmental monitoring; Criteria and Indicator; environmental measures; First Nation; Tl'azt'en Nation

3.2 Introduction

Natural resource professionals are increasingly seeking approaches that effectively and meaningfully combine science based resource management (SBRM) and traditional environmental knowledge and management systems (TEKMS) in a complementary fashion (Keith 1994; Parsons and Prest 2003; Allen 2005; Wyatt 2008). Although there are a number of accepted definitions, TEKMS are the dynamic and unique knowledge systems that each Aboriginal community has evolved and uses as a basis for their resource management decision making and planning (Berkes 1999a; Hawley *et al.* 2004). Science based resource management (SBRM) can be defined as "the application of the scientific method to address issues involving a wide range of species and environmental features, their ecosystems, the underlying ecological processes, and the working of humans" (Hawley *et al.* 2004: 38). Applying complementary aspects of TEKMS and SBRM in natural resource management can promote the use of multiple perspectives, methods, values, and ethics to generate new knowledge without compromising the integrity of either system (Knudtson and Suzuki 1992; Mauro and Hardison 2000; Durie 2004a, b; Stevenson 2005). Local goals of environmental sustainability may be realized through innovative management approaches that facilitate knowledge co-production with Aboriginal communities (Kofinas *et al.* 2002a)

The successful application of TEKMS and SBRM in natural resource management requires a flexible and adaptive approach that can accommodate the individual needs, values, and beliefs of Aboriginal communities and their TEKMS. Co-management is one governance and decision making framework with the ability to facilitate the complementary application of both knowledge systems (Olsson *et al.* 2004). These adaptive, institutional relationships can facilitate shared power, responsibility, and control of natural resources between Aboriginal communities and other stakeholders (Berkes 1994; Roberts 1996; Sherry and Myers 2002; Goetze 2005); though in practice, co-management has met qualified success (Berkes *et al.* 1991; Roberts 1996; Rusnak 1997; Sherry 2002; Hawley *et al.* 2004). One of the barriers impeding effective co-management is the inability of Aboriginal partners to contribute equally to the decision-making process (Castro and Nielsen 2001; Grainger *et al.* 2006). More equitable decision making is facilitated by the shared control of co-management processes, a sense of community ownership, and the incorporation of TEKMS (Sherry and Fondahl 2003; Grainger *et al.* 2006).

Criteria and Indicator (C&I) frameworks can improve shared decision-making by providing a structured approach for co-management partners to contextualize, translate, and define their key goals, values, and knowledge into discrete manageable parameters (Wright *et al.* 2002; Pokorny *et al.* 2004; Sherry *et al.* 2005). Across Canada, a number of national- and local-scale frameworks have demonstrated how C&I can be used by Aboriginal peoples to represent their TEKMS within contemporary forest management systems (National Aboriginal Forestry Association 1995; Bombay 1995; Rusnak 1997; Natcher and Hickey 2002; Smith 2002; Karjala *et al.* 2003; Parsons and Prest 2003;

Sherry *et al.* 2005; Harshaw *et al.* 2007). However, improvements to existing C&I frameworks are required (Wyatt 2008). At a local level, developing unique sets of C&I based on the TEKMS of individual Aboriginal communities will help to alleviate differences that arise from applying elements of one knowledge system within another (Berkes 1995). Community-centered approaches are most appropriate for working with TEKMS-based C&I. As the practitioners and experts of their TEKMS, the community can best assess how their knowledge, values, and beliefs should function within their co-management partnership.

Community-based environmental monitoring (CBEM) is an approach by which Aboriginal communities can apply their TEKMS, track the health of their environment, and implement locally relevant sustainability objectives. Through active information collection and ownership, CBEM can build Aboriginal communities into the feedback loop that informs, directs, and evaluates adaptive natural resource management processes and decisions (McDonald 1988; Natcher and Hickey 2002; Tipa and Teirney 2003; Fast *et al.* 2005; Stevenson 2005). Although CBEM is a relatively new approach, case studies demonstrate its ability to foster meaningful co-management partnerships with Aboriginal communities and their TEKMS, as well as effective bottom-up resource management practices (Berkes 1995; Pinkerton and Weinstein 1995; Tipa and Teirney 2003; Berkes 2009). Olsson *et al*. (2004) found that the social dimension of ecosystem management is essential to developing resilient adaptive co-management systems; CBEM reflects this understanding.

In this paper we describe how environmental measures can be developed and used in a CBEM context to identify the values of Aboriginal communities engaged in co-

management arrangements. A measure is the direct or indirect method that provides information about the state of a specific environmental attribute. We describe how we partnered with a First Nation community, Tl'azt'en Nation, to generate, develop, and verify local-level Tl'azt'en environmental measures for five focal traditional use activities. The Tl'azt'en environmental measures developed in this project will be applied through a CBEM initiative on the co-managed John Prince Research Forest (JPRF). We begin by introducing the local-level Tl'azt'en Nation C&I framework and our environmental measures development framework. We then present our resultant environmental measures and discuss the challenges and opportunities involved in their application to co-management, through CBEM.

3.3 Tl'azt'en Nation and Study Area

This study was developed and completed in partnership with Tl'azt'en Nation and their co-managed JPRF (Figure 1.2). Translated from their traditional *Dakelh* language, Tl'azt'en means "people by the edge of the bay" (Tl'azt'en Nation 2009a). Tl'azt'en Nation is located in north central British Columbia, Canada and currently has a population of approximately 1500 people, with half living in three main communities: *Tache* (Tachie), *Binche* (Pinchi), *Dzitl'ainli* (Middle River), and one seasonal village *K'uzche* (Grand Rapids) (Figure 1.2; Moran 1994; Tl'azt'en Nation 2009a; B. Leon and A. Stark, personal communication, July 2009). Amidst such industrial developments as the forestry industry, Tl'azt'en Nation developed partnerships and research initiatives as part of its adaptive effort to achieve sustainable resource management (Morris and Fondahl 2002). One of Tl'azt'en's most significant research and education partnerships is the JPRF. The Research Forest was officially established in 1999 and is co-managed

by Tl'azt'en Nation and the University of Northern British Columbia (UNBC). Comprised of 13,000 ha of forestland on Tl'azt'en Nation's traditional territory, the JPRF is the only First Nation-University co-managed research forest in North America.

3.4 Tl'azt'en Nation Local-Level Criteria and Indicator Framework

The Tl'azt'en Nation local-level C&I framework was developed prior to our study and includes principles, criteria, indicators, critical local values, measures, data elements, actions and strategies in its hierarchical structure (Sherry *et al.* 2004; Sherry *et al.* 2005). This local-level framework incorporates increased local knowledge, values, and beliefs through added levels of detail. A distinguishing feature of the Tl'azt'en Nation C&I framework is its ability to work with both SBRM and TEKMS (Sherry *et al.* 2005). Previous research between Tl'azt'en Nation and UNBC has focused on different stages of this framework's development (Karjala *et al.* 2003; Sherry and Fondahl 2003; Sherry *et al.* 2005; Quinn 2007).

Our study focused on developing environmental measures for the Tl'azt'en Nation C&I framework. All five of our study's focal traditional use activities shared the same principle - Land use and management, and criterion - Maintain forest ecosystem condition and function. The indicator - Maintain biological diversity - was shared by all animal-based traditional activities, while the indicator - Maintain botanical diversity - was shared by all plant based traditional use activities. In the context of the Tl'azt'en C&I framework, criteria are the conditions/processes that allow co-management to be assessed at multiple scales (Sherry and Fondahl 2004; Sherry *et al.* 2004). Indicators correspond to specific criteria, and are the measurable (quantitative, qualitative, both) attributes (Sherry and Fondahl 2004; Sherry *et al.* 2004). Critical local values (CLV)

provide specific local detail to indicators, and facilitate the incorporation of community values and priorities into the monitoring framework; this level is unique to the Tl'azt'en C&I framework (Sherry and Fondahl 2004; Sherry *et al.* 2004). Measures are the, indirect/direct, methods that act as a source of information for an indicator (Wright *et al.* 2002; Sherry and Fondahl 2004). Data elements are the resultant information from measures (Wright *et al.* 2002; Sherry and Fondahl 2004). Benchmarks are the standards that data elements are compared against (Wright *et al.* 2002; Sherry and Fondahl 2004). Actions/strategies are the directives that are adapted (may include activities, policies, etc.) once results are interpreted (Sherry and Fondahl 2004).

3.5 Five Traditional Use Activities of Tl'azt'en Nation

In this study, environmental measures were developed for five traditional use activities identified from previous research with Tl'azt'en Nation (Sherry *et al.* 2005). Each traditional use activity is an inherent component of Tl'azt'en Nation's culture, spirituality, well-being, and TEKMS. For each traditional use activity, Tl'azt'en project team members selected a representative species for developing measures and subsequent monitoring. These species were not chosen solely on the basis of value or worth to Tl'azt'enne; such considerations as the timing of the research (e.g., seasonality of species) and abundance (e.g., density and distribution) of species also shaped the selection process. Our focal traditional use activities and representative species were: *talo ha'hut'en*- fishing salmon, *huda ha'hut'en*- hunting moose, *tsa ha tsayilh sula*- trapping beaver, *duje hoonayin*- picking huckleberries, and *yoo ba ningwus hunult'o*- gathering soapberries for medicinal use. Aboriginal environmental measures should not

be separated from their rich cultural foundation, thus, we provide a brief introduction to each focal traditional use activity (Spak 2005; Stevenson 2005).

3.5.1 *Talo ha'hut'en*- Fishing Salmon

Tl'azt'en Nation's four communities are located along sockeye salmon migration routes, reflecting the important cultural and subsistence role of salmon (Hudson 1983; 1997; Nepal 2004). Most Tl'azt'enne fish salmon at camps or locations specific to their family groups. The processes involved with catching and preparing salmon are essential to the transmission of TEKMS knowledge from generation to generation. Tl'azt'en project team member, Violet Prince explains, "…we sit together in the smokehouse and cut salmon. There's a lot of storytelling and history that is shared in the smokehouse…" (Tl'azt'en Nation and Yim 2008b: 38).

Aside from the inherent qualities that characterize this traditional use activity, fishing salmon was distinguished from other representative species by three unique characteristics. First, Tl'azt'enne fish salmon in two different watersheds located on Tl'azt'en Nation traditional territory, the Skeena and the Stuart-Takla. The variety and type of salmon species differ between the watersheds. To narrow the scope of this traditional use activity, we focused on developing environmental measures related to salmon caught in Stuart Lake, which is located within the same Stuart-Takla watershed as the JPRF. Second, three species of salmon are found within Stuart Lake: sockeye (*Oncorhynchus nerka*), chinook (*Oncorhynchus tshawytscha*), and kokanee (*Oncorhynchus nerka*). Though Tl'azt'enne are aware of the different salmon species within Stuart Lake, they are typically characterized by run or time of year in which they are fished (e.g., first run of salmon). Lastly, due to low returns of sockeye salmon, the

Canadian government has placed restrictions on fishing this species (Fishery Notice, July 24, 2009). This is the only traditional use activity that faces legal harvesting restrictions.

3.5.2 *Huda ha'hut'en*- Hunting Moose

Moose (*Alces alces*) are the most commonly hunted animal by Tl'azt'enne. This large mammal is a staple in the community's diet (Hudson 1983). One Tl'azt'en project team member stated, "…we share all of the moose that we hunt together. We do it the Indian way. Each one of us will get portions of the meat to take home. That's what we'll keep for going hunting together" (Tl'azt'en Nation & Yim 2008b: 50); thus, hunting moose is not only important for sustenance, it is also an integral to Tl'azt'en culture, practices, and principles. Furthermore, Tl'azt'enne use moose for such things as shelter, clothing, and tools (Tl'azt'en Nation and Yim 2008b).

3.5.3 *Tsa ha tsayilh sula*- Trapping Beaver

The instrumental role of beaver (*Castor canadensis*) to Tl'azt'en culture and TEKMS is demonstrated by its use as a representative animal of one of Tl'azt'en Nation's four clans – the Beaver Clan (*Lhts'umusyoo*). Tl'azt'enne trap beaver (*Castor canadensis*) for food, fur, and medicinal purposes (Hudson 1983). Tl'azt'enne use, but are not restricted to, their *keyohs* for trapping and other resource uses. Though *keyoh*s are legally recognized in Canada as traplines, the meaning of the *Dakelh* word '*keyoh*' does not translate directly to the definition of a 'trapline.' Where traplines are legally defined territories owned by individual family members, *keyohs* are traditional family territories that are passed on paternally from generation to generation. Tl'azt'en land use methods and principles are integral to the use and functioning of *keyohs*.

3.5.4 *Duje Hoonayin*- Picking Huckleberries

Huckleberries (*Vaccinium membranaceum*) "are the most picked" berry by Tl'azt'enne. One Tl'azt'en project team member stated, "you can dry it, you can freeze it, you can can it for jam," demonstrating the wide range of methods commonly used to preserve huckleberries. Huckleberries are an important source of nutrients for Tl'azt'enne who preserve the berry for use throughout the winter. This traditional use activity is an important part of the Tl'azt'enne diet and seasonal way of life.

3.5.5 *Yoo ba ningwus hunult'o*- Gathering Soapberries for Medicinal Use

Soapberries (*Shepherdia canadensis*) are an important medicinal plant for Tl'azt'enne. In addition, soapberries are commonly picked and eaten fresh or as 'Indian ice-cream.' This traditional use activity is intimately linked to Tl'azt'en Nation's culture, beliefs, and TEKMS. Recognized experts within the community play an important role in gathering and preparing soapberries for medicinal use. The knowledge that these experts hold is sacred and is only passed on to those who are chosen. One Tl'azt'en Elder and project team member, Pierre John, reflects, "anybody who uses traditional medicine has got to pray about it before they use it…if you don't believe in it, it's just like drinking water. It won't do nothing for you."

3.6 Methods

The Tl'azt'en Nation environmental measures development framework is comprised of three phases (Figure 2.1). Each phase contributed to the iterative, participatory process of generating, developing, and verifying Tl'azt'en environmental measures. The participatory processes involved in each phase worked to identify and

incorporate the holistic environmental values and goals of Tl'azt'en Nation in the development of measures. We recognize that every community and co-management partnership is unique; therefore, other partnerships should adapt our methodological framework to best suit their needs.

3.6.1 Phase 1: Personal Transformative Process

This phase encompassed the personal and professional initiatives that the lead researcher undertook in preparation for conducting this research (Quinn 2007). During this phase, the lead researcher initiated a dialogue and cultivated a rapport with the community through repeated visits and participation in community events and activities. Through this personal transformative process, the lead researcher adjusted her cultural lens and became critically conscious of, familiar with, and situated in the Tl'azt'en Nation community (Kidd and Kral 2005; Savin-Baden and Wimpenny 2007). This phase initiated the development of a meaningful, trusting relationship with the community before research events began.

3.6.2 Phase 2: Tl'azt'enne Environmental Measures Generation

Tl'azt'en environmental measures were generated for each of the five focal traditional use activities and their representative species during the second phase of the research. Measures were generated through a series of linked and progressive research events (Figure 2.1). All research events were pre-tested with Tl'azt'en Nation community researchers and research assistants. At each pre-testing session, the lead researcher presented the event's agenda, objectives, methods, activities, and written materials for review and modification. Following most research events, team members

and Tl'azt'en community researchers and assistants completed in-progress methodological evaluations (Figure 2.1). These results were used to iteratively adapt the Tl'azt'en Nation environmental measures development framework throughout the course of the project. We recorded, audio and/or video each research event for the purposes of transcription, analysis, and the development of community products.

The first research event, the information session, was open to the Tl'azt'en Nation community. The purpose of this event was to introduce the project and the research team to the community (Figure 2.1). This event was announced to the community through invitation packages (Appendix C) and an information brochure (Figure 5.6). Following an introduction of project members, an overview of the project, and a question and answer period, lunch and refreshments were served. At the information session, we described the formulation of the project's two community participant teams: the Forest Team (FT) and the Elders Team (ET).

The ET was comprised only of Tl'azt'enne Elders. An Elder holds traditional knowledge, wisdom, and experience and is willing to share and teach others (Cajete 2000). The deeply respected designation of Elder is denoted by the community and is usually associated with an individual's age. The FT included any person who fulfilled four participant criteria. First, participants had to be a member of the Tl'azt'en Nation community. Second, participants had to be recognized by their peers as knowledgeable, through teaching and/or practice, in one or more of the focal traditional use activities. Third, participants had to be a recognized authority. This was defined as an individual who was recognized as an expert by a minimum of two other Tl'azt'en Nation community members. Lastly, participants had to be representative of the experts in the

Tl'azt'en community that used and were knowledgeable of the respective traditional use activity. For an individual to be a representative hunter or trapper they needed to be a *keyoh* holder.

Team members were nominated to participate through non-probabilistic purposive sampling or were identified using the snowball technique (Palys 1997; Côté-Arsenault and Morrison-Beedy 1999; Sherry and Myers 2002; Kirby *et al.* 2006). A total of 19 team members participated in this project, 12 FT members and 10 ET members; three Elders participated as members of both teams. Participatory methods and the involvement of each team varied among research events (Yim *et al.* 2009). Team members were given honoraria and gifts in appreciation of their participation. The accomplishments and contributions of team members were also recognized through community newsletters, presentations, and community-focused research products (Figure 2.1).

The first FT focus group (FTFG1) had three main objectives. The first objective was to select a representative plant or animal species for each of the five focal traditional use activities. These species were selected by the FT through group discussions. The second objective was for FT members to self identify their areas of expertise relative to the focal traditional use activities. Each FT member focused measure development on their area(s) of expertise. The third objective was to train FT members in the Photovoice method. Photovoice is a participatory research method that we adapted to directly engage FT members in the process of generating environmental measures (Wang *et al.* 1996). Using digital cameras that we supplied as a component of their honorarium, participants took photographs that illustrated their knowledge, experiences, and concerns about the

environmental health of representative plant and animal species. Forest team members had seven weeks (August - September), to take photographs of the signs and signals of environmental health for each of the representative species and their environments. Team members then shared the meaning and importance of their selected photographs at the second FT focus group.

The ET workshop was a two-day research event at a small, remote research station managed by and located on the JPRF (Figure 2.1). The workshop was comprised of a series of six, one-hour group interviews. An open-ended, semi-structured, group interview format was used to facilitate discussions which focused on each traditional use activity and the importance of CBEM. The ET workshop had four main objectives. First, we wanted to develop a deeper understanding of Tl'azt'en Nation's culture, beliefs, and values related to each of the focal traditional use activities and their representative species. Second, we explored reference values, such as benchmarks, norms, and standards, for each representative species. Third, we discussed if and how Elders have observed environmental changes related to each of the representative species. And lastly, we documented the CBEM goals that Tl'azt'en Elders would like to achieve.

Forest team members presented their selected photos at the second FT focus group (FTFG2) (Figure 2.1). Each FT member selected a minimum of three photos that they felt best communicated the signs and signals related to the environmental health or condition of a representative species. Forest team members discussed the subject of the photo, the importance of the photo and the specific signs and/or signals that illustrated the environmental condition of the featured plant, animal, or environment in the photo. Due to scheduling difficulties, only five of the 12 FT members were able to attend FTFG2.

One-on-one interviews, using the same open-ended semi-structured interview format, were conducted with the remaining seven FT members at a later date. An additional FT member who attended FTFG2 also had a one-on-one interview, as they had not been able to capture their desired images by FTFG2.

Together, the ET workshop and FTFG2 provided the necessary information to generate Tl'azt'en environmental measures. At the end of the second phase of the measures development framework, we held the Community Product Development Workshop (Figure 2.1). This research event provided an opportunity for the ET and FT to work collaboratively to develop the project's community products- a book and a digital video disc (DVD).

3.6.3 Phase 3: Tl'azt'enne Environmental Measures Identification and Verification

The third phase of the project focused on the identification and verification of Tl'azt'en environmental measures. We adapted an existing content analysis procedure (Sherry and Fondahl 2004; Sherry *et al.* 2004) to code FT and ET transcripts for environmental measure development. Measure-related statements were coded by traditional use activity or environmental theme. Codes were the unit of analysis used to inform the development of Tl'azt'en Nation environmental measures. From each code, one or more environmental measures were developed. The lead researcher conducted the initial coding of all transcripts. To ensure rigor, quality, and validity in our data analysis, the research team members, including our Tl'azt'en Nation community researchers, conducted inter-rater reliability testing (Kolbe and Burnett 1991; Lombard *et al.* 2002; Marques and McCall 2005). Transcripts were randomly selected for inter-rater reliability

testing by type (e.g., focus group, ET workshop, one-on-one interview). We used a percent agreement index [(number of agreements) ÷ (number of agreements + number of disagreements)] to measure inter-rater reliability (Lombard *et al.* 2002). A 90% coefficient of reliability was our minimum acceptable level of power (Palys 1997). All transcripts with an initial coefficient below 90% were re-coded through a group content analysis procedure until consensus was achieved. The number of analysts participating in each content analysis session varied between three and six.

Following coding and testing, qualitative, quantitative, and mixed methods measures were formulated. These measures were developed in consideration of pre-existing criteria for effective Tl'azt'en measures (Quinn 2007). Resultant measures were then presented to team members at FTFG3 for verification. This member checking process contributed to the transactional validity of our results (Creswell 1998; Cho and Trent 2006).

At the last research event, FT, ET, and research team members celebrated the project's accomplishments and the team member's contributions (Figure 2.1). Each participant was presented with our community products, a book (Tl'azt'en Nation and Yim 2008b) and a DVD (Tl'azt'en Nation and Yim 2008a), in appreciation of their involvement and commitment to the project. Also, FT and ET members evaluated examples of Tl'azt'en environmental measures, presented in an applied CBEM prototype. Feedback from team members focused on the effectiveness of the applied CBEM prototype. Lastly, FT and ET members completed a comprehensive final project evaluation (FPE).

3.7 Results

Environmental measures were developed from the codes identified during the content analysis and grouped by traditional use activity or by environmental monitoring theme. To ensure a functional connection with the Tl'azt'en C&I framework, resultant measures are presented below with their corresponding CLV. Within each CLV, thematic topics were identified. A thematic topic represents a related collection of measures that focus on one characteristic, use, or threat for a plant or animal species. Below, we define these CLV in the context of each of the five traditional use activities and provide a qualitative comparison of measure frequencies. We also provide a description of the ecological differences and management considerations of sets of measures as they vary within traditional use activities and among representative species. We identified a large number of measures; thus, for brevity, we present only single examples relative to each CLV thematic topics.

3.7.1 Inter-Rater Reliability Testing

Of the project's 15 transcripts, we used one to pilot the group content analysis procedure and we evaluated 10 with inter-rater reliability testing. The four remaining transcripts were tested by a subset of our group analysts due to time and budget constraints. All 10 tested transcripts received an initial percent agreement coefficient lower than our 90% acceptable level of power (Appendix B). Our initial percent agreement coefficient average was 50% (SD=22.44, range=73.26). Analysts represented different educational and cultural backgrounds, which contributed as initial sources of non-agreement. A group content analysis procedure was then used to discuss and recode these 10 transcripts until consensus was achieved.

3.7.2 Tl'azt'en Environmental Measures

Using our environmental measures development framework, we identified and verified a total of 252 Tl'azt'enne measures. This included 39 measures for fishing salmon, 69 measures for hunting moose, 31 measures for trapping beaver, 33 measures for picking huckleberries, and 26 measures for gathering soapberries. All resultant measures were organized by thematic topic within their respective CLV in the Tl'azt'en C&I framework. Three common CLV were identified amongst each of the traditional use activities; these were: habitat, abundance, and the health and quality of focal species for consumption or use. We identified two additional themes of environmental measures through our inductive content analysis: monitoring environmental change across Tl'azt'en Nation traditional territory and monitoring adherence to Tl'azt'en traditional environmental land use methods and principles, resulting in an additional 36 and 18 measures, respectively. As a result of budget and time constraints, measures for these latter two monitoring themes were not verified by FT and ET members. Out of respect for project participants and their TEKMS, we do not present examples of those unverified measures.

3.7.2.1 Tl'azt'en Habitat-Related Environmental Measures

We developed 64 habitat-related environmental measures across the five focal traditional use activities. These measures are related to monitoring the condition or health of the habitats of the representative plant and animal species. The largest number of habitat-related measures were developed for beaver (n=18), followed closely by moose (n=17), salmon (n=11), huckleberries (n=11), and soapberries (n=7). Thematic topics for habitat-related measures differed amongst the five activities. For example, water

temperature, water levels, water quality, and spawning areas were prevalent topics when considering measures of salmon habitat (Table 3.1). Alternatively, habitat loss, human displacement, lodges, and abundance of habitat characterized the habitat-related measures for beaver (Table 3.1). The topics of herbicide/pesticide and food sources were identified for beaver and moose habitat measures (Table 3.1). Relative to plant-based traditional use activities, thematic topics differentiating measures of huckleberry habitat included: herbicide/pesticide, habitat condition, burns, logging, shade, soil, and mountain pine beetle; whereas, topics for soapberry included herbicide/pesticide, habitat availability for medicinal use, and habitat condition (Table 3.1).

3.7.2.2 Tl'azt'enne Abundance-Related Environmental Measures

We identified 54 measures related to the abundance of the representative plant and animal species. We defined abundance as the quantity of plants, animals, or parts thereof, that Tl'azt'enne use for subsistence, health, spiritual, and/or cultural purposes. Specifically, these measures refer to the whole animal for salmon (n=12), moose (n=18), and beaver (n=10), and to the plant's fruit or berries for huckleberries (n=9) and soapberries (n=5). Some commonalities were observed between the thematic topics for salmon and moose, including numerical abundance, subsistence harvest, and sex ratio (Table 3.2).

3.7.2.3 Tl'azt'enne Health and Quality Related Environmental Measures

We identified 75 measures that could be used by Tl'azt'enne to monitor the health and quality of plants and animals for human consumption and/or use. We developed the greatest number of measures for moose (n=34), characterized by the following thematic

topics: color of fur, pus on body, behavior, body size, ticks, lumps/boils under skin and in meat, color of meat, scent of hunted game, overall body fat and in specific body locations, and health of internal organs (Table 3.3). Health and quality related measures were highly specific to each representative species. For example, topics for salmon measures (n=16) included the color and firmness of flesh, color of skin, body size, fat content, taste, and texture, whereas body fat and the color of fur were thematic topics for beaver (n=6) (Table 3.3). Measures also varied between the two plant species assessed by the Tl'azt'en team members. While thematic topics for huckleberry (n=12) included berry size, berry color, and berry taste, topics for soapberry (n=7) included appearances of leaves and branches (Table 3.3).

3.7.2.4 Measures for Monitoring Environmental Change Across Tl'azt'en Nation Traditional Territory

We identified a group of measures that were not directly related to a representative species, but captured broad environmental changes across Tl'azt'en Nation traditional territory. These 36 measures were related to seven critical local values; thematic topics of measures included human disturbance (e.g., logging), natural disturbance (e.g., insect outbreaks), applications of herbicides and pesticides, environmental contaminants originating from a closed mercury mine, road development, unusual weather, and water quality. Most of these measures were related to environmental change resulting from anthropogenic causes.

Table 3.1- Summary of Tl'azt'en environmental measures that correspond to each traditional use activity's habitat related critical local values (CLV) and subsequent thematic topics. One Tl'azt'en measure was selected as an example for each topic. Tl'azt'en environmental measures are written, where possible, with the words used by FT and ET members.

CLV	Thematic Topic	Tl'azt'en Environmental Measure
Maintain viable salmon habitat in Stuart Lake	Water temperature	Description of body condition of salmon caught from Stuart Lake, by run
	Water levels	Description of physical injuries observed on salmon caught in Stuart Lake due to water levels, by run
	Water quality	Absence of pesticide contaminants in Stuart Lake (ppm) water
	Spawning habitat	Description and number of salmon at spawning habitats
Maintain viable moose (ungulate) habitat	Habitat availability	Description of whether swamp/riparian habitats are increasing/decreasing
	Habitat use	Number of clearings used to hunt moose
	Herbicide/pesticide	Description of any moose habitat that is thought to be affected by pesticide spraying
	Mountain pine beetle	Description of how bug kill wood (insect killed forest) has/has not affected moose behavior
	Food sources	Description of the willow habitat where moose are hunted
Maintain viable beaver (fur-bearer) habitat	Habitat loss	Description of changes in beaver habitat (increasing/decreasing/not changing)
	Human displacement	Proportion of beaver damns observed to be lost to natural and man-made factors
	Lodges	Number of beaver lodges encountered that were not inhabited by beaver
	Abundance of habitat	Description of beaver food source- poplar abundance and availability
	Herbicide/pesticide	Description of any signs of herbicide contamination in beaver habitat
	Food sources	Description of the abundance and availability of food for beaver
Maintain viable huckleberry habitat	Herbicide/pesticide	Description of any signs of herbicide contamination in huckleberry picking habitats
	Habitat condition	Description of habitats used for picking huckleberry
	Burns	Number and description of habitats used for picking huckleberry, that were burned in the past
	Logging	Number and description of habitats used for picking huckleberry, that were logged in the past
	Shade	Description and proportion of huckleberries picked in areas of shade
	Soil	Description of soil moisture in huckleberry picking areas
	Mountain pine beetle	Description of how bug kill wood (insect killed forest) has affected huckleberries and habitat
Maintain soapberry habitat	Herbicide/pesticide	Description of herbicide contamination in soapberry picking habitats
	Habitat for medicinal use	Number and description of soapberry picking locations appropriate for medicinal use
	Habitat condition	Description of soapberry picking locations in the mountains

Table 3.2- Summary of Tl'azt'en environmental measures that correspond to each traditional use activity's abundance related critical local values (CLV) and subsequent thematic topics. One Tl'azt'en measure was selected as an example for each topic. Tl'azt'en environmental measures are written, where possible, with the words used by FT and ET members.

CLV	Thematic Topic	Tl'azt'en Environmental Measure
Maintain viable salmon abundance in Stuart Lake	Salmon abundance	Number of salmon caught in Stuart Lake per catch at a family fishing area: with a particular net, over a particular time span, at a family fishing area, by run
	Subsistence harvest	Number of salmon being consumed per household/family per week
	Supplemented salmon	Number of salmon received per salmon season to supplement salmon catches from Stuart Lake
	Sex ratio	Number of female salmon caught in Stuart Lake per catch: with a particular net, over a particular time span, in a specific location, by run
	Spawner abundance	Number of salmon returning to spawning areas in Stuart Lake
	Fecundity	Number of gravid (with eggs) female salmon caught in Stuart Lake per catch: with a particular net, over a particular time span, in a specific location, by run
Maintain viable moose (ungulate) population	Moose abundance	Number of moose seen in a particular area (i.e. *keyoh*), over a particular time span
	Subsistence harvest	Satisfaction of amount of moose available for consumption per household/family per year
	Age structure	Description of the number of calves and type of calves (single, twin, triplet) observed on the land
	Sex ratio	Number of sexually mature male moose hunted over a particular time span
Maintain viable beaver (fur-bearer) population	Beaver abundance	Description of beaver abundance observed (through tracks, sign, observations) in a particular area (i.e. keyoh), over a particular time span
Maintain viable huckleberry abundance	Abundance	Description of general abundance of huckleberries per season
	Shade	Number of pounds of huckleberries picked per season in shaded areas per picking period
	Huckleberry cycle	Description of huckleberry cycle stage on Tl'azt'en Nation traditional territory
	Seasonality	Description of seasonality of huckleberry picking season
Maintain viable soapberry abundance	Soapberry berry abundance	Description of soapberry abundance on Tl'azt'en Nation traditional territory per picking season

Table 3.3- Summary of Tl'azt'en environmental measures that correspond to each traditional use activity's health and quality related critical local values (CLV) and subsequent thematic topics. One Tl'azt'en measure was selected as an example for each topic. Tl'azt'en environmental measures are written, where possible, with the words used by FT and ET members.

CLV	Thematic Topic	Tl'azt'en Environmental Measure
Maintain health & quality of salmon in Stuart Lake	Color of flesh	Description of the degree of redness observed in salmon flesh caught from Stuart Lake, by run
	Firmness of flesh	Description of the firmness of salmon flesh of salmon caught from Stuart Lake, by run
	Color of skin	Number of salmon caught from Stuart Lake (by run), that exhibit a skin color considered healthy
	Body size	Length of male salmon caught from Stuart Lake, by run
	Fat	Description of the degree of richness (fat) of salmon caught from Stuart Lake, by run
	Taste & texture	Description of the taste and texture of salmon consumed from Stuart Lake, by run
Maintain health & quality of moose (ungulate) population	Fur	Description of the color of fur of male moose hunted and specific date of hunt
	Pus	Number of moose hunted per season with pus on body
	Behavior	Description of moose behavior prior to hunting
	Body size	Description of body size of moose hunted
	Ticks	Proportion of moose observed to not be negatively affected by ticks
	Lumps/boils	Number of lumps/boils under skin of hunted moose
	Color of meat	Description of moose meat color during butchering of hunted moose
	Scent of game	Description of smell emitted from moose during butchering process
	Fat	Description of the fat around the organs (kidneys) of male moose hunted and specific date of hunt
	Health of organs	Absence of spots on lungs of hunted moose, and specific date of hunt
Maintain health & quality of beaver (fur-bearer) population	Fat	Description of the degree of fatness of beavers trapped, in a specific place, over a specific time span
	Fur	Description of the quality of fur of beaver trapped, in a specific place, over a specific time span
Maintain huckleberry health & quality	Berry Size	Number of huckleberries picked considered to be large, per picking period
	Berry Color	Description of huckleberry color
	Berry Taste	Proportion of huckleberries picked considered to have optimal taste for consumption
Maintain soapberry health & quality	Leaves	Description of soapberry leaf health for medicinal use
	Branches	Description of soapberry bush branches for medicinal use

3.7.2.5 Measures for Monitoring Adherence to Tl'azt'en Traditional Environmental Land Use Methods and Principles

In FT and ET transcripts, participants explicitly recognized the linkages between environmental health and the community's adherence to traditional land management practices and principles. Using this information, we identified 18 resultant measures that coincided with two CLV. The CLV 'incorporate and apply traditional land management practices' represented 12 measures that included thematic topics of fire, wasting hunted animals, fishing for sport, selective hunting and trapping, rest and rotation of harvest areas based on animal population health, and hunting practices. We identified six measures for the CLV of 'incorporate and apply traditional beliefs.' These measures were grouped according to two topics: respect for all life and land, and reciprocity.

3.8 Discussion

Sustainability is the desire to preserve a particular environment in a state that can meet present and future needs (Wright *et al.* 2002). Due to differences in cultural beliefs, knowledge systems, and worldviews, cross-cultural co-management partners may not share a similar interpretation of this concept. This disparity may challenge cooperative relationships, as different understandings of 'sustainability' will inevitably influence management decisions and actions (Treseder and Krogman 2008). Wright *et al*. (2002: i) states, "the things we decide to sustain have value only because we do value them"; therefore, if co-management partners can use Aboriginal environmental measures as a tool to further their understanding of Aboriginal environmental values, then more culturally appropriate and effective resource management may develop. Aboriginal

environmental measures connect communities with co-management by translating local Aboriginal values into the language of natural resource management.

3.8.1 Formulating Aboriginal Environmental Measures

Our low, initial inter-rater reliability testing scores demonstrate the necessity of involving community researchers, research assistants, and participants in the data analysis process. Differing understandings of data can arise from the cultural background, worldview, and reality of research team members (Smith 2006). Cho and Trent (2006) explain how the transactional process of member checking can identify misinterpretations in the analysis and allow discussion and adjustment. This process builds capacity, promotes mutual learning and contributes to ensuring that results are accurate and valid.

Previously published criteria for 'effective Tl'azt'en measures' (Quinn 2007: 97) guided the development of our environmental measures. Although these 10 criteria were originally developed for socio-cultural monitoring, they were adapted to suit an environmental context as follows. According to the first criterion, we employed an empowerment methodology to develop and define measures. For example, each stage of the research process required collaboration amongst members of the research and participant teams (Figure 2.1). Our resultant environmental measures also embodied an empowerment methodology, as each measure respected and furthered the cultural values, practices, and principles of Tl'azt'en Nation TEKMS. Second, informed by Tl'azt'en experts, we identified a mixture of subjective (e.g., description of seasonality of huckleberry picking season) and objective (e.g., number of female salmon caught in Stuart Lake per catch) environmental measures. The third criterion required that measures assess management efforts as well as community conditions. Developed within

the local-level Tl'azt'en C&I framework (Figure 1.3), the environmental measures were intended to inform the co-management efforts of the JPRF. As these environmental measures are based on the Tl'azt'en TEKMS, resultant data will provide a culturally relevant perspective for Tl'azt'en Nation to assess their co-management partnership and community conditions. Fourth, we developed measures that were premised on qualitative, quantitative, and mixed assessment methods. The fifth criterion speaks to the wording of measures, suggesting positive rather than negative language. Our verified measures assessed positive environmental outcomes, if possible. Sixth, the development and wording of measures should build capacity within a community. We met this criterion whenever possible by using the actual words of team members when writing environmental measures. This was done in order to maintain the original meaning and to promote community understanding and accessibility. The final criteria, including validity, trustworthiness, practicality, and the sensitivity of measures to change, were confirmed through our analysis process, which included measure verification by team members.

Additional criteria will be considered when the effectiveness of the Tl'azt'en environmental measures is re-evaluated after field testing. For example, Parlee and Lutsel K'e First Nation (1997) suggest assessing indicators and measures according to the ease of use; the scale of monitoring results; the cost of the measurement activity; the number of measures required to accurately monitor environmental change; and, whether the measure will allow the community to anticipate change. Although these criteria are important, community acceptance and trust are paramount. If measures are perceived as

ineffective and inappropriate at a local level, then the sustainability of the monitoring system is at risk (Parlee and Lutsel K'e First Nation 1997).

The development of Aboriginal environmental measures should coincide with the seasonality during which each traditional use activity occurs to capture relevant cultural practices and environmental conditions. Parlee and Lutsel K'e First Nation (1997) found that timing is an important consideration influencing monitoring processes. In our study, all five traditional use activities were informed by photos taken during a seven-week period over August and September. This included the salmon and huckleberry seasons, but was not ideal for other activities such as hunting moose and trapping beaver which generally occur later in the year. This is a weakness of the study. Future testing and development of measures should coincide with the season of each focal traditional use activity.

The proposed 252 Tl'azt'en environmental measures provide a foundation for prioritizing and field testing a smaller subset of measures to be incorporated within a long-term Tl'azt'en CBEM initiative. Like Parlee and Lutsel K'e First Nation (1997), not all of the generated measures will be applied or monitored. Field testing will provide a better understanding of which measures are premised on techniques that are acceptable to the community and provide the most useful information for monitoring.

Current Aboriginal community-based monitoring programs can provide some guidance for testing and implementing measures identified in this study. In the Nihat'ni-Watching the Land community-based monitoring program, workshops are held with community participants to interpret monitoring results (Łutsël K'e Dene First Nation-Wildlife, Lands and Environment Department 2005). Information is discussed and

important indicators are classified as no change, natural change, potential unnatural change, or definite unnatural change (Łutsël K'e Dene First Nation- Wildlife, Lands and Environment Department 2005). The Arctic Borderlands Ecological Knowledge Co-op uses CBEM to monitor the effects of climate change on communities, amongst other applications (Arctic Borderlands Ecological Knowledge Society 2008). The Little Red River Cree Nation uses their CBEM results to assess forest management practices and to adapt their measures to accommodate dynamic ecosystem and community processes (Natcher and Hickey 2002).

Aboriginal environmental measures may play an important role in identifying and managing culturally defined keystone species. These are "plant and animal species whose existence and symbolic value are essential to the stability of a cultural group over time" (Cristancho and Vining 2004: 155). The CBEM of species representing traditional use activities may provide a direct link between culturally defined keystone species and resource management practices. Tl'azt'en Nation has not confirmed that the plants and animals used in this study are culturally defined keystone species; however, some species have been confirmed by other First Nations. As examples, the Gitga'at Nation has identified five species of salmon (*Oncorhynchus* spp.) and the Shuswap Nation has identified soapberries (*Shepherdia canadensis*) as culturally defined keystone species for their respective Nations (Garibaldi and Turner 2004).

3.8.2 Habitat-Related Aboriginal Environmental Measures

Other Aboriginal CBEM initiatives have identified habitat-related environmental measures and indicators as important (Fox 2002; Natcher and Hickey 2002; Łutsël K'e Dene First Nation- Wildlife, Lands and Environment Department 2005). These measures

allow communities to observe and monitor specific environmental conditions that are essential for supporting the distribution and abundance of important plant and animal species. For example, observations of salmon body condition will allow Tl'azt'enne to indirectly monitor water temperature in Stuart Lake. Habitat-related measures also provide environmental information about specific site characteristics needed for maintaining traditional use activities, such as gathering medicinal plants. The topic of 'habitat availability for medicinal use' (Table 3.1) included measures that monitor culturally appropriate habitat for soapberry gathering. Managing for the habitats of medicinal plants is a concern shared by traditional ecological knowledge experts from other First Nations, including the Little Red River Cree Nation (Schramm *et al.* 2008).

3.8.3 Abundance-Related Aboriginal Environmental Measures

A relatively large number of abundance-related environmental measures were developed for each traditional use activity. This CLV is prevalent across Aboriginal CBEM initiatives (Fox 2002; Natcher and Hickey 2002; Łutsël K'e Dene First Nation-Wildlife, Lands and Environment Department 2005). Aboriginal people use measures of abundance to track variability in population numbers or density and to help maintain the plant and animal populations necessary for sustenance and cultural purposes (Parlee *et al.* 2005b; Parlee *et al.* 2006). For example, the James Bay Cree and the Saanich First Nation, use environmental signals and feedback to maintain viable fish populations, important dietary staples for both communities (Berkes 1999a; Paul 2006). In a one-year bush harvest study with the Cree speaking Métis of Pinehouse Alberta, 55% of the community's diet was observed to depend on fish, and 14% on moose (Tobias and Kay 1994). This study demonstrates the substantial role that these two animals play in many

Aboriginal communities and illustrates the need to accurately monitor abundance in the context of management plans (Berkes 1990). The topic subsistence harvest, identified for both salmon and moose, represents the significant contribution of these two animals to the diet of Tl'azt'enne (Table 3.2). Practices such as supplementing salmon with sources from outside of the community (Table 3.2) and sharing moose meat amongst families were strategies identified by FT and ET members for coping with low abundance.

3.8.4 Health and Quality-Related Aboriginal Environmental Measures

The health and quality of animal and plants for human consumption and/or use is an important CLV consistent with the values of other Aboriginal communities (Fox 2002; Natcher and Hickey 2002; Łutsël K'e Dene First Nation- Wildlife, Lands and Environment Department 2005). This group of measures provides valuable guidance on when a plant or animal should be consumed. For animal-based traditional use activities, participants reported that body fat was an important attribute to measure (Table 3.3). Other Aboriginal people have used fat content as a measure of animal health (Kofinas 1998; Berkes and Folke 2002; Kofinas *et al.* 2002b; Lyver and Lutsel K'e First Nation 2005; Gordon *et al*. 2007). Huckleberry measures of health and quality were related to berry size, color, and taste (Table 3.3). For example, Tl'azt'enne use huckleberry color to indicate different stages of ripening and to monitor huckleberry seasonality; "the red [huckleberries] are the first…before they turn…purple." In addition to informing huckleberry quality and health, these environmental observations may be used with other CBEM results to generate a better understanding of cumulative, large-scale processes (Cohen 1997).

3.8.5 Aboriginal Environmental Measures Related to Monitoring Environmental Change

Unpredictable environmental change can cause emotional, cultural, and spiritual stress for Indigenous communities (Fox 2002). This group of measures recognizes the importance of anticipating broad changes in environmental quality and services. In particular, these measures represent the observed effects of anthropogenic activities and natural disturbance: logging, application of herbicides and pesticides, trees killed by pathogens, contamination from a closed mercury mine, road development, weather, and water quality. Other Indigenous communities have identified synonymous topics related to environmental change (Fox 2002; Furgal *et al.* 2002; Kofinas *et al.* 2002a). Learning how to identify environmental change through the use of Aboriginal measures can inform an understanding of ecosystem processes and adaptive responses.

3.8.6 Aboriginal Environmental Measures Related to Monitoring Traditional Environmental Practices and Principles

The environmental health of Tl'azt'en Nation's traditional territory is intimately linked to the well-being of their culture and community, as their value system is central to their traditional approach to resource management (Turner *et al.* 2000). In TEKMS, people are considered as part of, not separate from, the environment (Manseau *et al.* 2005). Aboriginal people do not 'manage' natural resources with their TEKMS, as is done with SBRM; rather, they use their TEKMS to direct how they interact and relate to the natural environment and its resources (Sherry and Myers 2002; Stevenson and Webb 2003; Stevenson 2005). This group of integrated measures capture this holistic relationship (Parlee and Lutsel K'e First Nation 1997).

The two main topics identified by Tl'azt'enne as important for monitoring were respect for all life and land, and reciprocity. These were also identified as significant principles embedded in other First Nations' TEKMS (Turner *et al.* 2000; Sherry and Myers 2002; Lewis and Sheppard 2005). The incorporation of cultural values in management is required to achieve environmental sustainability, as our values govern our actions (Knudtson and Suzuki 2006; Adam and Kneeshaw 2008). Thus, monitoring adherence to traditional management principles and practices will allow Tl'azt'en Nation to continue managing natural resources through culturally relevant means (Lewis and Sheppard 2005).

3.9 Conclusion

Though Aboriginal environmental measures offer many potential benefits for improving co-management, there are a number of important considerations. Practitioners of CBEM must ensure that Aboriginal environmental measures are representative, accurate, and appropriately communicated to maintain the inherent truth of the knowledge they present (Ferguson and Messier 1997; Stevenson 2005). Relative to application, Kofinas (2002a) discusses the challenges involved with sharing the results of Aboriginal environmental measures amongst CBEM programs. Networked programs can lead to the co-production of knowledge with beneficial outcomes including monitoring results that span larger geographic areas revealing broad-scale processes such as climate change.

Identifying commonalities between SBRM and TEKMS is a positive feature of CBEM; however, differences must be respected. Each knowledge system is equally valid for managing the health of the natural environment (Zamparo 1996; Durie 2004a, b;

Hawley *et al.* 2004; Knudtson and Suzuki 2006). The Aboriginal environmental measures identified in our study do not necessarily differ from SBRM in what they seek to monitor, but differ in how they are implemented and interpreted. Tl'azt'en environmental measures require Tl'azt'enne with lived experience, worldview, and knowledge of the Tl'azt'en Nation TEKMS. By applying Aboriginal environmental measures through CBEM, communities and community values become intrinsically linked to management processes. As CBEM results are continually used to evaluate, adjust, and direct co-management goals, an adaptive co-management partnership evolves (Berkes 2009). Through CBEM, Aboriginal environmental measures provide the necessary connection between communities and co-management resulting in culturally and ecologically sustainable resource management.

CHAPTER 4: THE APPLICATION OF TL'AZT'EN NATION ENVIRONMENTAL MEASURES: COMMUNITY-BASED ENVIRONMENTAL MONITORING PROTOTYPES AND RECOMMENDATIONS

4.1 Introduction

In this chapter, applied CBEM prototypes for each of the focal traditional use activities are presented; these were developed from a subset of the 252 Tl'azt'en environmental measures. The development of these applied CBEM protocols is significant to the future implementation of Tl'azt'en environmental measures, as over 80% of C&I projects never achieve the stage of implementing their developed measures (P. Wright, personal communication, March 29, 2009). Also, these prototypes provided a preliminary opportunity for team member feedback and evaluation. Future development of comprehensive Tl'azt'en CBEM protocols can use these results to improve design and application. The next steps, recommendations, and challenges and opportunities for the implementation of Tl'azt'en CBEM are also discussed.

4.2 Methods

4.2.1 Applied Community-Based Environmental Monitoring Prototypes

We selected the most frequently identified codes to develop an applied CBEM prototype for each representative plant and animal species (Table 4.1). Applied CBEM prototypes and corresponding mocked examples were developed for monitoring: the fat of moose (Figure 4.1), the abundance of salmon caught at particular locations in Stuart Lake (Figure 4.2), beaver abundance (Figure 4.3), huckleberry abundance (Figure 4.4), and soapberry abundance (Figure 4.5). The primary researcher developed these environmental monitoring prototypes in consideration of the measurement methods identified during the content analysis.

Table 4.1- Applied CBEM prototypes were developed for the Tl'azt'en measures resulting from each traditional use activity's most frequently identified code

Traditional Use Activity	Code	Coding frequency	Number of measures	Tl'azt'en Measures
Fishing Salmon	Salmon abundance: amount of salmon caught in a particular area	65	2	Number of salmon caught in Stuart Lake per catch: with a particular net, over a particular time span, in a specific location, by run
				Number of salmon caught in Stuart Lake per catch at a family fishing area: with a particular net, over a particular time span, at a family fishing area, by run
Hunting Moose	Health of moose: fat	30	2	Description of the fat on body of male moose hunted, over a specific period of time
				Description of the fat on body of female moose hunted, over a specific period of time
Trapping Beaver	Health of beaver: lodges	12	5	Number of beaver seen in a particular area, over a particular amount of time
				Description of beaver abundance observed (through tracks, sign, observations, etc.) in a particular area (i.e. keyoh), over a particular amount of time
				Description of whether beaver abundance is increasing/decreasing/not changing from last year to this year
				Number of beaver trapped in a particular area, over a particular amount of time
				Number of beaver pups observed in a particular area, in the spring
Picking Huckleberries	Huckleberry abundance	24	4	Description of general abundance of huckleberries per season
				Description of huckleberry cycle stage on Tl'azt'en Nation traditional territory
				Description of presence/absence of huckleberries on bushes on Tl'azt'en Nation traditional territory
				Description of effort required to pick a specific amount of huckleberries, in a specific area, at a particular date (seasonality), over a specific amount of time, per picking period
Gathering Soapberries	Soapberry abundance	35	3	Percentage and description of soapberry bushes in a particular area that have leaves, branches, berries, and size in healthy condition
				Description of soapberry abundance on Tl'azt'en Nation traditional territory per picking season
				Description of presence/absence of berries on soapberries bushes located on Tl'azt'en Nation traditional territory per picking season

We were unable to apply and present all of our resultant measures, because of budget and time constraints. Prototypes followed a written format and were intended to be completed by a Tl'azt'enne CBEM team (including a youth member, FT member, and ET member). Each prototype incorporated photographs, a map, and a variety of question types (e.g., short answer, Likert scale, yes/no, fill-in-the-blank) to inform the measures. Corresponding mocked examples were provided with each applied CBEM prototype to present a better understanding of how it may be used. Both applied prototypes and corresponding mocked examples were evaluated by FT and ET members at the project-wrap up celebration.

4.2.2 Evaluating the Applied Community-Based Environmental Monitoring Prototypes

Four research team members and two CURA graduate students assisted the primary researcher in leading an evaluation of the applied CBEM prototypes and their mocked examples. Working with a researcher, groups of FT and ET members evaluated a prototype for one focal traditional use activity. Team member responses and comments were recorded by the group's research team member. Each group answered two sets of evaluation questions. The first set of questions evaluated the overall format of the applied CBEM prototype. These questions were: what works well, what is tricky/difficult, and what would you do differently to improve the CBEM prototype? The second set of questions focused on evaluating the mocked prototype example. Together, these sets of questions allowed us to assess whether the prototypes would be a culturally appropriate format for recording monitoring results. First, team members were asked, "Do you think that this example of the CBEM method is a good tool for gathering

important information about the health of plants/animals and changes seen on the land?" This question was followed by an evaluation of the effort, validity, and trustworthiness of the mocked prototype. Successively, we asked the following questions: "Do you think that this example of the CBEM method, would be hard/easy to complete (Effort)?"; "would the CBEM method provide important information (Validity)?"; "would the CBEM method accurately and appropriately represent the knowledge of community monitors (Trustworthiness)?" Lastly, each group was asked, "How would you like the community-based environmental monitoring results provided to the community?" (e.g., report, slideshow, book, dinner, story, etc.).

4.3 Results

4.3.1 Results of the Applied Community-Based Environmental Monitoring Prototype Evaluations

Our evaluation began by asking team members what worked well with the CBEM prototypes. Team members reported that the map of Tl'azt'en traditional territory, the incorporation of photos, and the documentation of traditional use activity locations were three of the features that were effective (Table 4.2). Team members also indicated that the prototype's overall format was easy to understand and conducive to sharing information with others (Table 4.2). We also found that the proposed structure of the monitoring team (made up of a youth member, FT member, and ET member) was well received, and that the team members felt that it was important to write the names of monitors on the front page of the prototype.

We then asked team members to identify what was difficult about the CBEM prototypes.

Table 4.2- Summarized group responses from the evaluation of the Tl'azt'en Nation CBEM prototype's applied format

Questions	Responses
a) What worked well?	•*documenting locations, as each family has own location for different traditional use activities.* •*incorporation of photos* •*being given space to describe setting* •*good format to share information with others* •*easy to understand* •*monitoring team format- with the 3 team members (i.e., ET, FT, and youth) is important* •*having monitoring team names on front page* •*map of traditional territory* •*think that form is okay, looks good*
b) What was tricky?	•*make more check boxes & fill in the blank type questions and less written questions* •*written answers* •*areas that people use for specific traditional use activities may vary from year to year; thus may be hard to monitor the exact same locations every year* •*unit of measurement used to quantify the amount of berries picked and hard to know weight* •*being able to explain normal, natural cycles of abundance*
c) What would you do differently to improve the CBEM prototype?	•*good to include elders boxes, specifically for information shared by ET member* •*add weather description box* •*use Dakelh names and language where possible* •*larger size prototype (book is too small)* •*include a introductory section describing what CBEM is* •*involve young people, community*

Team members indicated that answers requiring lengthy written responses were difficult and that the prototypes could be improved by using more Likert scale, yes/no, and fill-in-the-blank type questions. Team members also remarked that standardizing quantities, recording specific monitoring locations, and defining terms such as 'normal' might be difficult (Table 4.2). Team members were then asked to tell us what they would do differently to improve the CBEM prototypes. One group suggested that exclusive areas should be created in the prototype for recording the ET member's knowledge. Other

suggestions included using *Dakelh* names and language as much as possible and including an area to record weather information (Table 4.2).

When asked, "Do you think that this example of the CBEM method is a good tool for gathering important information about the health of plants/animals and changes seen on the land?" all five groups responded yes (Table 4.3). When asked about the ease of completing the CBEM prototype, and if the prototype would provide important information all five groups responded positively (Table 4.3). Four of the five groups felt that the CBEM prototypes would elicit trustworthy results and appropriately represent the knowledge of the Tl'azt'en CBEM team (Table 4.3). The group evaluating the prototype for measuring soapberry abundance was unsure if results would be trustworthy, due to the challenge of standardizing quantities and describing specific berry picking locations (Table 4.3). In response to the question, "How should CBEM results be presented to the community?" groups suggested newsletters, meetings, slideshows, collaborative storybooks, and Elders gatherings (Table 4.3). The results of the prototype evaluation were summarized and presented to FT and ET members at the primary researcher's community thesis presentation.

4.4 Discussion

4.4.1 Next Steps for Tl'azt'en Nation Community-Based Environmental Monitoring

The next step for Tl'azt'en CBEM on the JPRF is the field testing of select measures. Field testing in combination with the results of the prototype evaluation will further inform appropriate environmental monitoring protocols. Considering that we developed and verified 252 measures, a smaller subset will need to be selected from each traditional use activity and environmental monitoring theme for field testing.

Table 4.3- Summarized group responses from the evaluation of the mocked Tl'azt'en Nation CBEM prototypes

	Fishing Salmon	**Hunting Moose**	**Trapping Beaver**	**Picking Huckleberries**	**Gathering Soapberries for Medicinal Use**
Do you think that this example of the CBEM method is a good tool for gathering important information about the health of plants/animals and changes seen on the land?	• *yes, good tool for: monitoring fish populations, guiding fishing, and, for teaching youth*	• *yes*	• *yes, good way to track animals*	• *yes, especially for the future to teach student in preschool*	• *yes, hard to track with logging and beetle kill. so this is important*
Effort: would this CBEM be hard to complete?	• *relatively easy* • *should be anonymous (with regards to catch information)*	• *easy to complete*	• *easy*	• *it would be very easy for huckleberries* • *completing the form on-site would make it easy to record*	• *easy to complete* • *people would be willing to fill it out*
Validity: would this CBEM provide important information?	• *yes, because it comes from the community* • *good data for future generation*	• *yes*	• *yes*	• *yes, when something is wrong (pesticide) it will be noted and shared with community members*	• *yes, to know how much you pick t* • *don't know if it will be easy to know amount*
Trustworthiness: would this CBEM accurately and appropriately represent the knowledge of community monitors?	• *yes, quantitative measures would work* • *anonymity is important for sensitive info*	• *yes*	• *yes, good way to get base info, go back for more info if necessary*	• *yes, providing that recorded information includes details of each picking location, and who picked*	• *not sure about quantity and location*
How should CBEM results be presented to the community?	• *newsletters (written)* • *meetings (oral)*	• *meetings*	• *slideshow*	• *easy to understand report to each house* • *storybooks* • *Elders gatherings*	• *get together and make a book with everyone's answers*

This selection process can be guided by a number of criteria, including time and cost (Parlee and Lutsel Ke First Nation 1997; Wright *et al.* 2002). Most importantly, however, selected measures should fit the particular skills, capacity, and resources of Tl'azt'en Nation and the monitoring teams. The empowerment evaluation criteria presented in Chapter 2 should be used to guide the application of candidate measures in a way that fosters participant satisfaction, independence, personal development, and relationship building.

Over the long term, results from environmental monitoring should provide continual feedback to assess and refine Tl'azt'en measures and CBEM protocols. These results will also provide the necessary information to complete the other levels of the Tl'azt'en Nation C&I framework, including data elements, benchmarks, and actions/strategies. This information will contribute to the adaptive approach of Tl'azt'en Nation's CBEM through continual critical evaluation of the monitoring program, its results, and co-management implications (Figure 4.6). This will ensure that protocols and environmental measures provide useful results for maintaining land based activities and making land management decisions across Tl'azt'en traditional territory. These results will also provide a foundation to expand Tl'azt'en CBEM to include additional species and traditional use activities; this future expansion will ultimately provide a more detailed understanding of the ecosystem and its processes.

4.4.2 Recommendations for Tl'azt'en Nation Community-Based Environmental Monitoring

Tl'azt'en Nation can draw on the insight and innovation from other Aboriginal CBEM studies in the development and continual improvement of their CBEM. For

example, partnerships, producing and sharing meaningful information, and inclusiveness are three of the attributes that the West Kitikmeot Slave Study has found to be essential to their CBEM program (Blondin 2008). Furthermore, Burn (2008) states that a good monitoring program has a clear purpose, is designed to answer a specific question, has a regular measurement schedule, and uses measures that are consistent and repeatable. Examining the recommended actions and improvements of other Aboriginal CBEM studies and how they have conducted monitoring, interpreted and communicated results can help to guide the development of Tl'azt'en CBEM on the JPRF. As examples of guiding frameworks and potentially applicable methods, the Arctic Borderlands Ecological Knowledge Co-op has designated monitors in each participating community to conduct interviews with respective experts. They then share and interpret CBEM results each year at an annual gathering (Tetlichi *et al.* 2004).

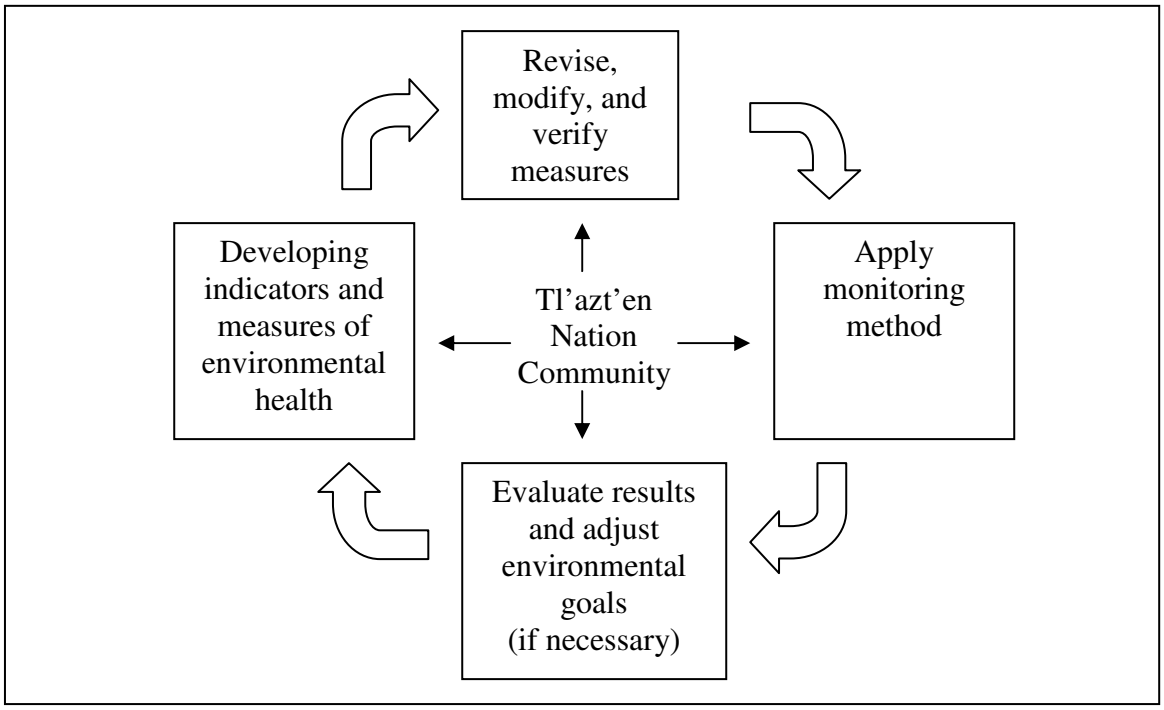


Figure 4.6- Schematic diagram of how Tl'azt'en CBEM could work with the Tl'azt'en Nation community and the JPRF to foster improved adaptive co-management

In the Ni hat'ni – Watching the Land CBEM program, information is collected through semi-directed, informal interviews with land users and Elders. Interpretation workshops allow Elders and land-users to analyze and interpret CBEM data (Łutsël K'e Dene First Nation- Wildlife, Lands and Environment Department 2005). The Ni hat'ni program has found that these workshops are integral to furthering the community's collective environmental knowledge. Interpreted CBEM results are also shared with the Chief and Council, community, and other local agencies (Łutsël K'e Dene First Nation- Wildlife, Lands and Environment Department 2005).

Results of CBEM can be communicated through a variety of methods. The Pikangikum First Nation's Whitefeather Forest Initiative has used maps and landscape models to share findings (O'Flaherty *et al.* 2008). Parlee and Lutsel K'e First Nation (1997) state that newsletters, reports, visual presentations and community workshops are potential formats for sharing CBEM results, but that catering reporting tools to each community is critical. They also note the importance of involving the appropriate people when recommending subsequent actions after results have been analyzed. In the Whitefeather Forest Initiative, a steering group of Pikangikum Elders are involved in decision-making processes (O'Flaherty *et al.* 2008).

4.5 Conclusion

The applied CBEM prototypes and corresponding mocked examples represented select measures from each traditional use activity in a field testable format. Forest and Elders Team members provided valuable feedback and information that will contribute to the future development of Tl'azt'en CBEM. Together, these evaluation results and the insight gained from other Aboriginal CBEM studies serve as the next steps for the

Tl’azt’en CBEM. Working in partnership with the JPRF, Tl’azt’en Nation can begin to implement and test select measures leading to an improved co-management relationship.

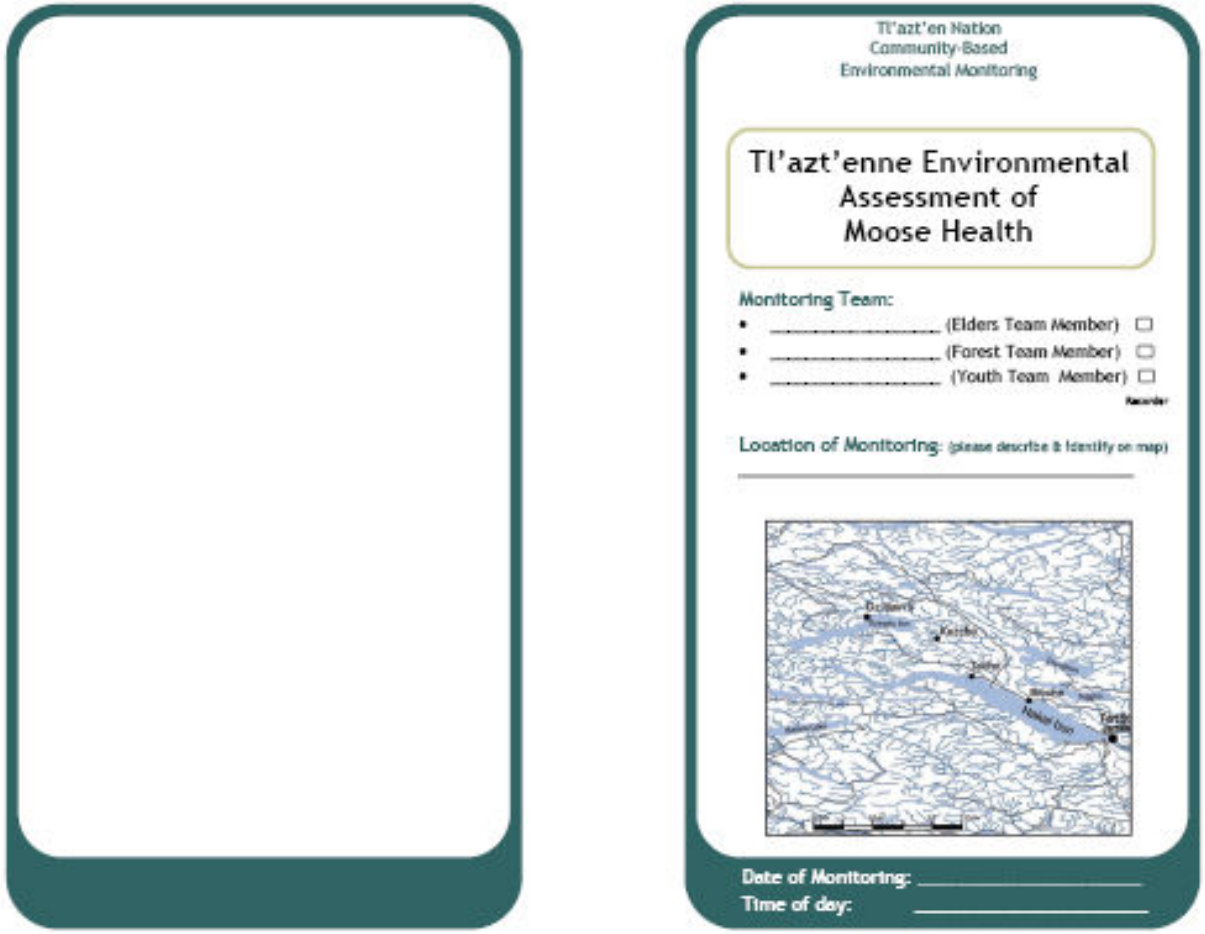


Figure 4.1- Community-based environmental monitoring prototype for hunting moose

Maintain healthy and quality of moose (ungulate) population

~ Fat of moose:

Attach picture of observed moose here:
(before butchering)

Moose was observed:_____ (Date)

Moose is a: ☐ Calf ☐ Dry Cow ☐ Pregnant Cow ☐ Bullmoose ☐ Rutting Bullmoose

Moose is: ☐ Less then 1 yr ☐ 2-4 yrs old ☐ 4-6 yrs old ☐ 6yrs-or older

Moose was:

☐ Not healthy, Very little fat ☐ ☐ ☐ ☐ Very healthy, lots of fat

Please describe the shape/fatness of the moose:

_____
_____
_____
_____
_____

Attach picture of hunted moose here:
(during or after butchering)

Moose was hunted:_____ (Date)

Moose had: ☐ Less fat Than expected ☐ ☐ ☐ More fat Than expected

Attach picture of moose kidneys:

Moose kidneys were: 1 Not healthy, No fat 2 3 4 5 Very healthy, Lots of fat

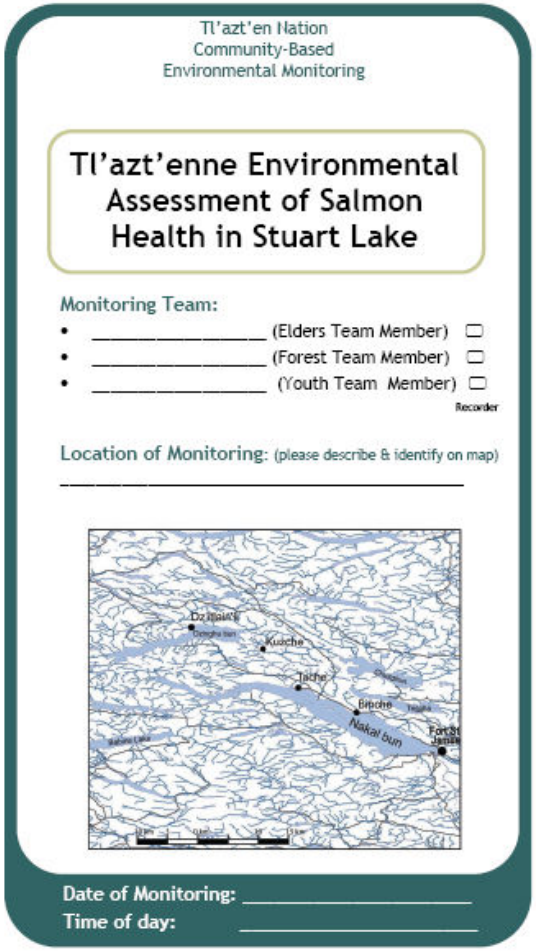


Figure 4.2- Community-based environmental monitoring prototype for fishing salmon

Maintain viable salmon population in Stuart Lake

~ Salmon abundance in Stuart Lake:

Salmon were caught:

Beginning of: ☐ First Run: ☐
Middle of: ☐ Second Run: ☐
End of: ☐ Third Run: ☐

_____ (Date)

Salmon were caught with:

Lazy Net: ☐ Number of nets used: 1 2 3 4 5 (circle)
Traditional Net: ☐

Net was set:

Day: ☐ Number of hours that net was set: _____
Overnight: ☐
Over 2 nights: ☐

Location that net was set:

Attach picture of particular fishing location here

Please mark the location on the map on the previous page and describe the location below:

_____
_____
_____

Is this location a family fishing area: Y N (circle)

Have you fished in this location before: Y N (circle)
If YES, how many years have you fished at this location:___

Attach picture of salmon caught from one catch here

Number of salmon caught at this location:_____

Did you catch:

More salmon than expected: ☐
The number of salmon that you were expecting: ☐
Less salmon than expected: ☐

Compared to fishing in this location last year:

There are more salmon: ☐
There are the same amount of salmon: ☐
There are less salmon: ☐

Please describe fishing in this location, by the Elders Team Member's:

_____
_____
_____
_____
_____
_____

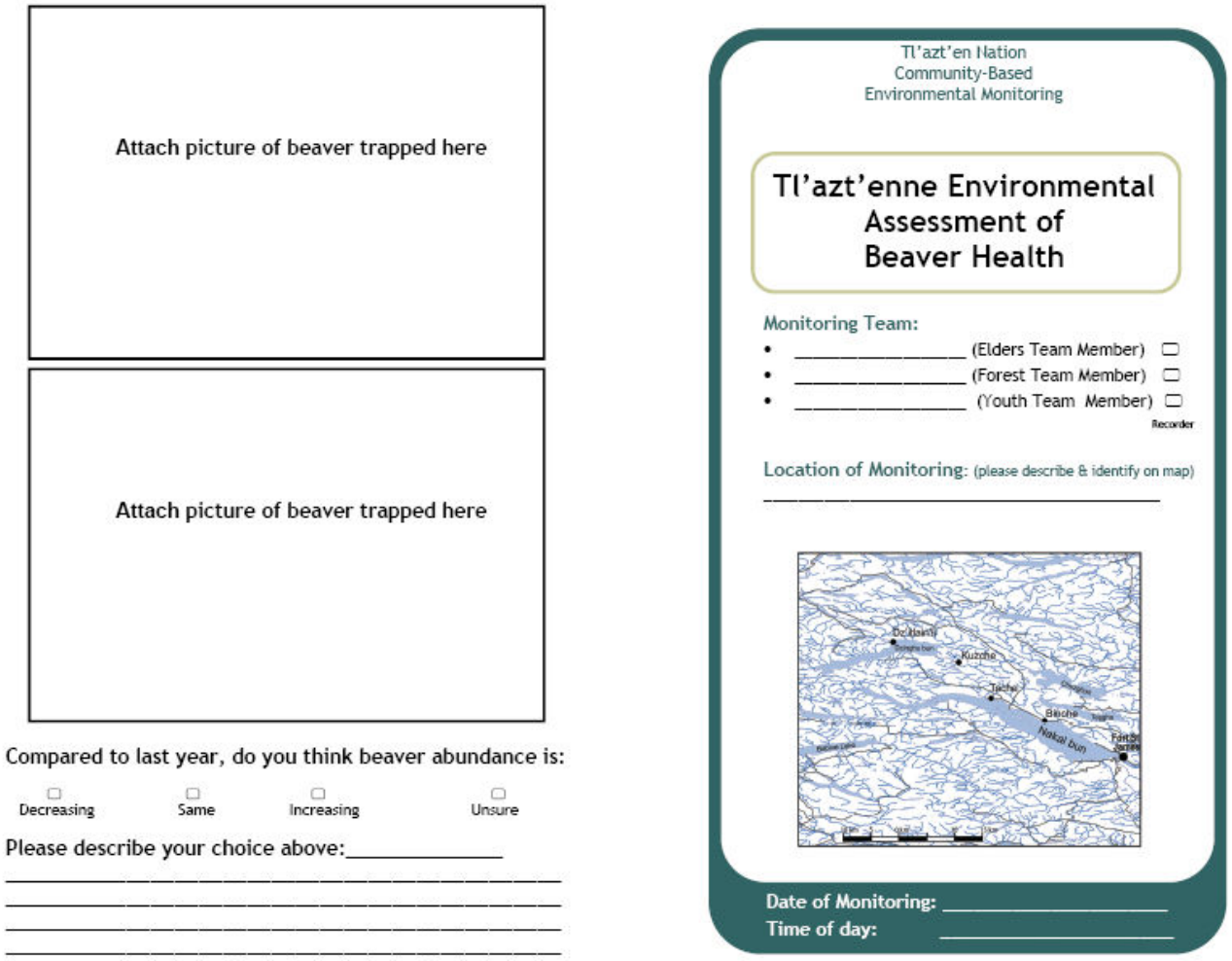


Figure 4.3- Community-based environmental monitoring prototype for trapping beaver

Maintain viable beaver (fur-bearer) population

~ Beaver abundance:

Beaver sign observed:

	YES	NO
Tracks:	☐	☐
Scat:	☐	☐
Trees:	☐	☐
Inhabitated lodge:	☐	☐
Dam:	☐	☐

Other sign observed: _____
_____
_____ (Describe)

Attach picture of beaver sign observed here

Described environment where beaver sign was observed:
_____
_____
_____
_____

Is this area located on your keyoh: Y N (circle)

Have you trapped in this location before: Y N (circle)
If YES, how many years ago have you fished at this location:___

Attach picture of environment where beaver sign was observed here

Number of beaver observed at this location:_____

Number of beaver pups observed at this location:_____

Number of beaver trapped at this location:_____

Did you trap:
Female beaver: ☐
Male beaver: ☐

Number of days that trap was set:
Less than one day (less then 24hrs): ☐
One day, one night (24 hours): ☐
More than 24 hrs: ☐

Please describe how beaver was trapped (conibear trap, snare, other):
_____
_____
_____
_____

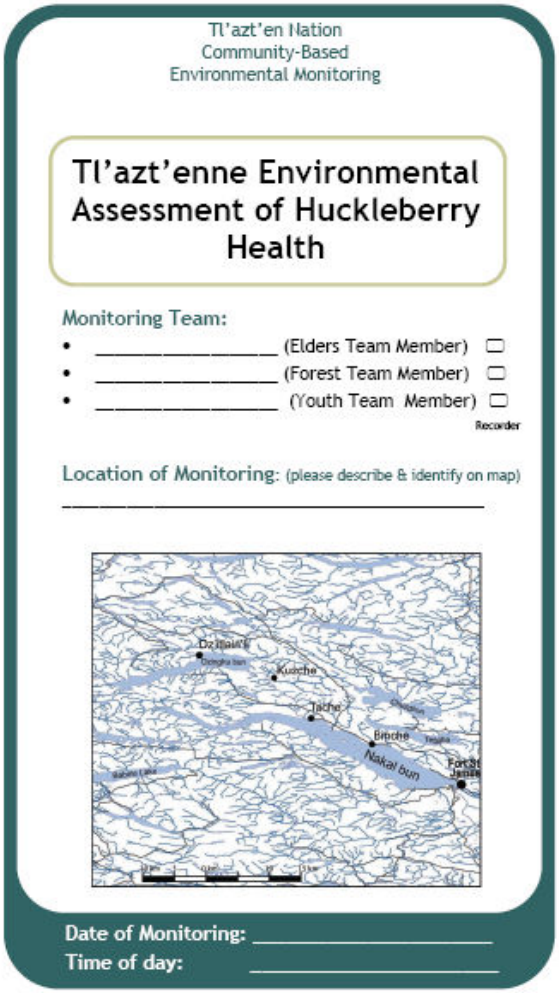


Figure 4.4- Community-based environmental monitoring prototype for picking huckleberries

Maintain huckleberry abundance

~ Huckleberry abundance:

Huckleberries were picked: _____ (Date)

Beginning of: ☐
Middle of: ☐
End of: ☐

June: ☐
July: ☐
August: ☐
September: ☐

The overall abundance of huckleberries on Tl'azt'en Nation traditional territory is:

☐ Not good ☐ Poor ☐ Good ☐ Pretty Good ☐ Excellent

Please describe your choice above:

_____
_____
_____
_____

Attach picture that represents the overall abundance of huckleberries here

Were there huckleberries on the bushes: Y N (circle)

Attach picture showing huckleberry abundance here

In _____ hours, picking at a _____ speed
(number of hours) (slow, medium, fast)
_____ pails or _____ pounds of huckleberries were
(number of pails) (number of pounds)
picked. (attaché photo directly above to illustrate this)

Did you pick:
More huckleberries than expected: ☐
The number of huckleberries that you were expecting: ☐
Less huckleberries than expected: ☐

Compared to picking huckleberries in this location last year:
There are more huckleberries: ☐
There are the same amount of huckleberries: ☐
There are less huckleberries: ☐

Please describe huckleberry picking in this location, in the past, by the Elders Team Member's:

_____
_____
_____
_____
_____

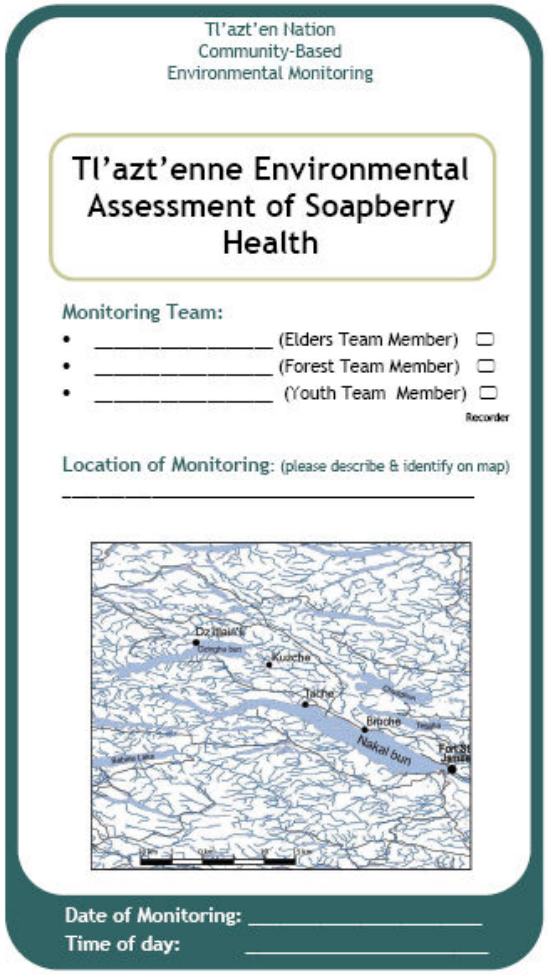


Figure 4.5- Community-based environmental monitoring prototype for gathering soapberries for medicinal use

Maintain soapberry abundance

~ Soapberry abundance:

Soapberries were picked: _____ (Date)

Beginning of: ☐
Middle of: ☐
End of: ☐

June: ☐
July: ☐
August: ☐
September: ☐

The overall abundance of soapberries on Tl'azt'en Nation traditional territory is:

☐ Not good ☐ Poor ☐ Good ☐ Pretty Good ☐ Excellent

Please describe your choice above:

_____
_____
_____
_____

Attach picture that represents the overall abundance of soapberries here

Were there soapberries on the bushes: Y N (circle)
Were there soapberries on the bushes last year: Y N (circle)

Attach picture showing soapberry abundance here

In _____ hours, picking at a _____ speed
(number of hours) (slow, medium, fast)
_____ pails or _____ pounds of soapberries were
(number of pails) (number of pounds)
picked. (attaché photo directly above to illustrate this)

Did you pick:
More soapberries than expected: ☐
The number of soapberries that you were expecting: ☐
Less soapberries than expected: ☐

Compared to picking soapberries in this location last year:
There are more soapberries: ☐
There are the same amount of soapberries: ☐
There are less soapberries: ☐

Please describe soapberry picking in this location, in the past, by the Elders Team Member's:

_____
_____
_____
_____
_____

CHAPTER 5- COMMUNITY PRODUCTS

5.1 Introduction

Meaningful and informative community products are important components of co-management related research, as they contribute to social learning and to a two-way knowledge exchange (Bonny and Berkes 2008; Berkes 2009). We define a community product as a research outcome or extension activity that is meant to recognize the contributions of the research team and transmit findings in a format that is accessible to the participants, their peers, and their community. Working in partnership with the community is key to ensuring that products are appropriate and well suited. Though products may differ depending on the intended audience, type of research, and stage of completion, all help to communicate progress and achievements, build support for current and future research, and recognize and reward the efforts and contributions of community participants (Wondolleck and Yaffee 2000a). Community products are a tangible demonstration of collaborative success; Wondolleck and Yaffee (2000b) state that this demonstration fosters hope and motivates involvement. We developed numerous community products that reported progress, communicated results, and highlighted the collaborative contributions of FT and ET members. Products were developed both as part of the larger Tl'azt'en Nation - UNBC CURA project and as a component of this research project. These products are presented in this chapter in their published format, if possible.

5.2 CURA-Related Community Products

The Tl'azt'en Nation - UNBC CURA project used community updates, newsletters, a website, and CURA community days to communicate the progress and findings of individual research projects associated with its four research streams. Community updates were short, semi-annual publications produced for Tl'azt'en Nation. These updates used language appropriate for a broad community audience and were hand delivered to every household in Tache, Binche, and Middle River. Newsletters were published semi-annually for a larger audience, including Tl'azt'en Nation, academics, government, and non-governmental organizations (NGO). These newsletters provided a more detailed look at ongoing research and related events. The CURA website (http://cura.unbc.ca) was an electronic forum for people to learn about the objectives and progress of the broader project, the people involved, and ongoing graduate research. All CURA publications were available at this site. The CURA community days were one day annual events held in the Tl'azt'en Nation community of Tache. These community days provided an opportunity for CURA researchers and Tl'azt'en Nation community members to interact through oral presentations, poster presentations, group activities, and a community lunch. The CURA research products associated with this project included written contributions to community updates, newsletters, and the CURA website.

5.2.1 CURA Community Updates and Newsletters

In this section, we present the excerpts that were written for CURA community updates and newsletters. These brief communications provided a means for us to communicate on a regular basis with a broad audience, including the general Tl'azt'en Nation community. Furthermore, CURA community updates and newsletters reinforced

our project's role and contributions to CURA's overarching project goal- to partner for sustainable resource management.

Community Update – Winter 2007

Hi, in September I moved from Vancouver to Prince George to begin my masters at UNBC in the Improved Partnerships Stream of the CURA project. I am very excited for this opportunity to work on community environmental monitoring research with Tl'azt'en Nation. My research will involve working closely with Tl'azt'enne to develop, apply, and evaluate methods for identifying indigenous measures of co-management success for monitoring particular plants and animals of interest to the Tl'azt'en Nation within the following five categories: medicinal plants, berries, trapping, fishing, and hunting. This project is of particular interest to me because of how this project will involve working closely in partnership with Tl'azt'en Nation; I know that I will learn a tremendous amount by working with community members. I am looking forward to being a part of and contributing to the meaningful research that is ongoing in CURA.

Newsletter – Winter 2007

The purpose of this research project is to develop, apply, and evaluate methods for identifying Indigenous measures of co-management success, which support meaningful local involvement and give voice, respect, and legitimacy to traditional knowledge and values. Communities may define sustainability differently from each other and from experts, requiring a unique set of progress measures (Beckley *et al.* 2002). Community-based environmental monitoring is an approach by which First Nation communities can apply traditional knowledge, track the health of their environment, and implement locally relevant sustainability objectives.

In partnership with two teams of Tl'azt'en Nation community members (the Forest Team and the Elders Team), we are developing a Tl'azt'en community-based environmental monitoring method that incorporates the knowledge, needs, beliefs, and concerns of the community through the development of an integrative, flexible framework that applies both Indigenous and scientific knowledge. Knowledge co-production can generate a more holistic understanding of the environment than either scientific or Indigenous knowledge can alone (Berkes 1999a).

Various research events that have taken place over the past summer and fall include: Forest Team focus groups, an Elders Team retreat, and a Community Product Development Workshop. The knowledge shared at these events will contribute to the formulation of Tl'azt'en measures of co-management success, specifically related to environmental sustainability.

In addition to academic products, team members are working together to develop community products, such as a book and a DVD.

Community Update – Summer 2007

Hello! My name is Deanna Yim and I have been working on my project titled, *Evolving Co-Management Practice: Community-based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest*, throughout the summer. I have really enjoyed spending time in the community this summer and I look forward to getting to know you all better in the future.

Three project events have taken place so far. In late July, we held a welcome information lunch for community members to come and learn about this project and join if interested. In early August we held our first Forest Team meeting and just recently we

held our Elders Team retreat at Cinnabar. Please stay tuned for community updates detailing the progress of this project. If you are interested in knowing more, please feel free to email me at deannayim@yahoo.ca.

Community Update – Spring 2008

Graduate student Deanna Yim (project: *Evolving Co-Management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest*) is currently working on her data analysis. She is analyzing transcripts from different research events conducted with Forest Team and Elders Team members over the past summer and fall. Results from this analysis will be used to develop a Tl'azt'en community-based environmental monitoring framework. The framework will be presented to Forest Team members later this spring at the final Forest Team meeting for their feedback and input. This framework will serve as the basis for an applied Tl'azt'en community-based environmental monitoring method that can be used on the John Prince Research Forest.

Team members are currently working together with Deanna, Tl'azt'en Research Assistant, Theresa Austin, and the children from Mr. McKay's Gr. 5,6,7 class at Eugene Joseph Elementary School to develop a book for the community that shares a collection of their photographs, stories, and knowledge gathered throughout this project. Another community product that will be developed from this research is a DVD. This DVD will use video footage taken from different research events to highlight themes, people, and knowledge shared in this project.

Newsletter – Summer 2008

Objectives of this research project include the development, application, and evaluation of methods for identifying local Tl'azt'enne measures of co-management success, in the context of environmental sustainability. These measures were formulated from the work done in partnership with two teams of Tl'azt'en community members (the Elders Team and the Forest Team) over the course of several research events during 2007 and 2008. A qualitative analysis of transcripts transcribed from audio and video recordings at research events provided the material from which measures were developed. These measures will be presented to the Tl'azt'en Team members to be evaluated and verified before they are applied in a Tl'azt'en community-based environmental monitoring method on the John Prince Research Forest.

The progress of this project has been shared recently at two symposiums. On May 8th and 9th, 2008 Deanna Yim (lead researcher), Bev John, and Amelia Stark (Tl'azt'en community researchers/CURA stream leaders) gave an oral presentation together at the *Community Based Research (CBR) Symposium* at Douglas College in Coquitlam, BC. This presentation focused on sharing the project's community-based methodology and provided a unique opportunity to present the perspectives of both the university and community researchers. Deanna also presented her research at a poster session during the *14th International Symposium on Society and Resource Management* at the University of Vermont in Burlington, Vermont USA. The theme of this year's symposium, held June 10-14, 2008, was 'People and Place: Linking Culture and Nature.' Many of the presentations and projects being shared at the symposium offered Deanna

great insight into this field of study. She really appreciated the opportunity to share her research with an international audience and learn from the work being done by others.

In the upcoming months, it is anticipated that this project's main community products (a collaborative book and the production of a DVD highlighting some of the knowledge, stories, and events that have taken place throughout the project) will be completed and the project's focus will be concentrated on the writing of academic papers and thesis.

Community Update – Winter 2008

My graduate research project is nearing completion and many exciting accomplishments have been achieved by the project and its team members since the last community update. Below is a diagram of the project's participatory research framework, which shows all of the events that have been conducted over the past year and a half. All research events have been completed and Tl'azt'en Environmental Measures for the project's five focal traditional use activities and their representative plant and animal species have been developed and verified by Forest and Elders Team members. The last box, (or most right handed box), is the stage that the project is currently in; this is the stage of writing the project's thesis and papers. There will be a final community presentation in early 2009 once the thesis and papers are complete. We look forward to sharing these final products with everyone!

The research team and I were really excited to have held the project's celebration wrap-up dinner in Tache on October 16th, 2008. It truly was a day of celebration, as the project's DVD and book were distributed to the project's Elders Team and Forest Team members, as well as to the Tl'azt'en Nation community. The DVD and book titled,

Tl'azt'en Nation Community-Based Environmental Monitoring Science and Tradition: Respect for our Elders, Respect for our People, Respect for our Land, were this project's community products which were created collaboratively with all of the project's team members. We hope that everyone enjoys the DVD and book.

If you would like a free copy of the book and DVD, and have not yet received a copy, please phone Amelia Stark or Bev John at the John Prince Research Forest (250-996-0028).

5.3 Project-Related Community Products

We developed a number of community research products over the course of this project. These products included a collaborative book (Figure 5.1) and DVD (Figure 5.2), posters (Figure 5.3, 5.4, 5.5), an information brochure (Figure 5.6), and several community newsletters (Figure 5.7, 5.8, 5.9, 5.10). All products were made available or delivered to every household in the Tl'azt'en Nation community. The collaborative book was written in partnership with members of the FT and ET. Extension products were also developed for a grade five, six, and seven class from the local Eugene Joseph Elementary School (Figure 5.11) and for the JPRF's *Chuntoh* Education Society (Figure 5.12). Products are presented in this chapter in their published format, where possible.

5.3.1 Poster Presentations

Posters were presented at various forums, including academic conferences, academic poster sessions, and community presentations (Figure 5.3, 5.4, 5.5). Following presentations, copies of presented posters were often given to Tl'azt'en Nation and/or the

JPRF to display. In addition, handouts of presented posters were given and made available to Tl'azt'en Nation community members.

Figure 5.1- Book Cover: Tl'azt'en Nation Community-Based Environmental Monitoring, Science and Tradition: Respect for our Elders, Respect for our People, Respect for our Land (Tl'azt'en Nation and Yim 2008b)

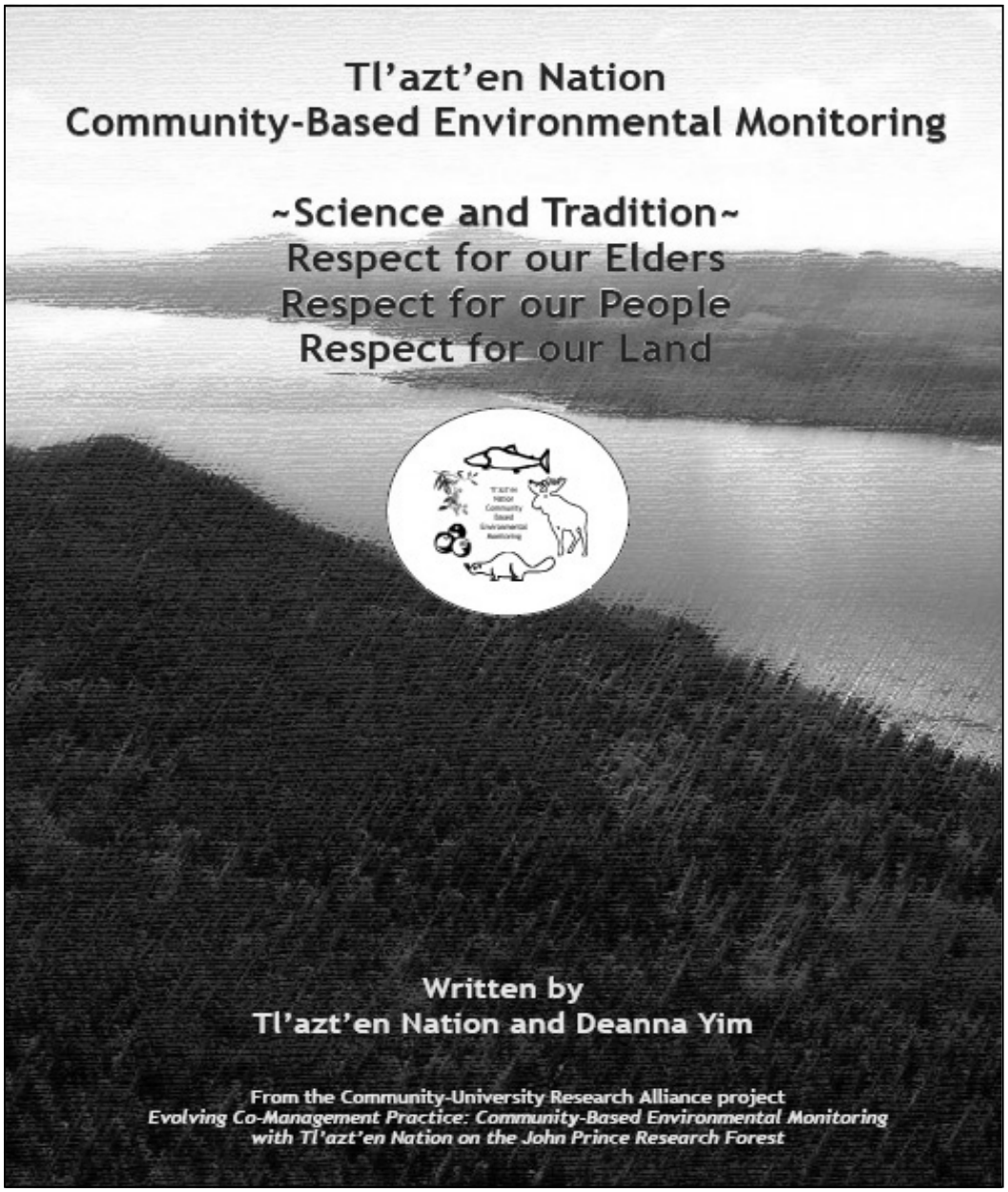


Figure 5.2- DVD Cover: Tl'azt'en Nation Community-Based Environmental Monitoring, Science and Tradition: Respect for our Elders, Respect for our People, Respect for our Land (Tl'azt'en Nation and Yim 2008a)

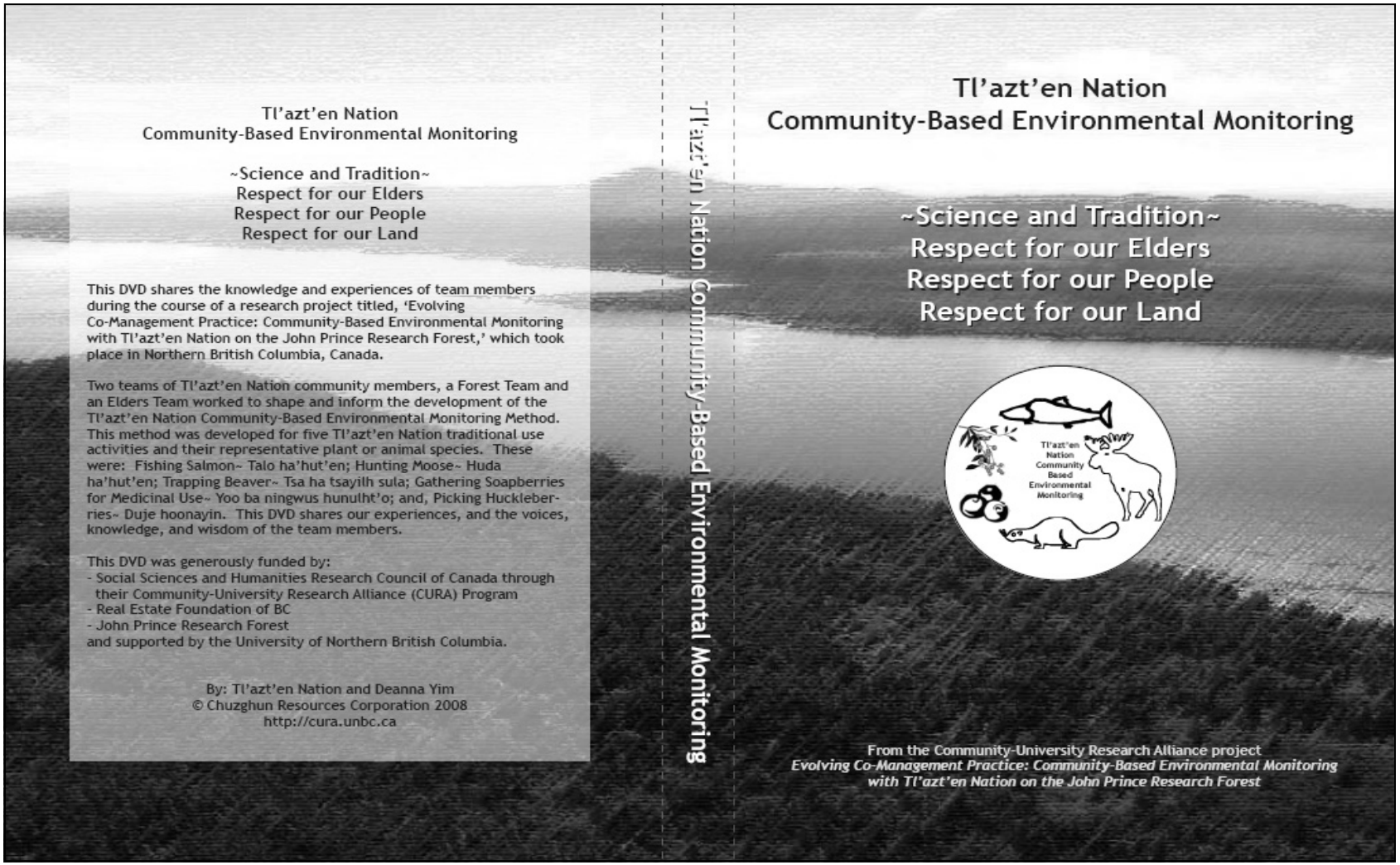


Figure 5.3- Poster presented at the UNBC Natural Resources and Environmental Studies poster session, Prince George, BC, October 2006

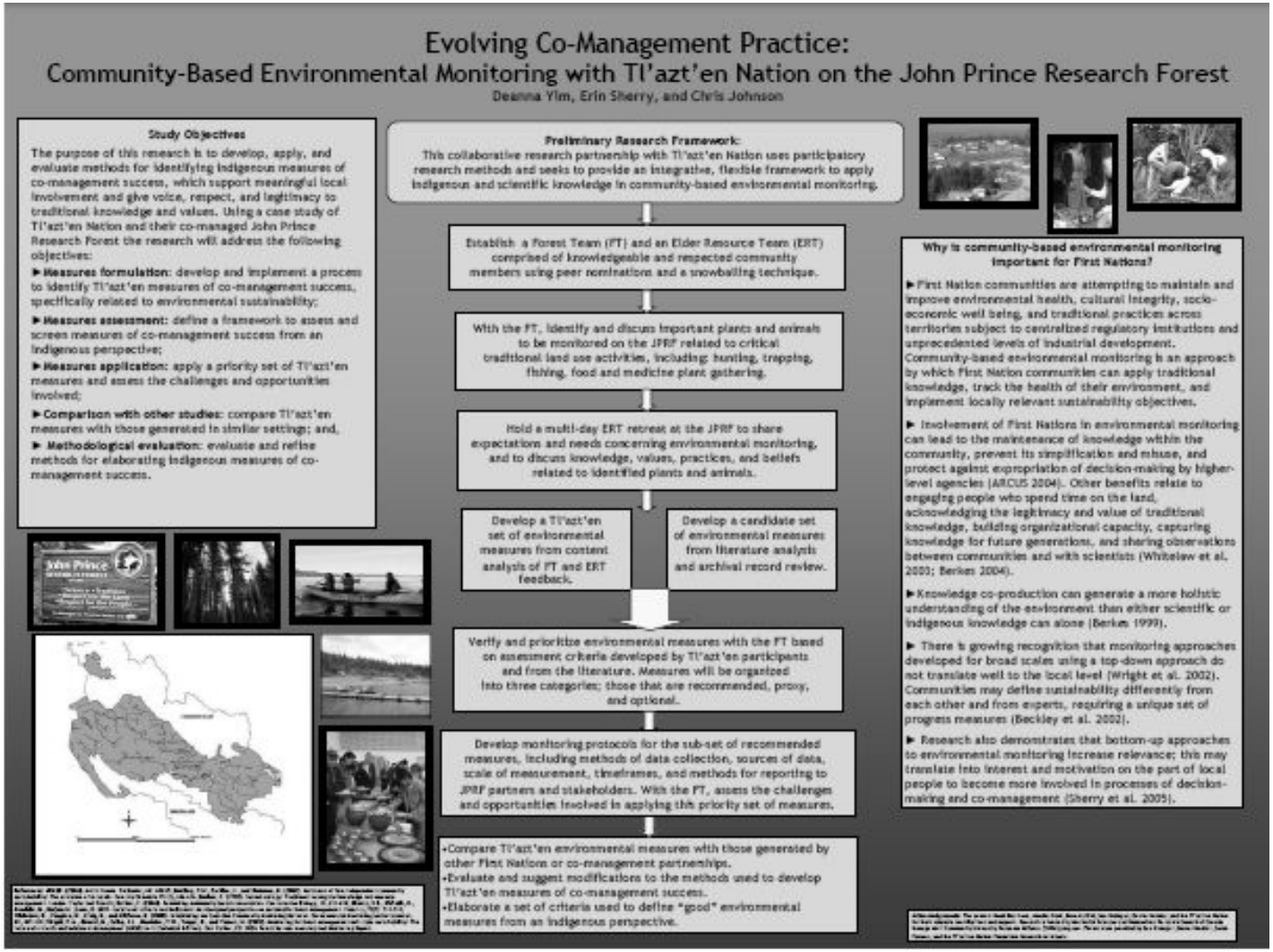


Figure 5.4- Poster presented at the Tl'azt'en Nation-UNBC CURA Community Day, Tache, BC, May 2007

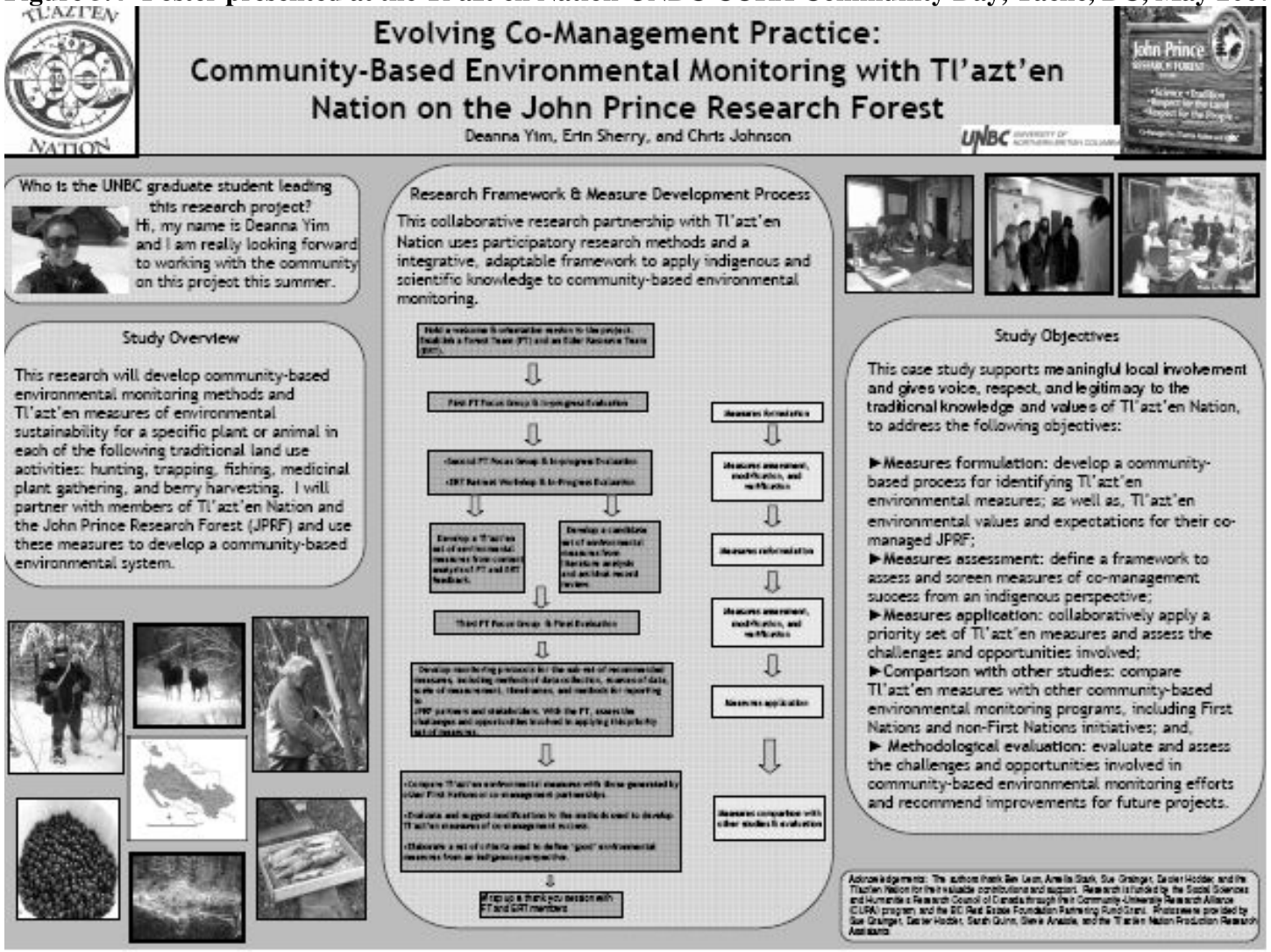
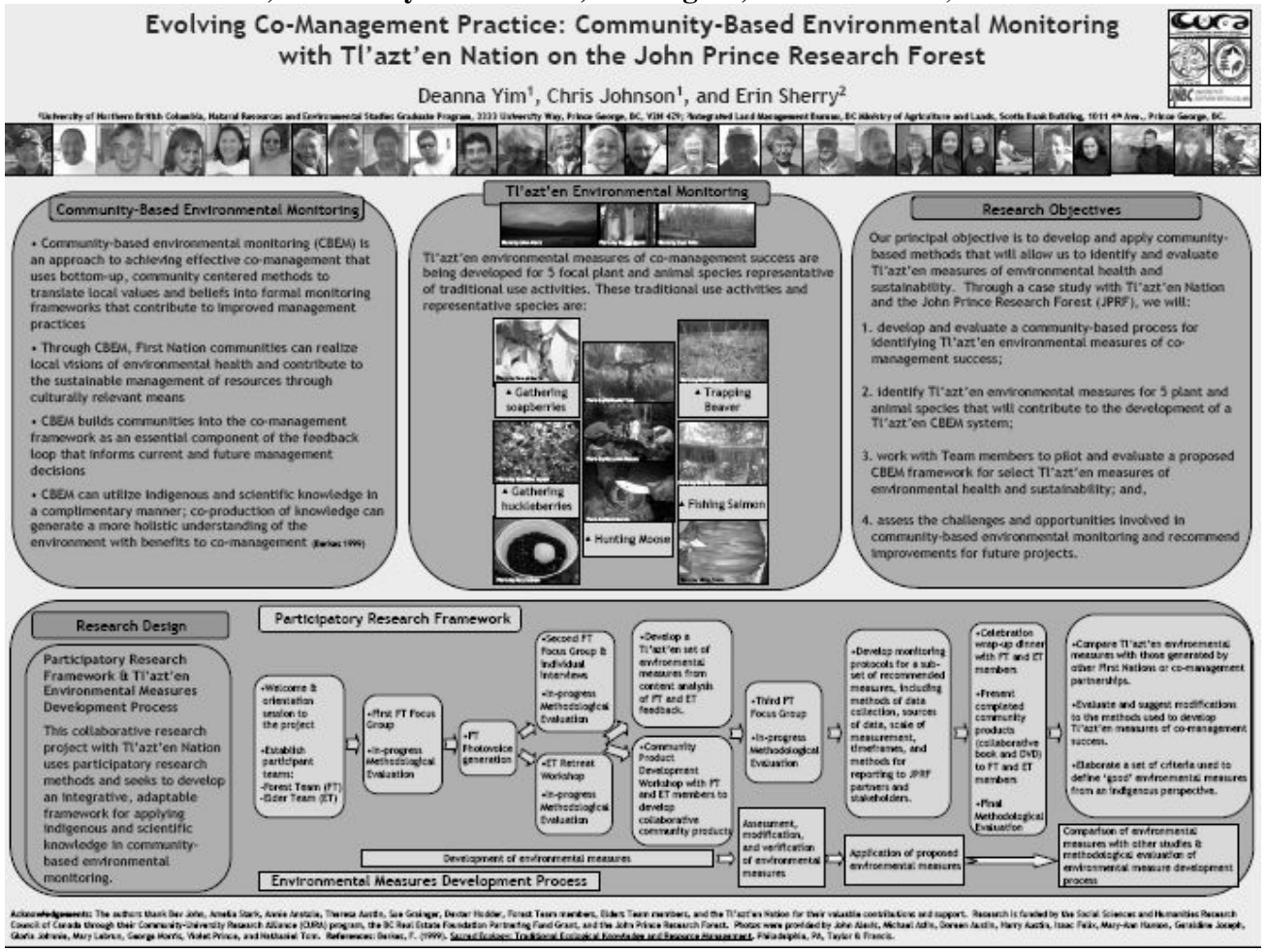


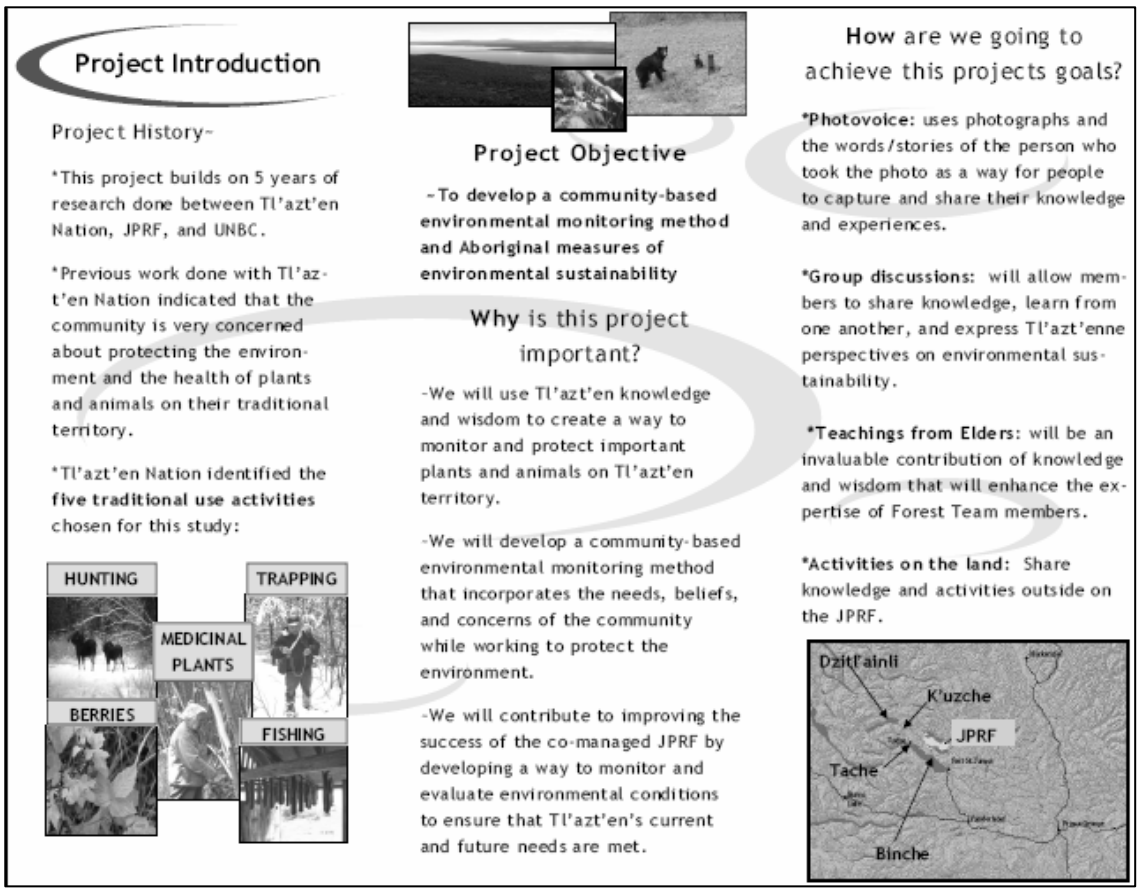
Figure 5.5- Poster presented at the UNBC Natural Resources and Environmental Studies Institute poster session, Prince George, BC and at the 14th International Symposium on Society and Resource Management, People and Place: Linking Culture and Nature, University of Vermont, Burlington, Vermont USA, March 2008

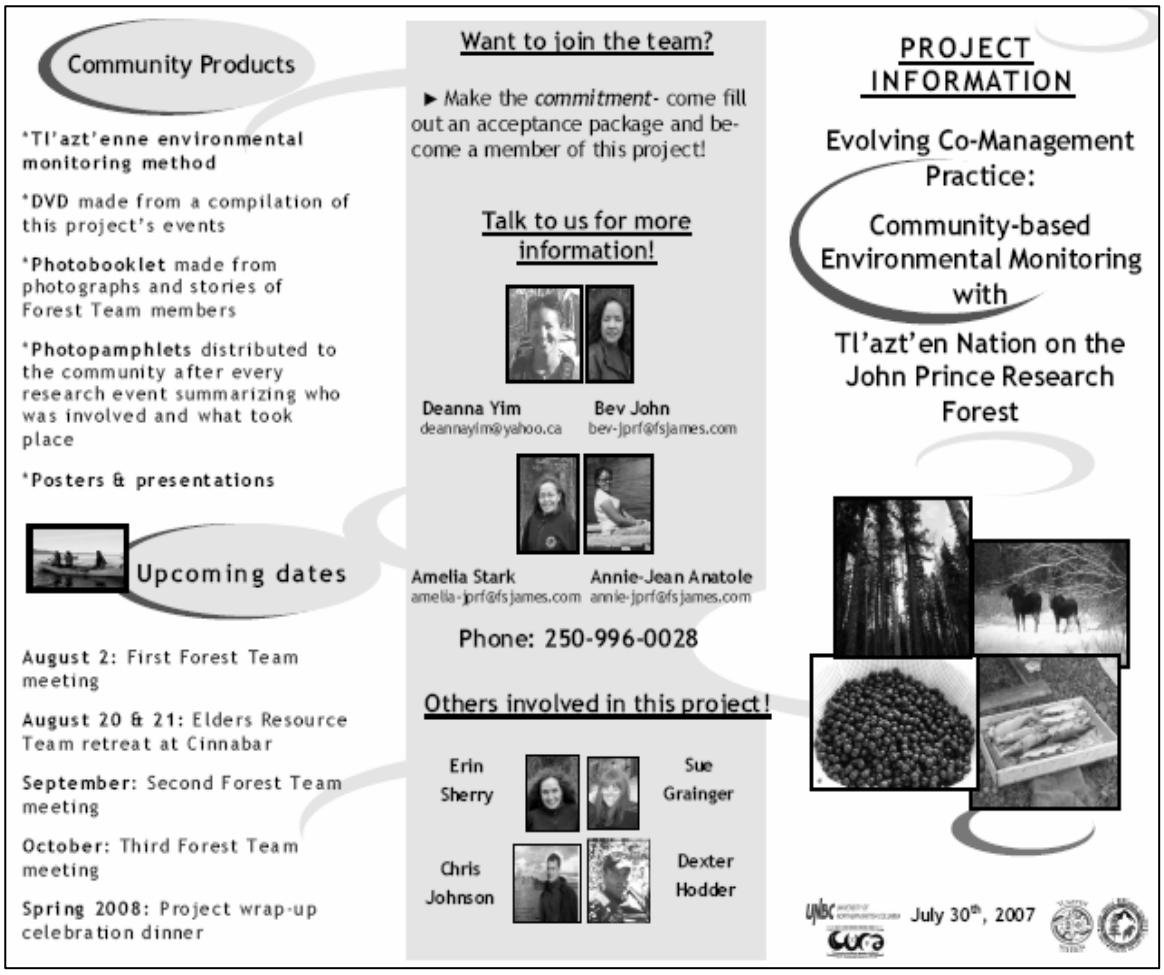


5.3.2 Information Brochure

The project information brochure was developed to introduce the project and participants to the Tl'azt'en Nation community. This brochure provided context and an overview of the project. Copies of the information brochure were distributed at the information session (Figure 2.1) and were available at such Tl'azt'en community venues as the Tl'azt'en Nation Education Center in Tache.

Figure 5.6- Project Information Brochure, July 2007





5.3.3 Forest and Elders Team Community Updates

Forest and Elders Team community updates were one-page newsletters that summarized and shared project information and photos with Tl'azt'enne. These community updates were distributed to households in Tache and Binche and mailed to the other Tl'azt'en Nation communities shortly after most research events (Figure 2.1). The purpose of these updates were to actualize our transparent and inclusive research approach, and to inform the community of the project's progress.

Figure 5.7- Forest Team Community Update Issue 1, August 2007

Forest Team Update

From the project:
Evolving Co-management practice: community-based environmental monitoring with Tl'azt'en Nation on the John Prince Research Forest

Issue 1, August 2007

~ Project information ~

This community-based environmental monitoring project is working with two groups of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en community members working on this project are:

- the Forest Team (FT)
- the Elders Team (ET)

Together with the FT and ET, we will develop a community-based enviornmental monitoring method that incorporates the needs, beliefs, and concerns of the community.

This project is focused on developing environmental monitoring method for one plant or animal in each of the following traditional use actitivities:

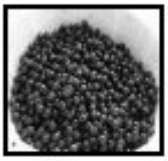
FT members at the first Forest Team meeting on Aug.2, 2007 in Tache at the Elders Center.

Hunting

Trapping

Fishing

Medicinal plant gathering



Berry picking

Forest Team Progress Update...

•At the first Forest Team meeting, Forest Team members discussed and selected one plant or animal to focus environmental monitoring on in each of the 5 traditional use activities. These were:

Hunting~ moose
Trapping~ beaver
Fishing~ salmon
Medicinal plant gathering~ soapberries
Berry picking~ huckleberries

•Forest Team members received Photovoice training and became familiar with using this method as a way of expressing their knowledge and expertise through photographs that they take on the land. Forest Team members will be using the cameras to take photos of, or related to, the health of plants and animals selected to focus environmental monitoring on in each of the traditional use activities. Forest Team members will then explain the significance of their photos with their own words and stories at the second Forest Team meeting.

Meet the Forest Team! (*Additional members may join in the future)

Photo not available

Michael Aslin

Doreen Austin

Harry Austin

Isaac Felix

Mary-Ann Hanson

Geraldine Joseph

Gloria Johnnie

Mary Lebrun

George Morris

Violet Prince

Nathaniel Tom

Elders that contributed to the first Forest Team meeting...

John Alexis

Marie Hanson

Pierre John

The Forest Team greatly appreciates the knowledge, guidance, and positive contributions that the Elders brought to the first Forest Team meeting. Both the Forest Team and project leaders look forward to and welcome their presence at future FT meetings, and we are all very excited to learn and share with them at the Elders Team Retreat at Cinnabar on August 20 and 21st.

Talk to us for more information!

Deanna Yim
deannayim@yahoo.ca

Bev John
bev-jprf@fsjames.com

Amelia Stark
amelia-jprf@fsjames.com

Annie-Jean Anatole
annie-jprf@fsjames.com

Phone: 250-996-0028 (JPRF)

Pictures from the First Forest Team Meeting

Getting Photovoice training with the cameras!

FT members working together during our group discussions

Enjoying talking with each other at lunch

Figure 5.8- Elders Team Community Update Issue 2, August 2007

Elders Team Update

From the project:
Evolving Co-management practice: community-based environmental monitoring with Tl'azt'en Nation on the John Prince Research Forest

~ Project information ~

Issue 2, August 2007

This community-based environmental monitoring project is working with two groups of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en community members working on this project are:

- the Forest Team (FT)
- the Elders Team (ET)

Together with the FT and ET, we will develop a community-based enviornmental monitoring method that incorporates the needs, beliefs, and concerns of the community.

This project is focused on developing an environmental monitoring method for one plant or animal in each of the following traditional use actitivities:

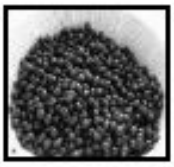
ET members at the Elders Team Retreat at Cinnabar on Aug.20 & 21 2007.

Hunting moose

Trapping beaver

Fishing salmon

Gathering soapberries for medicinal use



Picking huckleberries

Elders Team Progress Update...

•The Elders Team retreat was held on August 20 & 21st at Cinnabar. At the retreat, members of the Elders Team discussed each of the plants and animals selected for environmental monitoring in this project.

•On the first day of the retreat, 3 group discussions took place regarding hunting moose, trapping beaver, and fishing salmon. On the second day of the retreat, 2 group discussions about picking huckleberries and gathering soapberries for medicinal use took place.

•The Elders teachings helped us to understand how things have changed over time and the importance of protecting the health of moose, beaver, salmon, huckleberries, and soapberries for the future of Tl'azt'en Nation and for environmental sustainability.

•The Elders shared their knowledge, wisdom, and expertise over the course of this two day retreat. Their invaluable contributions to this project are deeply appreciated.

Meet the Elders Team!

(Left to right, back to front): Betsy Dennis, Doreen Austin, Pierre John, Seraphine Mattess, Willie Mattess, Celestine Thomas, Helen Johnnie, Lizzie Alexis, Mary Lebrun (Missing: John Alexis)

Special moments from the Elders Team Retreat

(Left to right, back to front): Leona Shaw, Amelia Stark, Betsy Dennis, Doreen Austin, Pierre John, Seraphine Mattess, Willie Mattess, Bev John, Deanna Yim, Celestine Thomas, Helen Johnnie, Lizzie Alexis, Mary Lebrun, Annie Anatole (Missing: John Alexis)

Talk to us for more information!

Deanna Yim
deannayim@yahoo.ca

Bev John
bev-jprf@fsjames.com

Amelia Stark
amelia-jprf@fsjames.com

Annie-Jean Anatole
annie-jprf@fsjames.com

Phone: 250-996-0028 (JPRF)

Picture Left: John Alexis sharing his knowledge and stories during a boat ride on *Chuzghun* Lake, (Tezzeron).
Picture Below: Leona Shaw, Mary Lebrun, & Lizzie Alexis talking about traditional uses of fir.

Below left to right: Celestine Thomas & Seraphine Mattess listening during a disoussion; Pierre John sharing in a discussion; Helen Jonnie taking a walk; Betsy Dennis & Amelia Stark spending time together; Willie Mattess enjoying the weather; Doreen Austin & Annie Anatole talking outside.

Figure 5.9- Forest Team Community Update Issue 3, December 2007

Forest Team Update

From the project:
Evolving Co-management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest

~ Project information ~

Issue 3, December 2007

This community-based environmental monitoring project is working with two groups of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en community members working on this project are:

- the Forest Team (FT)
- the Elders Team (ET)

Together with the FT and ET, we will develop a community-based enviornmental monitoring method that incorporates the needs, beliefs, and concerns of the community.

This project is focused on developing environmental monitoring method for *hunting moose*, *trapping beaver*, *fishing salmon*, *picking huckleberries*, and *harvesting soapberries for medicinal use*.

2nd FT meeting in Tache on Sept.20, 2007.

Forest Team Progress Update...

•Since the 1st FT meeting, FT members have been busy taking pictures out on the land related to *hunting moose*, *trapping beaver*, *fishing salmon*, *picking huckleberries*, and *harvesting soapberries for medicinal use*.

•At the 2nd FT meeting, FT members selected some of their photos and shared their knowledge and stories about them. This meeting was a special time of learning and teaching with one another.

•The photos and knowledge shared at this 2nd FT meeting has helped us to better understand what the signs and signals are that people use to tell whether a plant, animal, or environment is healthy or not. This information will be used to create a Tl'azt'en community-based environmental monitoring method.

Community Products Development Workshop...

•On November 1, 2007 Elders Team and Forest Team members met to work together on the development of community products from this project. Some of the exciting community products being developed by team members are a book and a DVD (see other side of this update for a sneak peak of the book). These products are expected to be complete in the spring of 2008. ET and FT were really excited for this opportunity to share and learn with Mr. McKay's grade 4,5,6,7 class from Eugene Joseph Elementary School.

~Some Pictures from Forest Team Members... a book sharing the knowledge, stories, and photos of ET and FT members will be made in 2008. The photos below are a glimpse of some of the FT's photos taken on the land showing different aspects of environmental health.

John Alexis

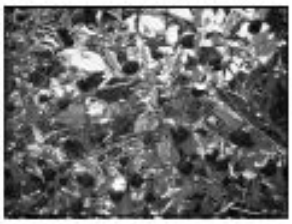
Michael Aslin

Doreen Austin

Harry Austin

Isaac Felix

Mary-Ann Hanson



Geraldine Joseph

Gloria Johnnie

Mary Lebrun

George Morris

Violet Prince

Nathaniel Tom

Figure 5.10- Forest Team Community Update Issue 4, November 2008

Final Project Update

Issue 4, November 2008

~Project information~

From the project:
Evolving Co-management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest

This community-based environmental monitoring project worked with two groups of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en Nation community members working on this project are:

- the Forest Team (FT)
- the Elders Team (ET)

Together with the FT and ET, we are developing a community- based environmental monitoring method that incorporates the needs, beliefs, and concerns of the community. This project is focused on developing environmental monitoring method for ***hunting moose~ huda ha'hut'en, trapping beaver~ tsa ha tsayilh sula, fishing salmon~ talo ha'hut'en, picking huckleberries~duje hoonayin***, and ***harvesting soapberries for medicinal use~ yoo ba ningwus hunulht'o***.

Elders & Forest Team Progress Update...

•The 3rd and final Elders and Forest Team meeting was held in Tache on August 20th, 2008.

•At this 3rd meeting, ET and FT members were presented with the Tl'azt'en Nation environmental measures developed during the analysis stage of the project. ET and FT members were presented with the measures, and group discussions took place to ensure that they were accurate and complete. The collaborative verification process that took place at this meeting was thorough and ensured that the Tl'azt'en Nation environmental measures were ready to be applied through a Tl'azt'en Nation community-based environmental monitoring method.

Above: Pictures from the wrap-up celebration dinner, October 16, 2008 in Tache.

Project Wrap-Up Celebration dinner...

•On October 16th, 2008 the project's wrap-up celebration dinner was held in Tache. This dinner marked and celebrated the achievements of the Elders and Forest Team members, and those of the project. It was a special day full of memories and fun, and was the last official event of the project.

•At the wrap-up celebration dinner, ET and FT members completed a final project evaluation, and were presented with applied examples of the Tl'azt'en Nation community-based environmental monitoring method for feedback and review.

•The project's community products, a book and DVD, were presented to ET and FT members at this dinner. The project's book and DVD are also available free of charge to the Tl'azt'en Nation community. Please phone Amelia Stark or Bev John at the John Prince Research Forest (250-996-0028) to receive your copy today!

These are pictures from our wrap-up celebration dinner, which took place on October 16th, 2008 in Tache.

Final community project presentation...

•Once the project's thesis and papers are complete, there will be a final community presentation in early 2009. Stay tuned!!

5.3.4 Project Extension

Our project's extension activities included working with a grade five, six, seven class from the local Tl'azt'en Nation Elementary School, Eugene Joseph, and with the JPRF's *Chuntoh* Education Society. Working with these groups provided a unique opportunity to share the project with Tl'azt'enne youth. Forest and Elders team members were aware of these extension activities, and many were directly involved. Efforts were made to include as much *Dakelh* as possible in these extension materials to promote Tl'azt'en Nation's traditional language with its youth.

Figure 5.11- Mr. McKay's Gr. 5, 6, 7 Class Information Bulletin, November 1, 2007

Mr. McKay's Gr. 5,6,7 Class

Project:
Evolving Co-management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest

~ Project information ~

November 1, 2007

This community-based environmental monitoring project is working with two groups of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en community members working on this project are:

Netso whudilhdzulhne 'ilhozdilne, *Elders Team*

(Betsy Dennis, Doreen Austin, Pierre John, Seraphine Mattess, Willie Mattess, Celestine Thomas, Helen Johnnie, Lizzie Alexis, Mary Lebrun, missing: John Alexis)

Chuntoh 'ilhozdilne, *Forest Team*

John Alexis

Photo not available

Michael Aslin

Doreen Austin

Harry Austin

Isaac Felix

Mary-Ann Hanson

Geraldine Joseph

Gloria Johnnie

Mary Lebrun

George Morris

Violet Prince

Nathaniel Tom

~ Objective of the Project ~

Together with the Elders and Forest Team, we will develop a Tl'azt'en community-based environmental monitoring method that incorporates the needs, beliefs, and concerns of the community. This project is focused on developing an environmental monitoring method for the following traditional use activities:

Jeyo 'uká'ut'én~ *Bull moose he is hunting*

Hunting Moose

Tsa 'uká'ut'én~ *Beaver he is trapping*

Trapping Beaver

Talo ba te'unle~ Salmon for he/she sets net

Fishing Salmon

Duje oona yin~ *Huckleberries she is picking*

Picking Huckleberries

Yoo ha ningwus 'uleh~ *Medicine for soapberries she makes*

Harvesting Soapberries for Medicinal Use

Figure 5.12 *Chuntoh* Education Society Information Bulletin, May 2008

Chuntoh Education Society

Project:
Evolving Co-management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest

~ Project information ~

May 2008

This community-based environmental monitoring project is working with two teams of Tl'azt'en Nation community members to create a way to monitor and protect important plants and animals on the John Prince Research Forest, a part of Tl'azt'en territory.

The two groups of Tl'azt'en community members working on this project are:

Netso whudilhdzulhne 'ilhozdilne, *Elders Team*

(Betsy Dennis, Doreen Austin, Pierre John, Seraphine Mattess, Willie Mattess, Celestine Thomas, Helen Johnnie, Lizzie Alexis, Mary Lebrun, missing: John Alexis)

Chuntoh 'ilhozdilne, *Forest Team*

John Alexis *Michael Aslin* *Doreen Austin* *Harry Austin* *Isaac Felix* *Mary-Ann Hanson*

Geraldine Joseph *Gloria Johnnie* *Mary Lebrun* *George Morris* *Violet Prince* *Nathaniel Tom*

~ Objective of the Project ~

Together with the Elders and Forest Team, we will develop a Tl'azt'en community-based environmental monitoring method that incorporates the needs, beliefs, and concerns of the community. This project is focused on developing an environmental monitoring method for the following traditional use activities:

Jeyo 'uká'ut'én~ *Bull moose he is hunting*

Hunting Moose

Tsa 'uká'ut'én~ *Beaver he is trapping*

Trapping Beaver

Talo ba te'unle~ Salmon for he/she sets net

Fishing Salmon

Duje oona yin~ *Huckleberries she is picking*

Picking Huckleberries

Yoo ha ningwus 'uleh~ *Medicine for soapberries she makes*

Harvesting Soapberries for Medicinal Use

CHAPTER 6- THESIS OUTCOMES AND CONCLUSIONS

This project's research process, findings and products support the application of a CBEM system on the JPRF. I addressed my first central research objective by developing and evaluating a measures development framework that used a range of community-based methods. Through repeated and systematic evaluations with project participants the community-based process for developing, identifying, and verifying Tl'azt'en environmental measures evolved to better meet the project goals and provide guidance to other CBEM initiatives. Sustained FT and ET member participation and a 0% rate of attrition reaffirm our community-based approach and our adaptation of culturally relevant research methods.

I identified and verified 252 Tl'azt'en environmental measures, thus achieving the second central research objective. Specifically, we developed 39 measures for *Talo ha'hut'en* – fishing salmon, 69 measures for *Huda ha'hut'en* – hunting moose, 31 measures for *Tsa ha tsayilh sula* – trapping beaver, 33 measures for *Duje hoonayin* – picking huckleberries, 26 measures for *Yoo ba ningwus hunult'o* – gathering soapberries for medicinal use, 36 measures for monitoring environmental change across the Tl'azt'en Nation traditional territory, and 18 measures for monitoring adherence to Tl'azt'en traditional environmental land use methods and principles.

As the final step in my research, five applied CBEM prototypes and corresponding mocked examples were developed and evaluated. These prototypes were developed for each traditional use activity, using the most frequently coded measures. The prototypes demonstrated a field testable format, thus serving as a starting point for the next phase of this research. Elders Team and Forest Team participants reported that

the applied format was useful and provided suggestions for improvement. The participant evaluations of CBEM prototypes provided important guidance for the implementation of Tl'azt'en environmental measures that I identified in this research.

A number of opportunities and challenges involved with CBEM were identified through the process of developing Tl'azt'en environmental measures and its respective framework; these will contribute to the improvement of cross-cultural partnerships, including Tl'azt'en CBEM. One significant challenge was engaging 19 Tl'azt'en community team members over the course of the 15-month project. Meaningful engagement of the Tl'azt'en team members required strong project organization, communication, and commitment. Our measures development framework provided team members with a clear methodological process and a defined set of goals that marked the project's progress and achievements. Having numerous research events facilitated the development of meaningful relationships and strong working teams. We met the challenge of maintaining a transparent research process by continually communicating with project team members and by distributing research products to the broader community. Team members received numerous written and oral updates throughout the course of the project; newsletters documenting findings and progress were distributed to the broader Tl'azt'en community. Other research products, including a book and DVD, as well as the involvement of a local elementary school class also enhanced the transparency of the research process.

This research project provided a number of opportunities for the growth and empowerment of Tl'azt'en community members. As discussed in Chapter 2, we fostered independence, personal and professional development, and relationship building.

Extension activities provided team members with the opportunity to work and share knowledge with Tl'azt'en youth (Section 5.3.5). Team members presented their contributions to the project book (Figure 5.1) to a local grade 5, 6, 7 class at the community product development workshop. This class also played a role in the project by contributing art work for the book. Informing youth of traditional practices and values was important to ET and FT members. The lead researcher contributed to the curriculum of a youth focused *Chuntoh* Education Society overnight camp. Such extension activities facilitated invaluable learning and teaching opportunities beyond the scope of the research project. The knowledge of team members and project findings were shared through community products such as a collaboratively produced book (Figure 5.1) and DVD (Figure 5.2). These products were designed to be accessible to a broad audience and were focused on Tl'azt'en TEKMS, rather than the theory or methods of CBEM. The book and DVD will be a valuable teaching and learning tool for the Tl'azt'en community. Ultimately, the lessons learned through our project's challenges and opportunities will contribute to building long-term local support for Tl'azt'en CBEM on the co-managed JPRF.

In addition to the direct findings and application of my research, the Tl'azt'en C&I framework has been furthered by the results and achievements summarized above. The future application of Tl'azt'en CBEM will further the active involvement of the Tl'azt'en Nation community and their TEKMS in the co-management of the JPRF. Ultimately, this will contribute to culturally and environmentally sustainable management practices on the JPRF and to the success of a vibrant and equitable co-management arrangement.

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APPENDIX A

A.1- Quantitative summary of the total number of Tl'azt'en environmental measures summarized by traditional use activity, critical local value (CLV), and method type.

Traditional Use Activity	Critical Local Value	Measures			
		Method type			Total
		Quantitative	Qualitative	Both	
Fishing Salmon	Maintain viable salmon habitat in Stuart Lake	5	3	3	11
Hunting Moose	Maintain viable moose (ungulate) habitat	4	13	0	17
Trapping Beaver	Maintain viable beaver (fur-bearer) habitat	7	11	0	18
Picking Huckleberries	Maintain viable huckleberry habitat	1	5	5	11
Gathering Soapberries for Medicinal Use	Maintain soapberry Habitat	3	3	1	7
Total		20	35	9	64

A.2- Quantitative summary of resultant Tl'azt'en environmental measures corresponding to each traditional use activity's abundance related critical local value (CLV).

Traditional Use Activity	Critical Local Value	Measures			
		Method type			Total
		Quantitative	Qualitative	BOTH	
Fishing Salmon	Maintain viable salmon abundance in Stuart Lake	12	0	0	12
Hunting Moose	Maintain viable moose (ungulate) population	10	8	0	18
Trapping Beaver	Maintain viable beaver (fur-bearer) population	5	3	2	10
Picking Huckleberries	Maintain viable huckleberry abundance	2	4	3	9
Gathering Soapberries for Medicinal Use	Maintain soapberry abundance	2	2	1	5
Total		31	17	6	54

A.3- Quantitative summary of resultant Tl'azt'en environmental measures corresponding to each traditional use activity's health and quality related critical local value (CLV).

Traditional Use Activity	Critical Local Value	Measures			
		Method type			Total
		Quantitative	Qualitative	BOTH	
Fishing Salmon	Maintain health & quality of salmon in Stuart Lake	8	8	0	16
Hunting Moose	Maintain health & quality of moose (ungulate) population	9	24	1	34
Trapping Beaver	Maintain health & quality of beaver (fur-bearer) population	2	4	0	6
Picking Huckleberries	Maintain huckleberry quality	3	4	5	12
Gathering Soapberries for Medicinal Use	Maintain soapberry quality	3	4	0	7
Total		25	44	6	75

A.4- Summary of resultant Tl'azt'en environmental measures related to monitoring change across Tl'azt'en Nation's traditional territory and adherence to Tl'azt'en traditional environmental land use methods and principles

Critical Local Value	Measures				
	Thematic topic	Method type			Total
		Quantitative	Qualitative	Both	
Consider the impacts of logging	Logging	0	2	0	2
Consider the impacts of herbicides and pesticides	Herbicides; pesticides	2	2	0	4
Address forest health issues	Mountain pine beetle	0	3	0	3
Restore or remediate damaged or degraded sites	Closed mercury mine	0	6	0	6
Manage access	Road development	0	1	0	1
Conduct environmental monitoring	Temperature; late seasons; snowpack; rainfall; weather conditions	3	12	0	15
Protect water quality for human consumption, for fish, and for wildlife	Water quality of lakes; Water quality of rivers; Water quality of groundwater	3	3	0	6
Incorporate and apply traditional land management practices	Fire, no waste of hunted animals, no fishing for sport; hunting/trapping selectivity; rest and rotation of harvest areas based on animal/population health; hunting	6	6	0	12
Incorporate and apply traditional beliefs	Respect for all life and land, reciprocity	3	3	0	6
		17	38	0	55

APPENDIX B

B.1- Quantitative summary of initial and final percent agreement scores for our inter-rater reliability tested transcripts

Transcript Number.	Number of analysts	Initial Agreement	Final Agreement
1	5	N/A- pilot	N/A- pilot
2	5	80.95%	100%
3	5	74.50%	100%
4	6	52.63%	100%
5	6	58.8%	100%
6	6	64.29%	100%
7	6	31.58%	100%
8	3	34.25%	100%
9	3	60.00%	100%
10	3	35.59%	100%
11	3	7.69%	100%
		Average= 50.03%	Average= 100%

APPENDIX C

C.1- Forest Team Member Invitation Package, June 2007

Forest Team
~Invitation Package~

To participate in the project:

Evolving Co-Management Practice:
Community-based Environmental Monitoring with
Tl'azt'en Nation on the John Prince Research Forest

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

Tl'azt'en Nation and the University of Northern British Columbia
Community-University Research Alliance
Partnering for Sustainable Resource Management

TL'AZT'EN NATION

UNBC • JOHN PRINCE RESEARCH FOREST • TL'AZT'EN NATION •

Fast Facts

On this research project_____

If I am interested in participating as a member in this research project, what do I need to do, and when?

- Review this invitation package
- **Come to our Welcome information luncheon in Tache on July 24th, 2007 at the Elders Centre from 10am-1pm where you will:**
    - meet the researchers (Deanna Yim, Mrs. Amelia Stark, Annie Anatole)
    - hear more about this project and what it involves,
    - learn about the community products that will develop from this research
    - ask questions
    - decide whether you would like to accept our invitation to be a member in this project.

Who is supporting this research project?

- Tl'azt'en Nation
- John Prince Research Forest (JPRF)
- Community-University Research Alliance (CURA)
- University of Northern British Columbia (UNBC)
- BC Real Estate Foundation

What is the timeline for this project?

- The specific timeline of this project will be jointly created between Deanna and those members who commit to participating in this project.
- The entire project is expected to be completed by May 2008.

Why was I selected to be a member of this research project?

Because your peers identified you as a member of the Tl'azt'en community who:

- is **knowledgeable** about traditional activities: hunting, trapping, fishing, medicinal plant gathering, and/or berry picking.

- is **respected** as an expert and has been nominated by a minimum of two Tl'azt'en community members who have identified you as an expert.

- is **representative** of important groups of people in the community.

What is asked of Forest Team members?

- Attend 3 gatherings in Tache or Cinnabar, which will involve photography, storytelling, a focus group, group discussions, and lunch. All meals and transportation to these events will be provided.
- Go out on the land with cameras to capture photos that can help to communicate my knowledge and expertise. (Training, cameras, and other materials will be provided)
- Participate in an Elders Workshop Retreat at Cinnabar (optional)
- Verify your transcripts
- Review research findings (optional)
- Attend a celebration/thank-you dinner in Tache at the completion of this project (optional)

Why should I participate as a Forest Team member?

- I will share my knowledge and expertise with others through community products such as: a DVD, a photobooklet, community photopamphlets, newsletters; and, academic products such as a thesis, papers, and presentations
- I will receive a digital camera and training on how to use the camera for environmental monitoring purposes
- Contribute to the development of a Tl'azt'en community-based environmental monitoring that will be used to help protect the health of plants and animals on the JPRF
- Contribute to improving co-management success

Who can I talk to for more information?

- **Deanna Yim**
  Phone: (250) 960-6357
  Fax: (250) 960-6533
  Email: deannayim@yahoo.ca

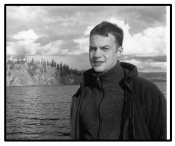
- **Ms. Bev John**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: bev-jprf@fsjames.com

- **Mrs. Amelia Stark**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: amelia-jprf@fsjames.com

- **Annie Anatole**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: annie_anatole@hotmail.com

Who else is involved with this project?

Dr. Erin Sherry



Dr. Chris Johnson

Sue Grainger

Dexter Hodder

Letter of Invitation

Hello, my name is Deanna Yim and I am leading this research project titled, "Evolving Co-Management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest." I am a graduate student at the University of Northern British Columbia (UNBC). I am doing this research as a part of the Community-University Research Alliance (CURA) project between Tl'azt'en Nation and UNBC.

I invite you, on behalf of myself and a larger team of research partners, to participate in this research project. This project is supported by CURA, and is part of the Improved Partnerships Stream. Research is supervised by Ms. Beverly John, Ms. Susan Grainger, Mrs. Amelia Stark and Mr. Dexter Hodder of the John Prince Research Forest, Dr. Chris Johnson of UNBC, and Dr. Erin Sherry of the BC Integrated Land Management Bureau.

We are exploring ways to evaluate the co-management of the John Prince Research Forest (JPRF), through community-based environmental monitoring. We hope our research will provide approaches that Tl'azt'en Nation and the JPRF can use to monitor and assess the health of important plants and animals.

We will be focusing on developing ways to measure the health of specific plants and animals from the following traditional use categories of hunting, trapping, fishing, medicinal plants, and berries. We will be using exciting methods such as photography, storytelling, forest walks, outdoor activities, an overnight Elders retreat at Cinnabar, and group discussions to identify and develop Tl'azt'enne measures of plant and animal health. Ultimately, we hope to develop an actual monitoring tool that is created from Tl'azt'en traditional knowledge and wisdom and that can be used by Tl'azt'en to monitor the health of plants and animals on the JPRF and perhaps other parts of your traditional territory.

To carry out this study, we invite you to consider participating in our Forest Team. This will involve 3 gatherings in Tache or Cinnabar that involve a 2-3 hour focus group, an outdoor activity,

and lunch. Meals and transportation to these meetings will be provided. It is impossible to compensate experts such as yourself for the full value of your time; however, each person's contributions will be recognized with gifts. Findings will be shared through community products, such as a DVD movie, a photo booklet, community photo pamphlets; a community presentation; JPRF and CURA newsletters, updates and website; as well as academic works. Results will help the JPRF better understand, respect, and incorporate Tl'azt'en perspectives and methods of monitoring the health of plants and animals.

Ms. Beverly John, Mrs. Amelia Stark, or I will contact you by July 31st by phone or in person, to answer any questions about the research and find out if you would like to attend a welcome information session introducing the people, methods, and objectives involved in this study. I look forward to hopefully seeing you soon at the Welcome information luncheon in Tache at the Elders Centre on July 24th.

Sincerely yours,

Deanna Yim,
Graduate Student,
University of Northern BC

Bev John,
CURA Research Coordinator,
Tl'azt'en Nation

Annie Anatole,
CURA/JPRF Research Assistant,
Tl'azt'en Nation

Amelia Stark,
CURA Ecotourism Stream leader,
Tl'azt'en Nation

Sue Grainger
CURA co-investigator, &
JPRF manager

C.2- Elders Team Member Invitation Package, June 2007

Elders Team
~ Invitation Package~

To participate in the project:

Evolving Co-Management Practice:
Community-based Environmental Monitoring with
Tl'azt'en Nation on the John Prince Research Forest

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

Tl'azt'en Nation and the University of Northern British Columbia
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Fast Facts

On this research project

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    - meet the researchers (Deanna Yim, Mrs. Amelia Stark, Annie Anatole)
    - hear more about this project and what it involves,
    - learn about the community products that will develop from this research
    - ask questions
    - decide whether you would like to accept our invitation to be a member in this project.

Who is supporting this research project?

- Tl'azt'en Nation
- John Prince Research Forest (JPRF)
- Community-University Research Alliance (CURA)
- University of Northern British Columbia (UNBC)
- BC Real Estate Foundation

What is the timeline for this project?

- The specific timeline of this project will be jointly created between Deanna and those members who commit to participating in this project.
- The entire project is expected to be completed by May 2008.

Why was I selected to be a member of this research project?

Because your peers identified you as a member of the Tl'azt'en community who:

- is **knowledgeable** about traditional activities: hunting, trapping, fishing, medicinal plant gathering, and/or berry picking.
- is **respected** as an expert and has been nominated by a minimum of two Tl'azt'en community members who have identified you as an expert.
- is **representative** of important groups of people in the community.

What is asked of Elders Team members?

- Attend a two day, one night retreat in late summer (August 20 & 21) at Cinnabar which will involve storytelling, photography, group discussions, and outdoor activities.
- All meals, transportation, and accommodations to this event will be provided.
- Elders are encouraged to invite their families to participate in evening activities.
- Verify your transcripts
- Review research findings (optional)
- Attend a celebration/thank-you dinner in Tache at the completion of this project (optional)

Why should I participate as an Elders Team member?

- I can share my knowledge and expertise with others through community products such as: a DVD, a photobooklet, community photopamphlets, newsletters; and, academic products such as a thesis, papers, and presentations
- Contribute to the development of a Tl'azt'en community-based environmental monitoring method that will be used to help protect the health of plants and animals on the JPRF
- Contribute to improving co-management success

Who can I talk to for more information?

- **Deanna Yim**
  Phone: (250) 960-6357
  Fax: (250) 960-6533
  Email: deannayim@yahoo.ca

- **Ms. Bev John**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: bev-jprf@fsjames.com

- **Mrs. Amelia Stark**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: amelia-jprf@fsjames.com

- **Annie Anatole**
  Phone: (250) 996-0028
  Fax: (250) 996-0038
  Email: annie_anatole@hotmail.com

Who else is involved with this project?

Dr. Erin Sherry

Dr. Chris Johnson

Sue Grainger

Dexter Hodder

Letter of Invitation

Hello, my name is Deanna Yim and I am leading this research project titled, "Evolving Co-Management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest." I am a graduate student at the University of Northern British Columbia (UNBC). I am doing this research as a part of the Community-University Research Alliance (CURA) project between Tl'azt'en Nation and UNBC.

I invite you, on behalf of myself and a larger team of research partners, to participate in this research project. This project is supported by CURA, and is part of the Improved Partnerships Stream. Research is supervised by Ms. Beverly John, Ms. Susan Grainger, Mrs. Amelia Stark and Mr. Dexter Hodder of the John Prince Research Forest, Dr. Chris Johnson of UNBC, and Dr. Erin Sherry of the BC Integrated Land Management Bureau.

We are exploring ways to evaluate the co-management of the John Prince Research Forest (JPRF), through community-based environmental monitoring. We hope our research will provide approaches that Tl'azt'en Nation and the JPRF can use to monitor and assess the health of important plants and animals.

We will be focusing on developing ways to measure the health of specific plants and animals from the following traditional use categories of hunting, trapping, fishing, medicinal plants, and berries. We will be using exciting methods such as photography, storytelling, forest walks, outdoor activities, an overnight Elders retreat at Cinnabar, and group discussions to identify and develop Tl'azt'enne measures of plant and animal health. Ultimately, we hope to develop an actual monitoring tool that is created from Tl'azt'en traditional knowledge and wisdom and that can be used by Tl'azt'en to monitor the health of plants and animals on the JPRF and perhaps other parts of your traditional territory.

To carry out this study, we invite you to consider participating in our Elders Resource Team. This will involve a two day, one night retreat at Cinnabar. Meals, transportation, and accommodations to this retreat will be provided. It is impossible to compensate experts such as yourself for the full value of your time; however, each person's contributions will be recognized with an honorarium. Findings will be shared through community products, such as a DVD movie, a photo booklet, community photopamphlets; a community presentation; JPRF and CURA newsletters, updates and website; as well as academic works. Results will help the JPRF better understand, respect, and incorporate Tl'azt'en perspectives and methods of monitoring the health of plants and animals.

Ms. Beverly John, Mrs. Amelia Stark, or I will contact you by July 31st, by phone or in person, to answer any questions about the research and find out if you would like to attend a welcome information session introducing the people, methods, and objectives involved in this study. I look forward to hopefully seeing you soon at the Welcome information luncheon in Tache at the Elders Centre on July 24th.

Sincerely yours,

Deanna Yim,
Graduate Student,
University of Northern BC

Bev John,
CURA Research Coordinator,
Tl'azt'en Nation

Annie Anatole,
CURA/JPRF Research Assistant,
Tl'azt'en Nation

Amelia Stark,
CURA Ecotourism Stream leader,
Tl'azt'en Nation

Sue Grainger
CURA co-investigator, &
JPRF manager

APPENDIX D- Forest Team member commitment to the Forest Team

Commitment to the Forest Team

I, _____(name) understand and agree that as a valued member of the Forest Team, that I am expected to attend all three Forest Team gatherings and to produce photographs that will contribute to the development of a Tl'azt'en community-based environmental monitoring method. If circumstances arise which prevent me from attending one of these gatherings I will make time to meet with Deanna to make up for the time that I missed. I,_____(name) understand that I will return the digital camera, camera case, digital memory card, battery charger, and rechargeable batteries if I do not fulfill my commitment as a Forest Team member.

Date:_____

Signature:_____

APPENDIX E- Forest and Elders Team Member Updates

E.1- Forest Team Member Update August 2007

Forest Team member

August 2007

How has your experience been so far?

Dear Forest Team Member,

We hope that you are enjoying learning how to use the cameras on the land to take pictures related to protecting the health of moose (hunting), beaver (trapping), salmon (fishing), soapberries (medicinal plant gathering), and huckleberries (berry picking). We were wondering how things are going for you and if there is anything that we can do to help! Please let us know if you would like:

- some help learning how to use the camera
- To download and print some photos that you've taken
- To discuss some of the photos that you have taken so far
- A ride to take pictures on the land
- Need a new Forest Team Photo-info Logbook
- Us to help you in any way!

At the SECOND FOREST TEAM meeting on September 20, we would like you to select 3 photos related to the health of the animal or plant in your area(s) of expertise. We realize that this will take a lot of time and thought to select 3 photos from all of your amazing photographs, and so would like you to know this well in advance so that you can keep this in mind as you take photos over the next month.

We hope things are going well for you and look forward to talking with you about your experience soon!

Sincerely,

Deanna Yim

Reminder:

The Elders Team is having their retreat at Cinnabar on August 20 and 21. This event is optional for Forest Team members. If you are able to come, it would be great to have you there. Please contact us for more information.

NEXT Forest Team meeting:

September 20, 2007

Please let us know if you are unable to attend on this date

Please feel free to contact us!

Deanna Yim~
deannayim@yahoo.ca

Bev John~
bev-jprf@fsjames.com

Amelia Stark~
ameliajprf@fsjames.com

Annie-Jean Anatole~
annie-jprf@fsjames.com

Phone: 250-996-0028 (JPRF)

E.2- Elders Team Member Update, September 2007

Elders Team member

September 2007

IMPORTANT Information!

Dear Elders Team Member,

Each and every member of our Elders Team has made invaluable contributions to this project. Because of the rich amount of information that has been shared at the 1st and 2nd Forest Team meetings and at the Elders Team retreat, it is going to take more time than I originally anticipated to: transcribe, translate, analyze, and verify your information, as well as to apply a selection of the community-based environmental measures you generated. All of the above steps MUST be taken before we can proceed with the 3rd and final Forest Team meeting. The 3rd Forest Team meeting was originally planned to take place on Nov.1, 2007. Because of the time required to thoughtfully and rigorously conduct the above steps, I would like to change this date from November 1st to February 2008.

This change of events has given us the opportunity to hold a workshop for both Forest and Elders Team members. The focus of this workshop is to further develop this project's community products. Forest Team members will select & verify which pictures they would like to contribute to the Photovoice booklet and select & verify the stories that they would like to share about each of their photos. Forest and Elders Team members will work together to develop the vision of the DVD (produced from footage of this project's events) and to share their knowledge and experiences in this project with each other and with Mr. McKay's gr. 4/5/6/7 class. This workshop is an optional event for both Forest and Elders Team members, but members are encouraged to come and share in this time together.

Community product workshop: November 1, 2007
Location: Tache

Please feel free to contact me if you have any questions about the community product workshop. I deeply appreciate your understanding and look forward to seeing you soon!

Sincerely,

E.3- Forest Team Member Update, September 2007

Forest Team member

September 2007

IMPORTANT Information!

Dear Forest Team Member,

Each and every member of our Forest Team has made invaluable contributions to this project. Because of the rich amount of information that you shared at the 1st and 2nd Forest Team meetings and at the Elders Team retreat, it is going to take more time than I originally anticipated to: transcribe, translate, analyze, and verify your information, as well as to apply a selection of the community-based environmental measures you generated. All of the above steps MUST be taken before we can proceed with the 3rd and final Forest Team meeting. The 3rd Forest Team meeting was originally planned to take place on Nov. 1, 2007. Because of the time required to thoughtfully and rigorously conduct the above steps, I would like to change this date from November 1st to February 2008. I understand that this timeline is different from the schedule of events that was originally given to you and I sincerely apologize for any inconvenience that this change may cause.

New date for the 3rd and final Forest Team meeting: February 2008

This change of events has given us the opportunity to hold a workshop for both Forest and Elders Team members. The focus of this workshop is to further develop this project's community products. Forest Team members will select & verify which pictures they would like to contribute to the Photovoice booklet and select & verify the stories that they would like to share about each of their photos. Forest and Elders Team members will work together to develop the vision of the DVD (produced from footage of this project's events) and to share their knowledge and experiences in this project with each other and with Mr. McKay's gr. 4/5/6/7 class. This workshop is an optional event for both Forest and Elders Team members, but members are encouraged to come and share in this time together.

Community product workshop: November 1, 2007
Location: Tache

Please feel free to contact me if you have any questions about the date change or the community product workshop. I deeply appreciate your understanding and look forward to seeing you soon!

Sincerely,

APPENDIX F- Tl'azt'en Nation Band Council Resolution

TL'AZT'EN NATION

P.O. Box 670, Fort St. James, B.C. V0J 1P0 • Phone: 250-648-3212 • Fax: 250-648-3250 • E-mail: tlazten@tlazten.bc.ca

CHIEF AND COUNCIL RESOLUTION

The council of the *TL'AZT'EN NATION*	Date of Duly Convened Meeting			
Ndiz un'a nets' oninai:	**B.C.R. #**	**DAY**	**MONTH**	**YEAR**
Do Hereby Resolve:	0890	19	06	2007

Whereas, the University of Northern British Columbia (UNBC) and Tl'azt'en Nation have jointly developed a successful research proposal through the Community-University Research Alliance (CURA) program of the Social Sciences and Humanities Research Council of Canada;

Whereas, the UNBC and Tl'azt'en Nation jointly manage the John Prince Research Forest through Chuzghun Resources Corporation;

Whereas, the proposed project will involve the employment of Tl'azt'en community members as a research assistant (1 position), participants, as well as provide technical and administrative support to the research;

Whereas, participation in this project will provide the Tl'azt'en community with an opportunity to build capacity and experience in developing equitable partnerships that may be beneficial in future land management of other parts of their traditional territories;

Whereas, research will be conducted according to guidelines and protocols established in the CURA Memorandum of Understanding developed jointly by Tl'azt'en Nation and UNBC steering committee members, as well as follow the Tl'azt'en Nation Guidelines for Research in the Tl'azt'en Territory;

Be it hereby resolved that Tl'azt'en Nation Chief and Council fully support the Project Evolving Co-Management Practice: Community-Based Environmental Monitoring with Tl'azt'en Nation on the John Prince Research Forest, led by Deanna Yim of the University of Northern British Columbia.

☐ Attachments

Quorum (5)

Chief

Councillor

Councillor

Councillor

Councillor

Councillor

Councillor

Councillor