COMPARING ABORIGINAL COMMUNITY-BASED CRITERIA AND

INDICATORS IN FOREST MANAGEMENT PLANNING

by

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A CAUTION TO THE READER

This MScF thesis has been through a semi-formal process of review and comment by at least two faculty members. It is made available for loan by the Faculty of Natural Resources Management for the purpose of advancing the practice of professional and scientific forestry.

The reader should be aware that opinions and conclusions expressed in this document are those of the student and do not necessarily reflect the opinions of the thesis supervisor, the faculty or Lakehead University.

ABSTRACT

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Criteria and indicator (C&I) frameworks have been developed and implemented on national and international scales to measure sustainable forest management. The purpose of this research is to examine the reasons why Indigenous communities would develop local-level criteria and indicator frameworks, what the process is for their development and how they are being used. Criteria and indicators were collected from published and unpublished literature for six First Nation communities. The indicators were reorganized using researcher definitions of institutional, cultural, environmental, social and economic indicators for ease of data analysis. Representatives from each of the case studies were interviewed to provide contextual information about their framework development. Indigenous indicators capture values rooted in traditional knowledge and cultural practices and seek to remedy social issues centred on community well-being. In the last decade the use of C&I in forest management is declining, but C&I still serve as an important tool to collect data and values to measure change and achieving goals, especially at the local level.

Keywords: criteria and indicators, First Nations, sustainable forest management, planning, community well-being, local values, Indigenous worldview, traditional ecological knowledge

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"Life is not easy for any of us, but what of that? We must have perseverance and, above all, confidence in ourselves. We must believe we are gifted for something and that this thing, must be attained." - Marie Currie

Completing this paper has been a 14 year exercise in perseverance and overcoming self-doubt. I would not have been able to do it without a lot of help! I would like to acknowledge my project manager, friends and family who contributed, time, encouragement, motivation, support and love whenever I needed it, even when it was 3am in India. Every bit of it meant a great deal to me. I'd like to specifically acknowledge my husband for always championing me to follow through, picking me up to get back at it when I felt I couldn't anymore and for looking after everything else so that I could write without distraction. Thank you to my three sons, who showed me love, caring and words of encouragement even though they bore the brunt of my time away from home to write and my exhaustion. This is an example that together we can do whatever we set our minds to.

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INTRODUCTION

ABORIGINAL FORESTRY IN CANADA

The Constitution Act of 1867 section 91 states that authority over "Indians and lands reserved for the Indians" resides with the Federal government, while section 92 states that the provincial legislature has authority over all "matters of nature in the province." This jurisdictional divide has complicated the relationship between the Crown and Indigenous[1] peoples (Smith 1995, Parsons and Prest 2003). In this current system, Indigenous peoples' concerns can easily be ignored because of the confusion about which level of government is responsible for Aboriginal issues related to natural resources.

Aboriginal and treaty rights stem from Indigenous peoples' status as the original inhabitants (Smith 2004) with the purpose of protecting fundamental aspects of Aboriginal culture (Macklem 2001); these rights are held by no other group. Aboriginal and treaty rights are recognized in the Constitution Act, 1982 under section 35(1) and Supreme Court of Canada decisions. Section 35 states:

> 35 (1) The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed.
>
> (2) In this Act, the "aboriginal peoples of Canada" includes the Indian, Inuit and Metis people of Canada.

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[1] Indigenous/Aboriginal: collective name for the original peoples of North America and their descendants. (AANDC 2017). The two terms are used interchangeably in the paper.

(3) For greater certainty, in subsection 1 "treaty rights" includes rights that now exist by way of land claim agreements or may be so acquired.

(4) Notwithstanding any other provisions of this Act, the aboriginal and treaty rights referred to in subsection (1) are guaranteed equally to male and female persons.

Due to their unique spiritual, cultural and physical relationship with the land, First Nation peoples should not be seen simply as another stakeholder whose interests in forest management are equal to stakeholders who may be affected by forest management, such as hunters, trappers, and tourists (Smith and Bombay 1995). Several Canadian court decisions have upheld the constitutional protection of Indigenous peoples' rights to the land (Smith 2000). *Calder v. The Attorney-General of British Columbia* in 1973 was the first court case before the Supreme Court of Canada that acknowledged the existence of Aboriginal title. The case reviewed the Aboriginal title claim to historic lands occupied by the Nisga'a people of British Columbia. Based on a technicality, the case was lost but its implications to Canadian law are considered groundbreaking (Salomons 2009). The Calder case became the driver of the federal comprehensive land claim process, the foundation of the Nisga'a land claim, and the first modern treaty in British Columbia, and it set the groundwork for other title claims (Salomons 2009). The Calder decision was furthered in Canadian law by the Supreme Court of Canada decision *Delgamuukw v. British Columbia* (McDonald 2003) in 1997. While Aboriginal and treaty rights were constitutionally protected, the matter of Aboriginal title was defined in the Delgamuukw case. Three characteristics of Aboriginal title have significant impacts on forested lands. They are described by McDonald (2003) as:

1) The right to exclusive use and occupation of the land;
2) The right to choose to what uses the land can be put; and
3) Lands held to Aboriginal title have an inescapable economic component.

Following the Delgamuukw decision, Indigenous communities continued to see infringement of their rights by governments and development proponents and sought resolution from the justice system. Cases like the *Taku River Tlingit v. British Columbia* 2004, *Haida Nation v. British Columbia* 2004, and *Tsilhqot'in Nation v. British Columbia* 2014 continued to challenge what is considered to be appropriate and adequate consultation and further defined the scope of Aboriginal title. The Tsilhqot'in decision was particularly important as it developed a test for Aboriginal title and decided that where title exists, consent from the Aboriginal people who hold it must be given. The test says that "Aboriginal title is based on sufficient, continuous and exclusive occupation by a First Nation prior to European sovereignty and does not bar nomadic and semi-nomadic people from proving an Aboriginal title claim" (Cooper 2014). Aboriginal title may also be established by people who have historically used a particular tract of land without necessarily settling it (Cooper 2014).

What this means for forest management is that consultation must be carried out when land use projects have the potential to negatively impact Aboriginal and treaty rights. Where Aboriginal title has been established, governments must seek consent from Aboriginal communities before development projects can be carried out. The duty to consult also applies where title has been asserted but not verified by the courts (Cooper 2014). Some form of "accommodation" such as compensation may also be required depending on the level of infringement (McDonald 2003).

As First Nation peoples were removed from their traditional lands for colonial development, the relations between them and the Crown became fraught with more conflict and Indigenous peoples began to be seen as barriers to development processes (Mann 2003). This relationship between Indigenous and non-Indigenous peoples is still fraught with conflict (Nikolakis and Nelson 2015, Wyatt et al. 2010).

In 1991 the Royal Commission on Aboriginal Peoples (RCAP) was created by Prime Minister Mulroney. The purpose of the commission was to examine and describe the Aboriginal position in the country as a result of the standoff with the Mohawks of Kanesatake in Oka, Quebec over a municipal proposal to expand a golf course on Mohawk traditional territory (McGregor 2011). The work of the Commission took five years and produced five volumes of reports and a Summary Report (RCAP 1996) calling for a new relationship between Aboriginal and non-Aboriginal people. With respect to forestry, the RCAP recommendations touched on incorporating worldviews, a resource management paradigm shift, confirmation that Aboriginal people are connected to the land for their livelihood, and participation in the forest sector in order to increase their self-sufficiency (McGregor 2011). The challenge now lies in how we integrate the rights of Indigenous peoples within the historical frameworks of natural resource management.

CRITERIA AND INDICATORS IN CANADA

A shift in the forest management paradigm from sustained yield to sustainable forest management (SFM) has changed how we view and value forests. Whereas sustained yield was founded on a steady flow of timber for industry, SFM is founded on

balancing three elements: 1) social, 2) environmental, and 3) economic. With this new goal of achieving sustainability comes a new challenge of measuring our movement towards it. This is where Criteria and Indicator (C&I) frameworks began to be seen as a tool to "assess, monitor and report on the state of forest sustainability" (Karjala and Dewhurst 2003). C&I are also a tool with which baseline data can be collected to describe the present situation in order to be able to determine the effects of resource use (Burford deOliveira 1999). This tool has been used at international, national, provincial and local levels.

This shift to sustainability was felt worldwide after the World Commission on the Environment and Development (WECD), a committee under the United Nations, published "Our Common Future" in 1987, defining "sustainable development" as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: 3(27)). The following UN Conference on Environment and Development in 1992 turned its attention to further defining sustainable development. The commitments made in the Statement of Forest Principles (UN 1992) by nation states led to national and international processes designed to further define sustainable forest management by developing criteria and indicators.

Canada endorsed the concept of sustainable management and set about developing national and provincial C&I initiatives. Some of these initiatives included the development of a national set of criteria and indicators by the Canadian Council of Forest Ministers and the Canadian Model Forest Network, and the adoption of sustainable forest policies in forest management planning provincially (Duinker 2001,

Smith 2010). Canada also participated in the regional Montreal Process for boreal and temperate forests, which resulted in the Santiago Declaration in 1995. The CCFM's national C&I were developed in parallel with the Montreal Process. The United Nations Food and Agriculture Organization (FAO 2001) describe C&I as follows:

> Criteria define the range of forest values to be addressed and the essential elements or principles of forest management against which the sustainability of forests may be assessed. Each criterion relates to a key element of sustainability, and may be described by one or more indicators. Indicators measure specific quantitative and qualitative attributes (and reflect forest values as seen by the interest group defining each criterion) and help monitor trends in the sustainability of forest management over time. Changes in the indicators between periods indicate whether a country is moving towards, or away from, sustainability. Criteria and indicators, at both national and forest management unit level, are tools for monitoring trends and effects of forest management interventions. The ultimate aim of these tools is to promote improved forest management practices over time, and to further the development of a healthier and more productive forest estate.

In addition, to national and regional C&I sets, non-governmental organizations have also developed frameworks. The Centre for International Forestry Research (CIFOR), forest certification programs, such as the Forest Stewardship Council, the International Organization for Standardization (ISO), the Canadian Standards Association, and the Sustainable Forestry Initiative (SFI) offer non-governmental international C&I sets (Wilson 2003, Smith 2006). Forest certification programs are private, voluntary, third-party audited, and developed for industry to promote their wood products as sustainable (Wilson 2003) and to measure their achievement of sustainability goals (Ozinga 2001).

THE CANADIAN COUNCIL OF FOREST MINISTERS

The Canadian Council of Forest Ministers (CCFM) was established in 1985 (Young and Duinker 1998, Apsey 2003) and consists of all federal, provincial and territorial forestry ministers. Their role is to strengthen the national forest sector through policy and initiative development and direction on sustainable forest management. The CCFM put out Canada's first official National Forest Strategy in 1987 focused on commercial forestry; the strategy also recognized the need for forestry to examine a wider breadth of values and benefits to society (Rayner and Howlett 2007). Despite Aboriginal and treaty rights being re-affirmed in the Constitution Act of 1982 just five years prior to the National Forest Strategy, there was no mention of Aboriginal issues or their importance in forest policy (McGregor 2011).

The second CCFM National Forest Strategy 1992-1998 did three things to recognize Indigenous issues: 1) it made specific reference to Aboriginal peoples' participation in the forest sector to enhance cultural and spiritual values and to increase economic development; 2) it made commitments in the strategy as a result of the Montreal Process to develop a national set of indicators to measure our achievement of sustainable management; and 3) it called for the development of an Aboriginal Forest Strategy (Duinker 2001, CCFM 2006, McGregor 2011). Although there was criticism that the strategy was not adequately implemented, the commitment to C&I was solidified.

The first C&I set was completed in 1995 designed with criteria, elements and indicators. It consisted of six criteria with underlying elements and 83 indicators (CCFM 1997). The six criteria were:

1. Conservation of biological diversity (three elements);
2. Maintenance and enhancement of ecosystem condition and productivity (three elements);
3. Conservation of soil and water resources (two elements);
4. Forest ecosystem contributions to global ecological cycles (five elements);
5. Multiple benefits (four elements); and
6. Accepting society's responsibility for sustainable development (five elements).

An Aboriginal criterion was advocated by the National Aboriginal Forestry Association (NAFA; Bombay et al. 1995), but in the end the CCFM decided to incorporate Aboriginal issues under criterion six with two elements and five indicators specifically addressing Aboriginal and treaty rights and participation by Aboriginals. Those indicators were:

6.1.1   Extent to which forest planning and management processes consider and meet legal obligations with respect to duly established Aboriginal and treaty rights.
6.2.2   Extent to which forest management planning takes into account the protection of unique or significant Aboriginal social, cultural or spiritual sites.
6.2.3   Number of Aboriginal communities with a significant forestry component in the economic base and diversity of forest use at the community level
6.2.4   Area of forest land available for subsistence purposes
6.2.5   Area of Indian reserve lands under integrated management plans.

The National Forest Strategy 1998-2003 had some of the strongest consideration of Aboriginal people in forestry of all the strategies. This can be credited in part to the conclusion of RCAP in 1996 and recommendations made in its final report, the lobbying by NAFA, which was a member of the National Forest Strategy Coalition that drafted these strategies, and the affirmation of Aboriginal and treaty rights by the Supreme Court of Canada in cases that were decided up to 2003. The most current National

Forest Strategy is from 2008 and is considerably lacking on the subject of Aboriginal

issues. It highlights partnerships with Aboriginal peoples in the forest sector but lacks

detail in the discussion around Aboriginal and treaty rights present in previous strategies

(McGregor 2011).

The C&I set was evaluated in 2001 against new science, new technologies for

data collection and the experience gained from five years of implementation. The

resulting revised set includes six criteria with underlying elements and 46 indicators

(CCFM 2003). The six criteria are now called:

1. Biological diversity (three elements and eight indicators);
2. Ecosystem condition and productivity (five indicators);
3. Soil and water (three indicators);
4. Role in global ecological cycles (one element and four indicators);
5. Economic and social benefits (three elements and 13 indicators); and
6. Society's responsibility (five elements and 13 indicators).

Indicators were condensed to focus on those most relevant and measurable.

Criterion six continues to hold the elements and indicators addressing Aboriginal issues;

however, the number of indicators decreased from five to three. The new indicators are:

6.1.1 Extent of consultation with Aboriginals in forest planning and in the
       development of policies and legislation related to forest management;
6.1.2 Area of forested land owned by Aboriginal peoples; and
6.2.1 Area of crown forest land with traditional land use studies.

National reports on the status of Canada's C&I have been published twice, once

in 2000 and the other in 2006 to show how the commitment to sustainable forest

management was being met. As of 2018 (CCFM), the framework has remained

unchanged from that of 2003. It was considered a useful tool in measuring the objectives

of the national forest strategies, but, as mentioned earlier, there has been no updated

National Forest Strategy since 2008.

Natural resources management is operationalized at the local level. In order to

evaluate sustainability at this scale, it is important to develop, in addition to national

C&I frameworks, regional and local indicators. Before exploring how to connect

Indigenous communities and local level C&I, the next few sections explore the

development of these indicators in provincial forest management, the Canadian Model

Forest Program, and forest certification systems.

CRITERIA AND INDICATORS IN PROVINCIAL FOREST MANAGEMENT

Through the CCFM, each province and territory has provided support for the

concept of sustainable forest management and the development of the national C&I

framework. Some provinces have gone a step further and incorporated C&I into forest

policy. C&I have been endorsed by the British Columbia, Ontario and Newfoundland

governments and implemented through forest management planning (CCFM 2008).

Other provinces have different mechanisms for reporting their sustainability goals; for

example, state of the forest reporting is required in Nova Scotia (NSDNR 2017).

In Ontario, the Crown Forest Sustainability Act (1994) is the key piece of

legislation for forest management. It describes the legal framework under which forestry

is carried out in the province. Section 6 acknowledges that the Act cannot "abrogate,

derogate from or add to any aboriginal or treaty rights that is recognized and affirmed by

section 35 of the Constitution Act, 1982." Part of that legal framework outlines the

mandatory incorporation of sustainability and forest objectives into forest management

planning in sections 68 (3)(c), 68 (3)(d) and 68(5)(b). These objectives are a reflection

of the C&I developed by the CCFM. Three of the past Forest Management Planning

Manuals (1996, 2009, 2017) have addressed these requirements through "Indicators of

Objective Achievement" (Table A3) and have tasked planning teams with completing

tables showing qualitative and quantitative management objects with their indicators.

Requirements to include First Nations and Métis in the planning process are described in

several sections of the FMPM, particularly in Part A, Section 3, First Nation and Métis

Community Involvement and Consultation in Forest Management Planning (OMNRF

2017), providing a mechanism to develop local level criteria and indicators through

Aboriginal community participation.

THE CANADIAN MODEL FOREST PROGRAM

By 2007, the Model Forest Program was finished, but some members continued

the work as a not-for-profit organization (IFMN 2017) with seven remaining model

forests. In 2017, as a result of insufficient funding, the Canadian Model Forest Network

announced that the network would be dissolved that summer.

In the 1990s the Canadian Forest Service developed the Model Forest approach

to examine the concepts of sustainable forest management on the landscape. Fourteen

locations across the country were selected as "living laboratories" (IMFN date

unknown). Each of the Canadian model forests was unique in its landscape, in the

research that is conducted and in the partnerships it has formed with local groups, but

each does have a common goal of developing forward thinking approaches to

sustainable forest management. Key goals of the program were to build consensus,

involve local people including Aboriginal people, and collaborate between governments, researchers and industry (Naysmith 2003).

The model forests provided the ideal arena to develop indicators based on the CCFM C&I. The local level scale, the diversity in forest areas and the variety of forest users helped to develop indicators. In 2000, during the second phase of the Model Forest Network, a user's guide published the work done on creating local level C&I. (Smith 2010).

FOREST CERTIFICATION PROGRAMS

Wilson (2003) describes forest certification as having its beginnings in concern over the sustainable management of wood sourced from tropical rainforests; this initial concern expanded to include the forestry practices in temperate and boreal forests. Certification systems are market based, voluntary, third party verified, and designed to reassure consumers that the forest products they purchase come from sustainably managed forests. They are designed to provide reassurance by setting management standards which, if met, lead to wood products being stamped with an eco-certification label as a visual cue to consumers. Ozinga (2001) argues there are several reasons why companies choose to be certified by one of the several certification programs: to improve forest sustainability through good management, to gain access to global markets, to promote wood as a renewable resource, or to charge a premium for certified products.

Not only are their standards to be met, certification programs also have independent third-party audits to assess the achievement of their standards; these audit

reports are, at least in summary form, available to the public. There is also chain of custody reporting to ensure wood products are tracked throughout the system from harvest to delivery to the consumer.

In Canada there are three certification programs: Canadian Standards Association (CSA), Forest Stewardship Council (FSC) and the Sustainable Forest Initiative (SFI). Each of the programs is based on principles of sustainable forestry and conserving biodiversity. According to NRCan (2017), as of 2016 Canada had 168 million hectares or 48% of the country's forest independently certified.

The Forest Stewardship Council (FSC) is an international certification body that formed in Toronto, Canada in 1993 with a Canadian working group set up in 1996 (Smith 1998, Wilson 2003). According to the Forest Stewardship Council Canada website (2018), FSC is the only certification program that consults with Aboriginal people for the purpose of protecting their rights.

The three regional working standards being used in Canada—the Maritimes Standard, the British Columbia Standard and the National Boreal Standard—are being replaced by one national standard, following a revision of FSC's Principles and Criteria (P&C). With the new P&C, International Generic Indicators have been developed which are being adopted or adapted for national standards. For Principle 3, Indigenous People's Rights, the IGIs are:

> 3.1 The Organization shall identify the Indigenous Peoples that exist within the Management Unit or those that are affected by management activities. The Organization shall then, through engagement with these Indigenous Peoples, identify their rights of tenure, their rights of access to and use of forest resources and ecosystem services, their customary rights and legal rights and obligations that apply within the Management Unit. The Organization shall also identify areas where these rights are

contested.

3.2 The Organization shall recognize and uphold the legal and customary rights of Indigenous Peoples to maintain control over management activities within or related to the Management Unit to the extent necessary to protect their rights, resources and lands and territories. Delegation by Indigenous Peoples of control over management activities to third parties requires Free, Prior and Informed Consent.

3.3 In the event of delegation of control over management activities, a binding agreement between The Organization and the Indigenous Peoples shall be concluded through Free, Prior and Informed Consent. The agreement shall define its duration, provisions for renegotiation, renewal, termination, economic conditions and other terms and conditions. The agreement shall make provision for monitoring by Indigenous Peoples of The Organization's compliance with its terms and conditions.

3.4 The Organization shall recognize and uphold the rights, customs and culture of Indigenous Peoples as defined in the United Nations Declaration on the Rights of Indigenous Peoples (2007) and ILO Convention 169 (1989).

3.5 The Organization, through engagement with Indigenous Peoples, shall identify sites which are of special cultural, ecological, economic, religious or spiritual significance and for which these Indigenous Peoples hold legal or customary rights. These sites shall be recognized by The Organization and their management, and/or protection shall be agreed through engagement with these Indigenous Peoples.

3.6 The Organization shall uphold the right of Indigenous Peoples to protect and utilize their traditional knowledge and shall compensate local communities for the utilization of such knowledge and their intellectual property. A binding agreement as per Criterion 3.3 shall be concluded between The Organization and the Indigenous Peoples for such utilization through Free, Prior and Informed Consent before utilization takes place, and shall be consistent with the protection of intellectual property rights.

The Canadian Standards Association (CSA) Sustainable Forest Management standard was initiated by the Pulp and Paper Association of Canada in response to industry's concern that the FSC standard was too stringent (Gereffi et al. 2009). The CSA national standard, CAN/CSA-Z809-16, was finalized in 1996 (Smith 1998, Wilson 2003). The CSA system was founded on the CCFM's C&I (Smith 1998). This standard acknowledges the constitutional protection of Aboriginal and treaty rights and decisions

of the courts. It outlines requirements for Aboriginal participation in the certification process. It also includes a criterion specific to Aboriginal issues, Criterion Seven, Aboriginal Relations.

The Sustainable Forestry Initiative (SFI) is a North American certification program that was released in 1998 as a result of work done by the American Forest and Paper Association in the United States (Wilson 2003). The current standard for 2015-2019 has 15 objectives and 101 performance measures. Objective #8 is to Recognize and Respect Indigenous Peoples' Rights.

The three certification programs are similar in their promotion of C&I of sustainable development and their inclusion of Indigenous perspectives into their standards.

CONNECTING INDIGENOUS PEOPLE WITH CRITERIA AND INDICATORS

The combination in Canada of the legal requirements from case law, the shift to a sustainable forest management paradigm and the adoption of a policy framework in forestry broadened the scope of forest management and allowed for the participation of multiple stakeholders in the planning process (Beckley and Korber 1995). This multi-stakeholder approach today has the potential to influence planning outcomes that reflect diverse forest values.

A stakeholder is defined by the B.C. Ministry of Forests and Range as "the range of groups and individuals who have a formal or informal stake in resource planning and management decisions, including tenure holders, local resource user and community groups, non-governmental organizations, and research institutions" (Govt. of B.C. 2008)

In forestry, stakeholders typically represent the forest industry, branches of government, environmental groups, the public, tourism industries, hunters, trappers and Indigenous peoples. While the most stakeholders depend on forests for income and leisure, Indigenous people depend on forests for their livelihood and they hold constitutionally protected rights making them "not just another stakeholder" (Smith 1995). Approximately 80 per cent of Aboriginal communities are located in Canada's commercial forest zone (Krcmar et al. 2006). These lands hold food, shelter, tools, sacred sites, medicines, spirituality, language and history. Indigenous peoples should be at the centre of planning, as they are most affected by the decisions made around forest use.

For Indigenous people, becoming involved in the process of decision making can be difficult, as they often lack adequate resources for influencing, participating in, or contributing to the process that has been framed by government (Stevenson and Perreault 2008). Provincial forest management systems in Canada were not designed to protect Aboriginal rights (Ross and Smith 2013) or to include Aboriginal people in the decision making over lands and resources (Wyatt 2008). However, increasingly, Indigenous communities are demanding a say in the decisions about the use of lands and resources that they depend on and with which they are intimately connected. Indigenous communities have gained a stronger presence in forest governance and forest industry in the last three decades and are realizing greater influence over resource management. Indigenous communities hold a significant percentage of timber allocations, forestry businesses and workforce (Wyatt 2008, Beaudoin et al. 2015, Beaudoin et al. 2016).

The involvement of Indigenous peoples in forest management offers many important benefits such as local control, employment and education opportunities, health benefits with the implementation of community programs, revenue generation for local benefit and the inclusion of cultural and environmental protection. Community involvement is considered of utmost importance to effective management of resources (Curran and M'Gonigle 1999). It is in this context that local concerns need to be heard and addressed.

Criteria and indicators are a mechanism for assessing sustainable forestry that seems to be disappearing from forest management strategies in Canada in the last decade. The fact that the federal government has not reported on their C&I framework since 2008 (CCFM 2008) illustrates the decline in use of C&I. Despite this, C&I continue to be an effective tool that can be used to capture baseline data and Indigenous worldviews, to improve participation, and to balance the environmental, social, economic and cultural values of Indigenous communities (Smith et al. 2010). Several approaches have been developed at international, national, provincial and local levels to identify and measure the economic, social and environmental forest values. In the broader sets of C&I, it is under the social criteria where Indigenous participation is considered an essential element of sustainable forestry. This is an acknowledgement that Indigenous people have a role to play. The mechanism, used at the local level, is a means by which First Nations communities can participate in, contribute to and develop relevant forest management discussions that can identify and protect their unique relationship with land, as well as build community strength.

RESEARCH FOCUS

If there are existing frameworks of criteria and indicators of sustainable forest management in Canada, then why is it important for First Nations communities in Canada to develop their own, what motivates their development and what is the process for local C&I development and the intent of their implementation? The purpose of this graduate research thesis is to attempt to answer these questions by collecting six First Nation[2] community sets of C&I from the available literature between the years of 2004 and 2006, by interviewing community representatives to determine how and why they developed their frameworks and by comparing the results against each other. The six communities have undertaken processes to gather criteria and indicators specific to their own culture, landscape and needs. Each community has developed a set of C&I independent of each other and different from national and provincial sets.

This comparison provides a detailed look at how the frameworks were established, who participated in their development and the particular indicators that were identified as important for each community. The resulting data provides insight into how forest management planning and First Nations communities can mutually benefit by including a criteria and indicator framework development in their planning for forest management and engagement in the forest sector.

The Sustainable Forest Management (SFM) Network was established as a non-profit research network at the University of Alberta in Edmonton Alberta through

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[2] First Nation is defined as a term "adopted by some Indian communities to replace the term Indian band". A band is defined as a body of Indians whose collective use and benefit lands have been set apart or money is held by the Crown or declared to be a band for the purposes of the Indian Act." (Govt. of Canada 2002).

Canada's Networks of Centres of Excellence program. The SFM Network ran from 1995 to 2009 and, through partnerships with industry, governments, universities, Aboriginal peoples and environmental groups, produced a wealth of published forest-based research.

This research was undertaken as part of a larger research project funded by the SFM Network, titled "Co-operative Learning for Integrated Forest Management: Building a Criteria and Indicators Framework for the Whitefeather Forest Initiative, Northwestern Ontario". The project had three main research areas that explored how First Nation communities assess changes in their environments and how these methods of assessment can be communicated to outside institutions. The first area is social and economic C&I. Research in this area was linked to social and ecological systems where people are a part of, not outside, the environment. The second area was Integrated Resource Management. Here, community-based management was explored in order to communicate the land management philosophies of First Nation people to governmental agencies. The third area is Sustainable Aboriginal Communities. This area of research looked at how to incorporate community objectives into sustainable forest activities. This thesis can be linked to all three study areas.

According to Floyd (2004), there is very little understanding of variation in natural resource use across cultures. This research is a contribution to the literature, the SFM Network and the Whitefeather Forest Initiative, a body of work that describes and compares local level First Nation C&I of sustainable forest practices. This work can be used to inform the development of frameworks of C&I that are suitable to the needs of the communities who undertake this work.

LITERATURE REVIEW

BACKGROUND

The practice of using criteria and indicator frameworks to measure sustainability

of forest management practices has proven useful on several different scales of

application: international, national and local. The frameworks breakdown the complex

components of forest management into smaller, more manageable ones, making them

easier to understand, quantify and therefore monitor. Implementing these types of

frameworks in First Nation contexts has proven difficult, despite their merits, in

addressing the unique relationships and values that First Nation communities hold for

the forests they rely on (Bombay et al. 1995). Applying top-down approaches to First

Nation initiatives presents challenges to, according to Sherry et al. (2005), incorporating

local definitions of sustainability. The way around is to develop local sets of C&I that

have been chosen by First Nation communities and are more in keeping with their view

of sustainability on the landscape.

IMPROVE OPPORTUNITIES FOR PARTICIPATION, COLLABORATION AND
RESEARCH

Criteria and indicators development can encourage a community's participation

in forest management planning and create a transparent local-level process, where

multiple stakeholders can voice concerns (Sheppard and Meitner 2005). Participation

from local community members is crucial to gaining support for sustainable forest

management. C&I can be used to collect and illustrate the values of participants for

outside groups in order to make local decisions and inform broader forest policy

(Santiago Declaration 1995). According to Wyatt (2008), meaningful consultation in forest management means that First Nation people have participated in valid and proportionate ways. C&I frameworks developed at the local level can include mechanisms to garner community participation.

Participatory criteria and indicators development can incorporate multiple stakeholder points of view and ensure a more holistic, detailed inclusion of values. Local participation benefits the process of C&I development by incorporating the knowledge of those groups of people who are most familiar with the landscape that the indicators are meant to monitor (Burford deOliveira 1999, Sherry et al. 2005b, Fox et al. 2017). Not only is the knowledge of the land held by those groups available to be incorporated into indicator development, but also their goals, vision for types of benefits and changes they would like to see in sustainable forest management.

In a research article by Burford de Oliveira (1999), three tests of criteria and indicators were conducted by the Centre for International Forestry Research. The tests were conducted by a multi-disciplinary team and examined themes of participation and knowledge of forest management. Understanding community participation took two approaches: first by examining the extent to which community members participated in the development of C&I, and second by gauging the emphasis placed on participation in the C&I development. Community members who participated were generally wealthy, outgoing and had political influence in their community. There was less participation by women, children and the elderly populations.

Although not always captured by the word "participation," all three tests included some language about the importance of community participation in the C&I,

particularly in areas of policy and law making, conflict management and monitoring.

The results of the study showed that participatory processes for developing C&I had the

potential to improve communication and the flow of information between participants,

to increase a sense of ownership and pride in the community, to avoid conflict, and to

outline processes for decision making and monitoring of those decisions.

Duinker (2001) pointed out that politics play a significant role in sustainable

forest management, as it influences who participates, and who has power over the

outcomes. He described three ways to look at the effect of politics. The first is to look at

the influence of politics in relation to the classification of values of sustainability in a

multi-stakeholder approach. Priorities will be different if the major players are

predominantly foresters rather than social scientists and economists. The second is

incorporating everyone's needs at the table; this can negatively impact the process if less

measurable, less scientific indicators are chosen in an effort to be inclusive. The third is

over revealing what Duinker (2001) describes as the dark side of performance, when

indicators are omitted from frameworks where they may show negative performance

and results in the public becoming nervous over the sustainability of forest management.

Collaborating in discussions around sustainable use of the forest is inherently political,

and Duinker (2001) suggests that process design and implementation need to be

carefully considered so that science and politics support each other.

Participation can also be achieved through co-management agreements. There

are varying definitions and purposes of co-management; however, for the purpose of

this thesis the definition refers to a partnership between, at minimum, Aboriginal

communities and government. Smith (2013) and Castro and Nielson (2001) refer to co-

management as a rights-based sharing of natural resources management and responsibility. In this way, co-management is an opportunity for Aboriginal people to influence management decisions that focus on the protection of their rights (Notzke 1995). Beaudoin et al. (2015) describe this authority over forest resource decisions as Aboriginal governance, whereby Aboriginal people and their institutions make decisions that will improve the well-being of the community through resource management. Co-management agreements began as a solution to conflicts over natural resources in an effort to bring partners together and to provide those partners with opportunities they may not have had if they had worked alone (Castro and Nielson 2001, Notzke 1995). Such agreements have also been criticized as another form of assimilating Aboriginal values into formal government processes (Smith 2013).

The multi-stakeholder approach was created in an effort to balance multiple interests over common resources and to find efficiencies in sustainable development governance (Grimble and Wellard 1997, Moog et al. 2015). For this thesis, multi-stakeholder initiatives will be defined as a form of participation that "brings together a range of stakeholders to create governance solutions for environmental problems" (Moog et al. 2015). Grimble and Wellard (1997) point out that stakeholder analysis can be used as a tool to understand natural resources by identifying important stakeholders who have interests in their management. These initiatives can help to bring disadvantaged groups to the negotiating table to gain visibility as stakeholders and compromise in decision-making (Edmunds and Wollenberg 2001).

To capture the diversity of local community perspectives, a variety of participants in framework development should be considered. Sherry et al. (2005) found

that, although any community member could hold traditional local knowledge, some community members were regarded as experts. They also found that perspectives differed across ages, genders and families. Considering differing values among subsets of community populations could lead to a robust set of criteria and indicators. Natcher and Hickey (2002) point out that it is local participation that validates the outcomes of community-based management.

In order for co-management and multi-stakeholder initiatives to provide the most positive experience for parties involved, there is a required level of respect for cultures, understanding of rights and a balance of stakeholder objectives. These characteristics will allow for open discussion about resource development that results in a well-rounded and well-informed plan where common goals can be described and implemented (Notzke 1995, Grimble and Wellard 1997, Castro and Nielson 2001).

Participation is a very important value in First Nation communities (Elias 1997, Natcher and Hickey 2002). Although First Nation communities are not homogenous societies with the same values and opinions about forestry, some common themes, among others, are presented in their criteria and indicators: research and monitoring, forestry operations, protection of traditional land use values, community health and well-being, and employment and business opportunities. In order for the best decisions to be made, it is important for committed community participation (Natcher and Hickey 2002). By engaging a broad range of stakeholders and community players representing various interests and values their differences can be better incorporated into forest management planning (Robitaille et al. 2017).

The measurability and monitoring of criteria and indicators are essential
contributors to the success of the sustainability of resource projects. Duinker (2001)
pointed to the importance of having indicators meet certain requirements in order to
ensure indicators can be measured and produce accurate information. He defined
measurability in two ways: first, indicators need to be able to move in a direction that
can be measured and, second, indicators need to have quantifiable units by which they
can be measured. Duinker (2001) discussed eight ways by which indicators can be
deemed useful. A few of these eight ways include that they be relevant, practical,
predictable and valid. The quality of the indicators themselves can help to ensure that a
C&I framework is concise, manageable and successful. Criteria and indicators
contribute to baseline data so that subsequent evaluations can be interpreted as an
improvement or not from the original state.

Garcia and Lescuyer (2008), in a number of cases, point out that the monitoring
of C&I fails when financial backers are no longer present. Their paper discusses the
importance of developing a monitoring system with local bodies that will need to
conduct the work. The authors credit a difference in focus between resource managers
and local communities on which indicators have more weight. Resource managers tend
to focus on the resource, while communities tend to focus on the potential social gains.
Local communities also have their own way of monitoring systems that have developed
in their culture through observation. Outlining how monitoring will be carried out at the
outset of C&I development would help to ensure a more successful follow-through.

As described by McKay and Johnson (2017), community-based monitoring
programs are an opportunity for organizations and communities to contribute to

observations of environmental change where science and traditional knowledge are combined through education and experience. Community monitoring can build capacity through knowledge exchange, help to communicate concerns, build trust between participants and incorporate local values most affected by natural resource management (McKay and Johnson 2017).

Building on this foundation of community-based monitoring is the Indigenous Leadership Initiative's (ILI) Indigenous Guardians Program in Canada. This program has been motivated by Australia's Indigenous Ranger programs that serve to protect cultural and ecological values (ILI 2018). The ILI is a national scale, Indigenous led initiative that has received Government of Canada funding. The ILI has partnered with education institutions in order to deliver guardian programs in over 30 communities (ILI 2018). Guardians participate in land-use planning by providing feedback about environmental and cultural values they monitor as well as stimulate the sharing of Indigenous knowledge within the community (ILI 2018).

Adaptive management is the process of learning from management systems outcomes and incorporating those concepts learned to improve the system. Prabhu et al. (2001) see the most important potential of criteria and indicators as having the ability to inform the multiple stakeholder group of indicator developers and users. Also described in their research is the need for monitoring systems to provide relevant, sound and cost-effective information. The adaptive management approach to resource management allows for new information to be incorporated as it becomes available. According to Davidson-Hunt (2006), new methods of adaptive management require the inclusion of First Nation communities in framework development. Monitoring is explored in this

research as a means to evaluate indicators through sustainable forest management plans and to determine if these indicators continue to provide useful information. If they do not, new indicators can be determined through the management plan renewal process.

MAINTAIN FOREST INTEGRITY AND HEALTH TO ENSURE SUSTAINABLE USE

Ecological indicators have often been overlooked in First Nation criteria and indicator sets for several reasons, according to Adam and Kneeshaw (2008). One explanation is that the First Nation worldview makes it difficult to quantify measurements and apply prescriptions in the context of forestry. Another explanation is the similarity of the underlying concepts of First Nation environmental indicators with those in the national, international and certification sets (Adam and Kneeshaw 2008, Sherry et al. 2005). The application of the national sets has the potential to take away from local participation and diminishes the importance of a community's individuality.

Adam and Kneeshaw (2008) sought to determine the differences between Aboriginal and non-Aboriginal environmental criteria and indicators, by comparing sets developed by several Aboriginal communities and state-based sets. Their findings showed that the Aboriginal indicators were not that different from the non-Aboriginal sets, except for three themes that were important for maintaining culture: 1) of most importance to communities were species diversity, landscape patterns and ecosystem function; 2) communities expressed concern for forest operations that impacted culturally significant activities such as hunting; and 3) communities held sacred the access to resources for traditional activities.

Research conducted by Gibson et al. (2005) and Saint-Arnaud et al. (2009) noted the importance of maintaining forest environmental condition during and after resource extraction. In particular, Saint-Arnaud (2009) found that common misunderstandings of forestry operations were associated with clear-cutting practices that had not protected diversity or community cultural values. The Kitcisakik people of Quebec preferred harvest operations that preserved aesthetic and ecological values in order to preserve their lifestyle.

PROTECT ABORIGINAL CULTURAL VALUES IN FOREST MANAGEMENT PLANNING

The knowledge held by First Nation peoples about their environment comes from centuries on the land knowing the cycles that nature goes through and how these cycles are linked between organisms. This knowledge is often termed Traditional Ecological Knowledge (TEK). Usher (2000) defined TEK as knowing about the environment from the experience and tradition of a particular group of people. TEK is also linked with the Indigenous worldview, which is characterized by "collectivism, non-possession, harmony with nature and seeing all things as interconnected" (Kant et al. 2013). Understanding the impacts of the Indigenous worldview has been difficult in forest management.

It is not enough to simply include First Nation communities in developing objectives for management under a system that was not designed for a holistic worldview. With a more holistic approach, not only do non-Indigenous people get an opportunity to learn about Indigenous communities, Indigenous communities also get an

opportunity to learn about themselves and the values they hold communally and those to be taught to younger generations. As communities rely more on technology and less on traditions particularly for hunting methods Elders are fearful of the loss of traditional knowledge from one generation to another (Pye 2008). Local-level C&I under the cultural criterion serve to promote and develop culture through the identification of significant, traditionally used forested areas; they also provide an opportunity to capture variation in values from one community to another (Saint-Arnaud et al. 2009).

Relationships between governments and Indigenous people have been difficult to navigate due to differences in their understanding of values, politics and mutual needs, particularly in the context of resource management. Forest management planning continues to be predominantly science based with management objectives skewed towards landscape, wildlife and economics; bringing together First Nation and science-based perspectives has proven to be a challenge (O'Flaherty et al. 2008). Conflict often arises when management objectives seem to trivialize the Indigenous worldview. A collaborative approach between researchers and communities through planning exercises such as C&I framework development can produce knowledge that supports resource management (Davidson-Hunt and O'Flaherty 2007). This challenge presents an opportunity to work cooperatively and develop a planning approach from the ground up, where cross-cultural learning can be promoted to achieve common goals.

Bridging western science and TEK has proven to be a challenge due to the differences in methods involved with data collection and interpretation (Usher 2000, O'Flaherty et al. 2008, Robitaille 2017). Western science uses precise measurements of the environment that separate people from nature through experimental design, while

TEK collects data through generations of observation and the passing down of oral

tradition (Mason et al. 2012, Moller et al. 2004, Tindall 2003). Scientific and TEK

knowledge systems used together offers a complementary form of knowing the

environment (Usher 2000). According to Schramm et al. (2008), TEK offers an

opportunity for cross-cultural learning between foresters and community members, as

well as the potential to inspire intergenerational learning between youth and TEK

holders, strengthening cultural capacity. Rathwell et al. (2015) conclude that

maintaining the two systems, Western science and traditional knowledge, but bridging

them to allow for an exchange of information between them, promotes a better

understanding of environmental values and better prepares communities for

environmental change. The authors go on to credit TEK as a tool that can level the

balance of power by supporting traditional ways of knowing through storytelling and art

thereby encouraging participation of community members who hold the knowledge.

With the growing understanding that top-down Western approaches to criteria

and indicator frameworks do not fit at the local level, a new approach of working

together to create frameworks from collective understanding of Indigenous and non-

Indigenous knowledge is developing (Shearer et al. 2009), and has been applied in

Ontario through the Whitefeather Forest Initiative. In the Whitefeather example, the

First Nation of Pikangikum partnered with several groups, including universities and the

Ontario Ministry of Natural Resources, to work together on a joint C&I framework for

the purpose of incorporating it into forest management planning. The process involved

conducting interviews with elders and other community members, reviewing transcript

records, community workshops and graduate student researchers. According to Shearer

et al. (2009), the process of information gathering and framework development was a continual one, whereby, as knowledge was shared and understood, it was presented back to participants for confirmation until a final framework had been developed.

Tuhiwai Smith (1999), in her book "*Decolonizing Methodologies: Research and Indigenous Peoples*," explored the contention that damage done by colonialism is far from being "finished business" and in fact continues in various forms into the present. Her perspective is from that of an Indigenous Maori from New Zealand, but the parallels to colonialism in Canada are clear. Government control over lands, resources and people is as relevant today as it was in the days of colonialism. She described how the effect of that control shapes how communities view research and researchers by rejecting all its forms. She countered that communities should be encouraged to understand the importance of research, and that researchers must understand the importance of community participation in their projects. Communities are not asked to provide local knowledge only to have it be dismissed or ignored (Tuhiwai Smith 1999); instead, they are co-founders, partners from inception.

INCREASE ECONOMIC BENEFITS FROM FORESTS FOR ABORIGINAL COMMUNITIES

The Canadian forest industry has experienced a downturn in the past decade with variations in commodity prices, the increased value of the Canadian dollar, competitive international markets, a decline in the demand for newsprint, high energy costs, wildfire and insect damage decreasing timber supplies, all leading to mill closures (Mockler and

Robichaud 2011). These challenges beg the question: "Is this an appropriate foundation to build sustainable communities?" (Stevenson and Perreault 2008).

Indigenous participation in the job market is a value that is of particular importance for communities (JBACE 1998, Smith 1999) as employment brings skills to the community, and being employed provides a challenge that, when met, brings self-esteem and pride. Economic, spiritual and mental health are connected in a way that jobs can have a positive effect on the health of a community (Czaykowska-Higgins 2014). Jobs help to decrease dependence on government transfer payments and help to narrow the divide between the haves and the have-nots.

The C&I of two communities from Quebec, one from BC and one from Ontario were compared by Teitelbaum (2014) in terms of their participation in forestry and its economic benefits. The aspirations of these communities to have benefits from forestry flow back to the community were discussed. Economic indicators addressed primarily local hiring practices and timber sales to local mills and, secondarily, employment in non-timber jobs. In industrialized countries like Canada community forestry is a part of overarching mill-driven industrial tenure system that results in benefits that are characterized by jobs and mill opportunities. Globally, there are examples where community forestry has the potential to alleviate poverty by focusing on direct benefits to local communities.

The people of Kitcisakik Quebec felt that economic benefits for their community would be best achieved through forest protection, tourism, and conservation activities over those of traditional timber harvesting (Saint-Arnaud et al. 2009). Some contributing factors to their focus on protection of the forest came from the feeling that past forestry

operations did not serve them, jobs with forest industry for community members were unlikely and that finding a balance between economics and traditional practices was difficult. At the same time, the Kitcisakik people considered the economic gains from the forest as an opportunity to re-invest in the community.

Conflict between economic and social goals is very common with First Nation forestry pursuits (Treseder and Krogman 1999, Vanlaerhoven and Andersson 2013). Commercial forestry operations that impact the environment ultimately impact the cultural links that Indigenous communities have with the forest, forcing communities to face trade-offs between promoting economic development through forestry and protecting culture (Beaudoin et al. 2016, Krcmar et al. 2003). The underlying premise is that economic gains lead to social gains through job creation and income; however, there are doubts about the extent of positive gains seen in communities (Nikolakis and Nelson 2015, Fortier et al. 2013).

IMPROVE EQUITY, HEALTH AND STABILITY FOR INDIVIDUALS AND THE COMMUNITY

There has been much research in the field of Indigenous community health and well-being in terms of resource extraction, mainly oil and gas and mining, and the social sciences, (Kirmayer 2011, Parlee 2012, Durkalec et al. 2015, Jones and Bradshaw 2015, Parlee 2015, Whalen et al. 2015,) but little was found in terms of literature that embeds community health or well-being into forestry C&I. Gaps exist in forestry criteria and indicator frameworks, specifically in areas of social capital and Aboriginal concerns, a problem across C&I sets worldwide (Hickey and Innes 2005, Gough et al.

2008). To close the gap 29 potential indicators were suggested by Hickey and Innes (2005) in the area of community wellbeing. These indicators addressed gender in forestry, mental health, poverty rates and mortality rates. Strengthening the C&I processes with an inclusion of more indicators in these areas will be important to improving the well-being of communities as a whole. It is likely that uncertainty in the definition of "social capital" contributes to the gap. Social capital should be defined in a local context to meet the specific needs of those affected (Gough et al. 2008, Kant et al. 2013).

According to Stevenson and Perreault (2008), the lack of capacity in First Nation communities is the largest barrier to their participating in and benefiting from resource extraction. Capacity in this sense is described as the education, training and skills to participate in forestry. Having the appropriate capacity would allow community members to access jobs in resource extraction, forest management planning and other indirect employment that would improve the economic and social conditions of communities. Indigenous communities and their governments should identify the community strengths and their needs and how best to build bottom-up approaches to capacity building programs.

The importance of Indigenous people's connection to land has been described previously, but there is sparse literature on the link between connection land and community well-being. Land use for culture and traditional activities contribute greatly to community well-being and this should be taken into consideration when developing policies for First Nation people (Kant et al. 2013, 2014). Some improvements to wellbeing include better mental and spiritual health through traditional healing

ceremonies out on the land and physical health by eating traditional diets of culturally

important wildlife species (Kant et al. 2013, 2014).

CONCLUSION

Despite a large body of literature on the value of criteria and indicators as a

means to engage First Nation communities and to incorporate the expert knowledge at

the local level, there are notable gaps in data and in successful implementation. A C&I

framework has the potential to address community participation in forest resource

management planning, ensure that community values and goals are integrated in

management planning, contribute to the cycle of adaptive management through

monitoring, and promote cross-cultural learning between two polarized worldviews.

RESEARCH METHODOLOGY

RESEARCH METHODS

For this study, qualitative research methods were chosen. Cresswell (2007) described three main characteristics of qualitative methods of inquiry. The first is that research questions stem from exploring the meaning that people give to a particular problem. The second is that data is collected in the natural setting as opposed to a laboratory, using a variety of different methods, and that it is analyzed by sorting it into themes. The third quality is that final reports give voice to the participants and interpret their problem. The final report also adds to the wider body of literature on the chosen subject and may provoke or encourage the reader to take action.

The type of qualitative research chosen here is the case study. Case study inquiry is ideal, according to Creswell (2007), when the researcher can choose clearly defined cases in order to understand the case or compare multiple cases. More specifically, a collective case study was used for this research. The collective case study is described by Creswell (2007) as the researcher choosing multiple cases to express different perspectives on one issue.

Interviews help to provide an ethnographic point of view to this research. By interviewing participants from the community-developed C&I processes a better understanding of the people involved, what they did and how they saw their activities throughout the process is gained.

The elite interview method was employed in order to gather the necessary information from each community about their criteria and indicator frameworks. The

elite methodology involves contacting experts who will provide insightful information about the process of the framework development. The elite usually have participated in or have decision-making authority over the processes they participate in. They provide firsthand knowledge of the process. The snowball technique, whereby the elite interviewee can provide names of other individuals who will have important information to add, was also used to increase the sample size. The snowball method has the benefit of identifying important participants not necessarily known from the literature.

PARTICIPANTS

For this collective case study research, six First Nations communities were chosen for this research based on their work to develop local sets of criteria and indicators. The six communities[3] are the Nuu-chah-nulth Tribal Council central region communities of Tla-o-qui-aht, Ahousaht, Hesquiaht, Yuu-cluth-aht and Toquaht who formed Iisaak Forest Resources Ltd., and the Tl'azt'en in British Columbia, the Little Red River Cree Nation in Alberta, the Waswanipi Cree and the Algonquins of Barrière Lake in Quebec and the Innu Nation of Labrador (Figure 1).

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[3] All six of the communities are First Nations. This term is used throughout the paper to describe these communities specifically.
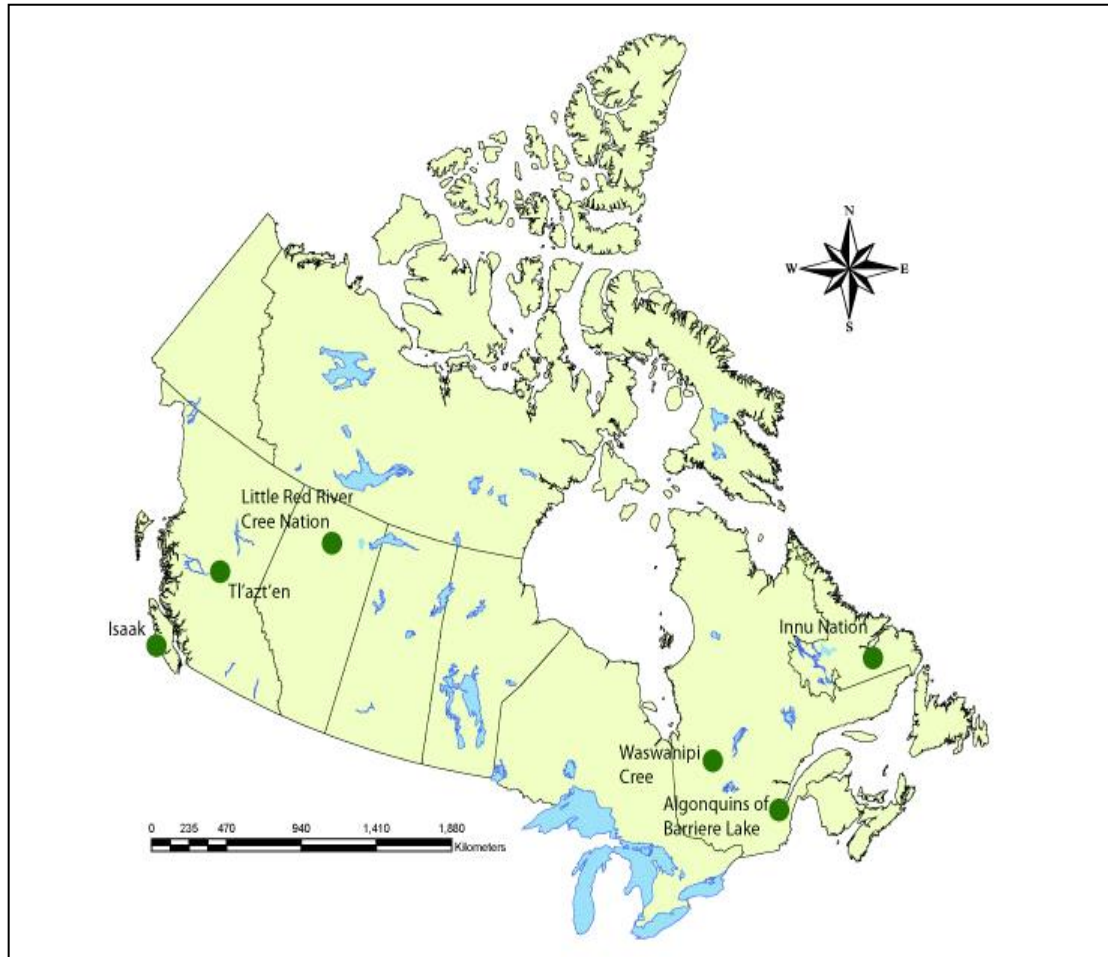
Figure 1. Geographic Location of Research Communities (Smith et al. 2010)

Eight participants (4 men and 4 women) were selected for interviews. The participant pool was restricted to those closest to the development of the indicator sets. They were specifically chosen based on the information provided in supporting literature as key individuals involved with the research, development and implementation of the community initiatives. They are generally not representative of the six communities. They are typically university researchers, forest managers or community advisors, only one of the candidates was also a member of the First Nation community under study. Two communities had two interview candidates; the remaining

four communities had only one interview candidate. The small sample size is a result of

limited access to experts after their respective projects were completed. There were only

a few people per project that were involved from beginning to completion. Other

community participants were difficult to locate or connect with during the timeframe of

this thesis. Participant interviews provided more detailed background information for

each of the initiatives that supplemented the literature that had been examined. Some

participants provided direction to examine new sources or new participants for

interviews.

MATERIALS

Criteria and indicators were gathered from both published and grey literature for

each of the six communities. Interview candidates were mailed participant packages that

included a copy of the approved research proposal, detailed description of the research

project, sample interview questions (see Appendix 1), a cover letter and participant

consent forms. Microsoft's Excel software was used to organize data and to produce the

final paper. A tape recorder and telephone recording device were used to capture

interview responses from participants. These responses were later transcribed into

Microsoft Word software for analysis.

PROCEDURES

The process of sorting through all the available data from the literature involved

several steps of refinement. The final data set is organized in the following hierarchy:
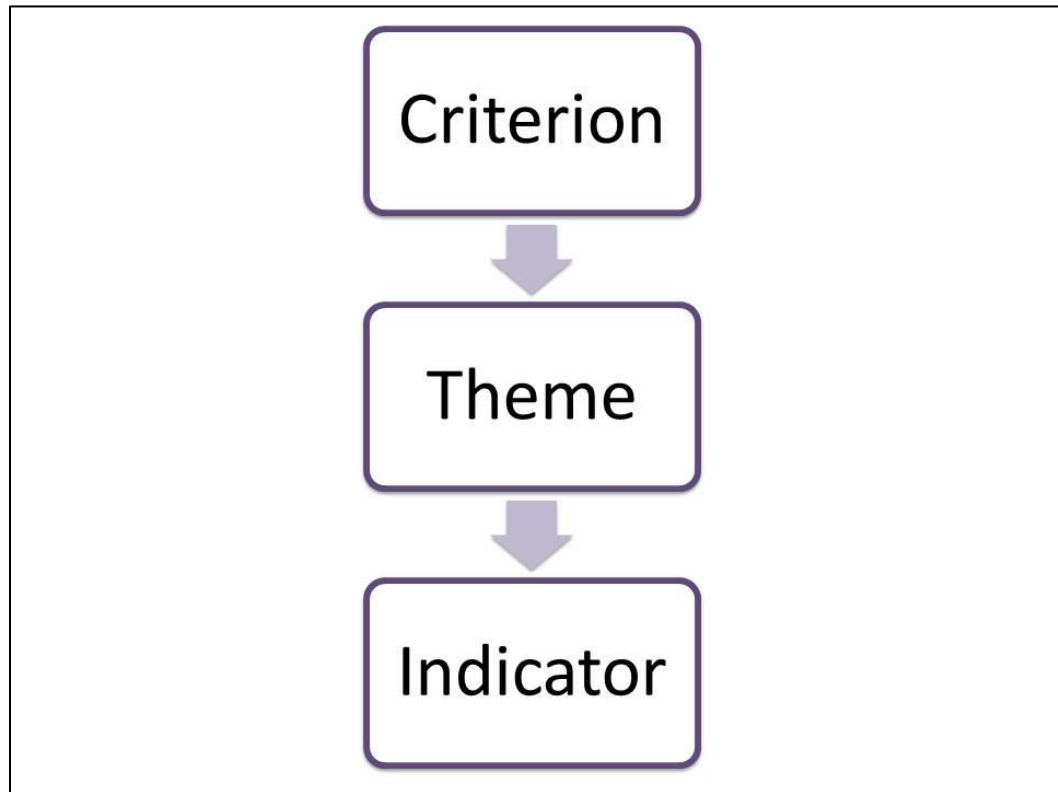
Figure 2. Hierarchy of sorted data (Symington-Armstrong 2017)

Categorizing First Nations Criteria and Indicators

The information was sorted in Microsoft Excel by community under the headings: environmental, social, economic, cultural, rights and institutional. These headings later became criteria. The indicators for each community were numbered to keep a total for each community and a total for all indicators combined.

Together with Master of Science student Sarah Allen and Dr. Peggy Smith, the indicators were regrouped under the criteria with strict definitions to provide uniformity to each criterion. The definitions used were guided by the chart in Table 1. This regrouping was done in order to provide consistency to the charts. Only those indicators

that clearly demonstrated the definition of each criterion were assigned under that

criterion. The definitions are as follows:

ECOLOGICAL: Maintain forest integrity and health to ensure
sustainable use

ECONOMIC: Increase economic benefits from forests for Aboriginal
communities

SOCIAL: Improve equity, health and stability for individuals and the
community

CULTURAL: Protect First Aboriginal cultural values in forest
management planning

INSTITUTIONAL: Improve opportunities for participation, collaboration
and research

Within each criterion, themes were chosen to group similar indicators together.

In the environmental criterion, the theme "Natural Forest Emulation" was used to group

all indicators, where fire, blow-down, silvicultural prescriptions and native species are

considered in order to emulate the natural patterns of forest stands. After the indicators

were grouped under their common theme, duplicates were "rolled-up" to eliminate

duplication and to produce the final condensed charts. This method was used to make

the number of indicators more manageable and to organize them more clearly for

comparison. If there were multiple indicators for the same concern, they were recorded

as one indicator but tagged in the spreadsheet to maintain records of the multiple

communities that had listed that item in their indicator set. In the social criterion, for

example, under the theme "Fair distribution of Opportunities in the Forest Sector," three

communities have six indicators concerned with First Nation participation. Instead of

listing the six similar indicators separately, they are represented by one indicator. The

final charts were organized from the theme with the highest number of indicators to the

theme with the lowest number of indicators for a visual impact. This method was

applied to each of the five criteria.

Table 1. A sustainable development framework incorporating Aboriginal peoples' values in forest management (Smith 2005).

OUTCOME: COMMUNITY WELL-BEING/SATISFACTION			
Basic needs (food, shelter, clothing), self-sufficiency, self-governance, adequate standard of living, high employment, fair distribution of economic benefits across households, cultural integrity, human health, education, political stability, access to lands & resources, sustainable forest management			
SUSTAINABLE FOREST MANAGEMENT CRITERIA			
ENVIRONMENTAL Maintain forest integrity & health to ensure sustainable use	**ECONOMIC** Increase economic benefits from forests for local Aboriginal communities	**SOCIAL** Improve equity, health & stability for individuals & the community	**CULTURAL** Protect Aboriginal cultural values in forest management planning
▪ Condition of forest ▪ Forest health ▪ Sustainable extraction of renewable resource (amount & rate of logging) ▪ Maintenance of habitat for all users, including wildlife ▪ Environmental services (air, water, carbon storage, etc.)	▪ Jobs & income ▪ Revenue-sharing ▪ Business opportunities ▪ Forest product development ▪ Development planning ▪ Taxation ▪ Profitable businesses	▪ Capacity-building (education & skills, ability to hire resource managers long-term) ▪ Increased community stability ▪ Improved health ▪ Equity among community members ▪ Workers rights	▪ Maintenance of way of life ▪ Language retention ▪ Cultural learning (knowledge) ▪ Traditional land use ▪ Identification & protection of cultural values
THE FOUNDATION			
ABORIGINAL RIGHTS		**INSTITUTIONS**	
▪ Recognition, protection & accommodation of Aboriginal & treaty rights=sovereignty/self-government ▪ Rights are inherent, cannot be extinguished; apply to all areas—historic treaties, modern land claims, areas without agreements to which Aboriginal title or ownership/use apply		▪ Shared decision-making (ranging from advisory to consent & control, including joint decision-making or "co-management) ▪ Conflict resolution ▪ Consultation & participation ▪ Communication ▪ Monitoring, enforcement & adaptation mechanisms	

The Aboriginal rights indicators (Table 1) were amalgamated into the other four criteria because it was the feeling of the team that they were the underlying foundation of all the indicators. Some communities had no indicators at all in the rights category, while others had listed indicators such as trappers, annual allowable harvest, economic benefits and community use of resources.

The data was analysed first by within-case analysis, examining a community's individual set, and then by drawing out the common and unique themes between communities in a cross-case analysis. Similarities and differences in the themes were sought with existing criteria and indicators from published literature and between the cases themselves.

Interviews

Interviews were conducted to provide insight into the process of indicator development. Both common and unique themes that had been drawn out of the data were discussed in the interview to clarify why a community chose a particular indicator for their set.

A minimum of one individual for each of the six initiatives was contacted by email. The initial email explained the project. Once participant consent forms were returned by fax, email or mail, interview dates were selected. Semi-structured telephone interviews were then conducted using some of the sample interview questions provided, as well as other questions that arose from the interview itself. The interview responses were recorded by either hand or using a tape recording device. The notes from each of the interviews were transcribed into Word documents and returned to the participant for

approval and editing. When the participant was finished with the notes, they were returned by email.

RESEARCH CHALLENGES

The case study approach has several research challenges: first, the researcher must choose what type of case study and, second, they must choose how many cases to study. Creswell (2007) describes selecting four or five cases at the most with clear boundaries of the case to avoid generalizing the data.

Finding themes in qualitative research is an essential component to qualitative research and perhaps one of the most challenging as a result of the struggle that researchers have in clearly identifying how they have arrived at the themes they have selected (Ryan and Bernard 2003). The charts were difficult to classify according to our newly defined headings because of differing understandings of criteria and indicators. Some of the indicators used vague terminology where an interpretation of its meaning needed to be made in order for it to be placed according to our organizational chart.

There is a limited amount of published information about each of the sets of indicators, making it hard to interpret their true meaning. Each set of indicators was developed based on different community motivations and influenced by different sources. This made it a challenge to determine if some of the indicators were community driven or developed for a partner's benefit. There were several Innu indicators that mention adherence to Environmental Protection Guidelines. These guidelines were developed by the Department of Natural Resources of Newfoundland and Labrador to guide forestry operations in the province (NLDNR 2013), and are likely not community

driven. In addition, variation in researcher understandings of each of the criteria made it difficult to come to consensus about defining and sorting the criteria and indicators into the condensed set of indicators. In the end it came down to researcher opinion about the goal or intent of an indicator to determine where it would be placed in a criterion.

Some of the challenges associated with elite interviews according to Bozoki (2017) are that, compared with other types of interviews, they require more preparation before the interview to not waste the participant's valuable time; the participants are irreplaceable due to the knowledge they hold and therefore critical to the research; the dynamic between researcher and participant is unequal with the participant in a position of power and able to control the interview.

Finding participants using the elite method proved to be a challenge due to the nature of the elite's position. Elite participants are busy individuals because they are experts in their field, often times the leading expert. The elite position offers benefits because they hold vast amounts of knowledge on the topic; however, this knowledge is often guarded and not easily shared or challenged. For this research it was a difficult to contact elite participants and plan interviews because of the work and travel schedules of participants. Perhaps the biggest challenge to this research was the limited number of interview participants who were community members involved in their processes. By not including the community participants we cannot fully understand the motivation behind indicator selection.

RESULTS

The results presented will illustrate the findings of the different levels of data collection, including community profiles, the process that each community undertook to develop its C&I sets and, finally, a description of the C&I sets and the results of condensing the C&I sets. Themes from the interviews will also be presented. Community profiles provide the context for the development of C&I sets. A general description of the criteria and indicators for each of the communities is provided in order to demonstrate the individualism of each set. Each community faces different concerns and each set of indicators was developed within an individual climate; it is therefore important to represent the uniqueness of each set before the similarities can be examined.

IISAAK FOREST RESOURCES LTD. (IISAAK)

Iisaak Forest Resources Ltd managed Tree Farm License (TFL) 57 within the Clayoquot Sound region of British Columbia's Vancouver Island (Wilson 2002). The TFL is approximately 87,000 ha in size and its landscape is characterized by mountains and heavy precipitation. Key tree species include the western hemlock (*Tsuga heterophylla*, (Raf.) Sarg.), western red cedar (*Thuja plicata* Don ex D. Don), yellow cedar (*Chamaecyparis nootkatensis* D. Don), Douglas fir (*Pseudotsuga menziesii* Mirb.) and lodgepole pine (*Pinus contorta* Dougl. Ex. Loud.). The forest and marine resources of the area are valued by both Indigenous and non-Indigenous peoples with most local

residents being connected economically to the natural environment (CSSP 1995). For First Nations land-based activities include hunting, fishing and gathering for both cultural and economic reasons, selected burning to create animal habitat and improve berry production. The scenic landscape is very important as it helps to define the people of the area (CSSP 1995).

After decades of conflict over resource use and extraction in Clayoquot Sound, the British Columbia government created the Clayoquot Sound Scientific Panel (CSSP) in 1993 to review forestry operations and make recommendations that would improve practices (Spiro 2003). The panel was made up of representatives from the Nuu-Chah-Nulth, scientists, foresters and engineers. Membership was decided based on their experience with natural resources management and their independence from government, industry and environmental groups (Spiro 2003). They made recommendations in seven key areas: silviculture, harvesting, transportation, scenic and tourism values, planning for sustainable management, monitoring and including First Nation perspectives. There were over 125 recommendations presented in the CSSP reports that were accepted by the government of British Columbia and the First Nations of Clayoquot Sound in 1995 (Verschoor 2004). Around the same time as the CSSP appointment, there were two other important decisions made as a result of treaty talks: the Interim Measures Agreement (IMA) and the creation of the Clayoquot Sound Central Region Board (CRB) (Nicholls 2016, Spiro 2003, Verschoor 2004).

The IMA was negotiated in 1994 for a period of two years between the government of B.C. and the five First Nations of the Nuu-chah-nulth Central Region giving those First Nations the co-management responsibility of their traditional lands

and resources (Spiro 2003, Verschoor 2004). The agreement was extended in 1996 and 2000; a new agreement called the *Interim Measures Extension Agreement: A Bridge to Treaty* was put in place and was not renewed after it expired in 2010 (Nicholls 2016).

The CRB was put in place to assist with the implementation of the co-management agreement; however, as of 2016, the CRB is no longer operating (Nicholls 2016). The board was made up of ten representatives appointed by both government and First Nations and was meant to review land-use proposals (Spiro 2003) and to oversee development in Clayoquot Sound according to the recommendations from the CSSP (Nicholls 2016).

In the late 1990s talks began between the forest company MacMillan Bloedel Ltd and the five First Nations of Clayoquot Sound that would eventually see the creation of a joint venture and signing of a shareholders agreement in 1998 between the forest company and Ma-Mook Natural Resources Limited; the economic development group created by the First Nations (Verschoor 2004). MacMillan Bloedel was later purchased by Weyerhaeuser. The shareholder agreement divided the shares with 51% held by First Nations and the remaining held by Weyerhaeuser. The company became fully owned by the Central Region Nuu-Chah-Nulth First Nation when the community bought the remaining Weyerhaeuser shares in 2005 (Scott 2011). The new company was named Iisaak, the Nuu-chah-Nulth word for "respect." The incorporation documents had a four-fold sustainability management philosophy that focused on economic, environmental, social and cultural goals (IFRL 2007, Wilson 2002, Verschoor 2004). As of May 27, 2016, TFL 57 is owned by Ma-Mook Natural Resources Limited (Nicholls 2016), and Iisaak has suspended operations.

As a result of signing Memorandums of Understanding (MOU) with environmental groups, Iisaak committed to achieve Forest Stewardship Council certification and in 2001 became the first TFL in the province to become certified under this system (Verschoor 2004). The development of criteria and indicators was necessary as requirements of the CSSP recommendations the B.C. regional standard of the FSC and the Sustainable Forest Management Plan. The criteria and indicator data was collected through public forums which included participants from the Nuu-Chah-Nulth, as well as other involved stakeholders. After the information was collected, it was organized similarly to the sets developed by the CCFM and the FSC and used in Iisaak's Sustainable Forest Management Plan.

Iisaak also partnered with the Clayoquot Sound Biosphere Trust (CBT) to create the Iisaak Sustainable Forestry Project. The CBT was responsible for achieving the goals of the Clayoquot Sound UNESCO Biosphere Reserve that had been designated in 2000 (Wilson 2002). The purpose of the project was to provide capacity to the Nuu-chah-Nulth First Nations and to implement a framework that would monitor criteria and indicators over a three-year period, the results of which would be incorporated in forest management (Wilson 2002).

Although Iisaak saw gains in harvesting more of its Annual Allowable Cut[4] (AAC) from 2000 to 2008, particularly under their management contractor Ecotrust Canada (IFR 2007), since its inception Iisaak has struggled to maintain productivity and

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[4] Allowable Annual Cut is an area-based calculation that is determines the maximum area of a TFL that can be cut. It is determined by the Chief Forester of the province of British Columbia (Nicholls 2016).

its FSC certification (Bunsha 2013, Scott 2011). Purchasing the TFL saddled the company with a large debt that forced them to look into harvesting some of the intact watersheds in 2011; however, due to negative reactions by environmental groups and First Nations, these areas were not cut (Bunsha 2013). The strict operational requirements of the CSSP and the FSC standards made it economically challenging for Iisaak's harvest operations throughout the years and in 2014 operations were suspended in order to make plans for the future (Pynn 2015).

TL'AZT'EN NATION

The Tl'azt'en Nation has a population of 1750 (Tl'azt'en 2017) distributed between four communities: Tache, Binche, Dzitl'ainli and K'uzche. Tache is the main community where most community's services are located. The Tl'azt'en use "keyohs," family territories as traditional resource use areas. These territories are where community members hunt fish, trap and gather traditional plants. The main wildlife species used by this First Nation include bear, moose, deer, caribou, salmon whitefish and trout (Tl'azt'en 2017). The community uses family campgrounds in the summer and collects food for the winter months, a tradition that has always been a part of their culture.

The John Prince Research Forest (JPRF) is situated in the northern interior of British Columbia, 250 kilometers northwest of Prince George (Karjala and Dewhurst 2003). Established in 1996 the 13,000-ha forest is managed under a partnership between the Tl'azt'en First Nation and the University of Northern British Columbia (UNBC) for the purposes of research, teaching and training; it is the only one of its kind in the

country (Fondahl and Atkinson 2007; Karjala and Dewhurst 2003). It is named after former band manger and deputy chief of Tl'azt'en nation, John Prince (Fondahl and Atkinson 2007; Grainger et al 2006). The JPRF also covers three traditional family territories or "keyohs" that are used for hunting, trapping and fishing (Karjala and Dewhurst 2003).

The JPRF is located is the sub-alpine spruce region of British Columbia (JPRF 2007). Tree species include Douglas fir, sub-alpine fir (*Abies lasiocarpa* Hook), black spruce (*Picea mariana* Mill.) and lodgepole pine. The region is characterized by cold winters with a lot of snow and by warm summers (JPRF 2007). Current activities occurring on the land are tourism, hunting, fishing and forestry.

An MOU was signed between Tl'azt'en and UNBC that outlined the details of their co-operative venture and addressed the formation of a management committee, economic benefits, timber supply, employment and the desire to use sustainable ecosystem management (Grainger et al 2006). The JPRF was given a Special Use Permit (SUP) by the provincial government to manage the land. Tenure on the land was held by Chuzghun Resources Corporation, the company owned by Tl'azt'en, and UNBC (Grainger et al 2006). The majority of Tl'azt'en traditional land was under the jurisdiction of industrial forest tenure as a result of unsettled land claims. The community did hold one TFL through their company Tanizul Timber (Booth 1998; Karjala and Dewhurst 2003). The SUP presented an opportunity to explore traditional management practices.

The partnership with UNBC allowed for graduate research with a focus on how to include the Tl'azt'enne more meaningfully in forest management to meet community

needs. The Aboriginal Forest Planning Project (AFPP) was a community-based planning tool to be used primarily by First Nations (Karjala et al. 2004; Sherry et al. 2005). It was designed to simplify and encourage First Nation participation in forest management. It is through this planning process that community members were involved in order to ensure that local values were documented and respected, communication was facilitated between stakeholders and education was gained about forestry planning and First Nations values. Through the AFPP, community values were gathered using interviews, archived information, focus groups and field trips with community members (Karjala et al. 2004; Sherry et al. 2005).

Through the Community-University Research Alliance (CURA) partnership with UNBC, a community-based environmental monitoring (CBEM) framework was developed by Yim (2009) with the Tl'azt'en community to be applied on the JPRF. The results of this work provided a process for evaluating five important cultural activities: salmon fishing, moose hunting, trapping beaver, picking huckleberries and gathering soapberries. The purpose of this research was to strengthen the relationship between Tl'azt'en Nation and UNBC and improve community decision-making processes. The John Prince Research Forest is still in existence today funding research through timber revenues.

LITTLE RED RIVER CREE NATION

Three communities in northern Alberta make up the Little Red River Cree Nation (LRRCN): Fox Lake, Garden River and John D'Or Prairie. They have a combined registered population of 4609 (Government of Canada 2017a). The three

communities are located in two boreal eco-regions: the mixed-wood and the sub-Arctic (Natcher and Hickey 2002). The boreal mixed-wood forest is characterized by balsam poplar (*Populus balsmifera* L.), aspen (*Populus tremuloides* Michx.), jack pine (*Pinus banksiana* Lamb), black spruce and white spruce (*Picea glauca* Moench). The sub-Arctic region is characterized by black spruce and permafrost soils due to its proximity to the Caribou Mountains and higher elevations.

The LRRCN has a staggering unemployment rate of 85 per cent (Natcher and Hickey 2002). The few existing jobs held by community members are with government services or seasonal work resulting in a heavy dependence on natural resources for subsistence (Natcher and Hickey 2002). In the past, caribou (*Rangifer tarandus caribou* Gmelin) and bison (*Bison bison* Linnaeus) were the preferred food species; however, a decline in these animal populations has made the community turn to moose (*Alces alces* Linnaeus).

In Alberta, Forest Management Agreements (FMAs) are awarded to companies for a 20-year term. Extractive industries such as agriculture, forestry and oil and gas have a huge impact on the environment with road building, laying pipeline, and timber harvesting. This impact is affecting the Aboriginal and Treaty rights of the LRRCN to hunt trap and fish, rights that were secured with the signing of Treaty Eight in 1899 (Natcher and Hickey 2002).

With large tracts of forest going to industry and no profits being shared with LRRCN, communities became concerned and sought to engage both federal and provincial governments in order to protect lands and resources vital to them. As a result, in 1995 an agreement with the Province of Alberta was reached and the LRRCN and

Tall Cree First Nation were awarded a Special Management Area (SMA) of 30 000 km^2 (Natcher and Hickey 2002). The unit was to be managed cooperatively between the forest company Tolko Industries Ltd, the province and the First Nations (Krcmar et al. 2006). The management of the SMA was designed to have a planning board as decision-maker. The board was made up of representatives from First Nations, government, and the forestry and petroleum industries.

The SMA was divided into protected area and working forest. The working forest was 25,000 km^2 and consisted of seven provincial forest management units (FMU); four were held by LRRCN and Tall Cree and three were held by Tolko Industries Ltd. (Krcmar et al. 2003). Forest management planning saw several commitments put in place directing volumes to Tolko and Footner Forest Products Ltd and stumpage was paid to LRRCN (Krcmar et al 2003). LRRCN attained the timber quota[5] on FMU F23 (an amalgamation of FMUs F3, F4 and F6 which were part of the four FMUs held by the First Nations) (Krcmar et al. 2003), and their forest company Little Red River Forestry Limited employed two full-time forestry staff as well as 100 seasonal LRRCN for silviculture operations (LRRCN 2017). The most recent available Forest Management Plan for this unit was approved in 2004.

Although forestry operations were bringing economic development to the community, there were concerns from the elders that these operations were not in line with traditional values (Natcher and Hickey 2002). Criteria and indicators were looked

[5] Timber quotas in the province of Alberta are a form of forest tenure that lasts for 20 years and can be area or volume based giving the holder the right to a percentage of the Annual Allowable Cut or a specific volume from a specific area (Government of Alberta 2017).

at as a means of evaluating land management decisions in the SMA. The LRRCN began

work to develop a local set of indicators because the national and international sets did

not address local level concerns. The process for developing the C&I began with the

evaluation of past research findings to develop a baseline of data. The community

formed a partnership with the SFM Network in 1996 and collaborated on 20 social and

natural projects (Natcher and Hickey 2002). A partnership between the University of

Alberta and LRRCN led to the formation of a research team that developed and

implemented the research project. Techniques used included interviews of community

members and surveys to document local values (Natcher and Hickey 2002). It is from

these values that the criteria and indicators were created.

WASWANIPI CREE

The Waswanipi Cree Model Forest (WCMF) in Quebec was the only First

Nation-led forest in the Canada's Model Forest Network. It was located approximately

800 km north of Montreal in the boreal forest region (Pelletier 2002). The community

population is 1400 members (Waswanipi First Nation 2017), and the community still

depends largely on natural resources to maintain culture and to provide livelihoods with

fishing, hunting and trapping.

In 1975 the Quebec government, the James Bay Cree of Northern Quebec and

Inuit communities signed an agreement called the James Bay and Northern Quebec

Agreement (JBNQA). The agreement was settled out of court after being initiated by the

Cree and Inuit against a hydro-electric development who argued that the development

should not move forward without their consent (Papillon 2008, Penn 1995). Ultimately

the agreement provided financial remuneration to the Inuit and Crees in exchange for

surrendered rights to be replaced by those specified in the Agreement (Papillon 2008).

The JBNQA determined the division of Cree traditional territory into three

categories of lands which determined the types of activities that could occur on those

lands. Category I lands were the only portion of the territory that the Crees had

exclusive rights to hunt, trap fish and develop (Salee and Levesque 2010). Category II

and III lands, the bulk of the area, were classified as public lands that could be

developed, where Aboriginal people retained some rights to hunt, trap and fish (Papillon

2008) and where forestry operations could be conducted by the Crees with fees paid to

the province (Salee and Lescuyer 2010). Section 22 of the JBNQA sets out the

conditions with respect to an "environmental and social regime" that sought to link the

social values of the Cress to environmental conditions through Strategic Environmental

Assessment (SEA) (Lajoie and Bouchard 2006).The JBNQA determines which types of

resource development projects in the area of the Agreement will be required to undergo

a SEA and which would be exempt.

Forestry was one such resource development that was subject to an assessment

for some activities such as road construction but forestry operations were not (Penn

1995, LaJoie and Bouchard 2006). The Agreement has a provision that forestry

operations included in a forest management plan were exempt from SEA as long as the

plan was provided to the James Bay Advisory Committee on the Environment (JBACE)

for review and comment (Penn 1995, Lajoie and Bouchard 2006, JBACE 2012). The

JBACE was created as a requirement under the Agreement. It was formed in 1978 and

consisted of representatives of Canada, Quebec and the Crees. The committee's main

function was to oversee the implementation of the JBNQA, which includes the requirement to review FMPs (Lajoie and Bouchard 2006, JBACE 2012).

Through their FMP review, the JBACE tracked the effects of forestry on Cree traplines and determined that the rate of deforestation merited a ban on forestry (Lajoie and Bouchard 2006, JBACE 2012). Despite the JBACE's concerns, forestry was never subject to a SEA and in 1997 the JBACE developed a set of criteria and indicators with the intent of including the environmental and social interests of the Crees in forest management plans (FMP) (JBACE 2012). In 1998 the Quebec Ministry of Natural Resources made it a requirement in FMPs to include 14 of the Cree's proposed C&I (JBACE 2012). Forest operations over the territory grew and the application of the conditions in the JBNQA seemed to be applied inconsistently over the years (Lajoie and Bouchard 2006). With forestry operations in their traditional territory not being subject to the necessary SEA, the Cree felt that their participation was limited and that their rights were being ignored by the industry as well as their concerns about land use, biodiversity and ecology (JBACE 1999).

After decades of dispute over the intent of the JBNQA, a new agreement was signed in 2002; it was called the Paix des Braves and intended to resolve the issues stemming from the JBNQA with respect to forest management (LaJoie and Bouchard 2006). This was a nation-to-nation agreement to co-manage the natural resources of Eyou Istchee through the creation of the Cree-Quebec Forestry Board (CQFB) and Joint Working Group (JWG) (Etapp and Gravel 2003; Jacqmain et al. 2012). The mandate of the Board is to ensure the Adapted Forestry Regime (Chapter 3 of the Paix des Braves) is being implemented through monitoring, reporting and assessing (CQFB 2015). The

JWG is made up of representatives of both Quebec and the Crees who work on the ground facilitating the relationship between forest industry and the tallymen (CQFB 2015). Each of the five Cree communities affected by the Adapted Forestry Regime has a JWG.

As a means of economic development and employment of community members, Waswanipi First Nation started two forest-based companies: Waswanipi Mishtuk Corporation in 1983 and the Apit-See-Win cooperative in 1986 (Salee and Levesque 2010). The former is a logging company and the latter a tree farm; the two companies merged in 1999 to ease their administrative burden (Salle and Levesque 2010). In the early days of operation, the company logged trees in a manner that focused on economics and following government standards. As the community began to voice concerns over forestry and its impacts on the land, the logging operations were reduced and the decision to apply to the Canadian Model Forest Network was made in 1997 (Salle and Levesque 2010; Jacqmain et al. 2012).

As a requirement of the Model Forest Network (MFN), Waswanipi needed to develop a set of criteria and indicators of sustainable forest management. As a matter of timing, the WCMF found it difficult to develop C&I. The WCMF felt that the concept of C&I was too new and difficult to grasp. Work done by the James Bay Advisory Committee on the Environment (JBACE) and the Cree Trappers Association were combined to provide the indicators for the requirements of the MFN (Waswanipi respondent pers. comm. 2006).

The main purpose of the C&I developed by the JBACE was to measure the impacts that forestry was having on the community and to establish ground rules to

improve the consultation process and participation level of the Crees in management planning (JBACE 1999). The set of indicators was developed as a preliminary set. On-the-ground testing would be required in order to adapt the indicators if they were not satisfactory. Baseline data would need to be collected as a starting point for monitoring. Public consultation with the Cree community and relevant stakeholders would also need to take place again to determine the effectiveness of the indicators. The JBACE (1999) felt that the WCMF would be the ideal location for data collection as the WCMF had the means to carry out the necessary work and the facilities to analyze data and store records. The WCMF could also benefit from the work already done by the JBACE so that duplication would not occur (JBACE 1999).

In 2007 the Waswanipi Model Forest became the Cree Research and Development Institute that continued the work started by the Model Forest. By 2012 the Institute had completed the translation of Cree forest vocabulary words into syllabics, and English (Francis 2016). The WCMF, with hunters, trappers, government and researchers, also developed the Ndoho Istchee (hunting territory) process. The process documented Cree conservation interests using trapline maps. Cree land use knowledge held by the Tallymen (leader of a trapline) and other land users provided the data for the maps. The map information was translated into a zoning approach that was used by foresters to write management plans.

The JBACE and the CQFB continue to work with the Quebec government to implement the JBNQA and the Adaptive Forestry Regime on their traditional territory. The CQFB have produced two status reports outlining how the regime has been implemented on the landscape. The first six years of operations from 2002-2008 were

assessed in the initial status report. The findings concluded that overall there was satisfaction with the implementation of the regime, that the concerns of the Cree were given consideration, and that there was an increase in Cree contribution to management processes (CQFB 2015b). One recommendation focused on the development of a monitoring program as a requirement of the Paix des Braves agreement. A monitoring framework was accordingly developed in 2014 and uses an objective and criterion framework.

The 2008-2013 status report summary document commented on the increase in experience the Cree communities now had with a regime that resulted in more consultation with the Crees and offered a better understanding of the regime by communities. The role of the JWG had improved and the tallymen saw improvements to habitat as a result of the cutting methods (CQFB 2015c). Three priorities were listed for continued success in the future: 1) to strengthen collaboration between those in charge of the implementation of Chapter 3 of the Agreement; 2) to set up adaptive management based on assessment and evolution of the Adapted Forestry Regime; and 3) to pay more attention to the economic benefits of forestry.

ALGONQUINS OF BARRIERE LAKE

The Algonquins of Barrière Lake (ABL) have a registered population of 764 members as of 2015 (Government of Canada 2017b). The community lives on a reserve called Rapid Lake, north of Montreal. The local environment is a mix of boreal and Great Lakes-St. Lawrence ecoregions with diverse tree species such as white spruce, black spruce, white birch (*Betula papyrifera* Marshall), yellow birch (*Betula*

alleghaniensis Britton), red pine (*Pinus resinosa* Aton) and maples (*Acer*). It is habitat

for several wildlife species including moose, bear (*Ursus americanus* Pallas), wolf

(*Canis lupus* Linnaeus), goose (*Branta Canadensis* Linnaeus) and walley (*Sander

vitreus* Mitchill) (Notzke 1993).

The Algonquins are connected to the natural environment as a way of living as

the community did not have a reserve until the 1960s and no housing until the 1970s

(ABL respondent pers. comm. 2006). The community still has a strong connection to

that lifestyle today, and seasonal fluctuations in on-reserve population occur as members

return to family territories for hunting and trapping. In the spring and fall, the

community has beaver breaks to accommodate the hunt, and even the school calendar

has incorporated the breaks for children to accompany their families (ABL respondent

pers. comm. 2006).

In the 1980s, the ABL experienced many negative impacts on their traditional

territory. Clearcutting was affecting the land, dams were being built that affected their

waterways and the logging roads increased the competition for hunting and trapping

with non-First Nations people (ABL respondent pers. comm. 2006). The community

struggled with several social problems, including an unemployment rate of between 80

and 90 per cent, overcrowding in homes, low levels of education and a high dependence

on government transfer payments (ABL respondent pers. comm. 2006).

In 1991 an agreement was signed called the Barrière Lake Trilateral Agreement,

between the Federal Government, the government of Quebec and the Algonquins of

Barrière Lake (Notzke 1993). This agreement was created for the purpose of developing

an Integrated Resource Management Plan (IRMP) to manage an area of approximately 1

million ha (Notzke 1993). The management was to be based on the principle of sustainable development defined in the Brundtland Report that was released by the World Commission on Environment and Development in 1982 (Notzke 1993). Management was to follow principles to support sustainable development while maintaining the Algonquin traditional way and listening to their environmental concerns.

Work began on the IRMP with data collection and analysis, inventory and studying the natural resources and their uses by the community. There were three phases for plan development and implementation. Data collection was the purpose of the first phase. A draft plan was created in the second phase and recommendations for implementation of the plan were developed. Phase three was for negotiating the plan's implementation. As a means of measuring the effects of the plan on the community, C&I were considered. The results from the studies conducted in phase one were synthesized by a consultant into a socio-economic profile for the community. There was a focus on social indicators of whether the plan was affecting the community positively or negatively. Other indicators addressed the economic health, community statistics and other non-forestry related indicators that help to determine community health. Community representatives reviewed the indicators to determine "whether or not those indicators made sense"(ABL respondent pers. comm. 2006).

Despite the Trilateral Agreement and the development of the IRMP, the Algonquins of Barrière Lake continue to struggle with management over lands resources. In 2009 and 2012 the community set up blockades in efforts to stop forest

industry operations on traditional lands until the Quebec government honoured their past agreements (Kitz 2009; Waawaaskesh 2012).

INNU NATION

Nitassinan is the Innu word meaning "our land"; the term refers to the traditional lands occupied by Innu in parts of eastern Quebec and Labrador. Sheshatshiu and Natuashish are the prominent communities of the Innu in Labrador. The Innu population living primarily in one of these two communities is approximately 2200 people (Innu 2017).

Central Labrador is within the geographic boundaries of the boreal forest. This forest is characterized by mainly spruce and fir species. The majority of the land is characterized by shallow soils that are nutrient poor supporting little vegetation. There are a number of lakes and rivers which help determine the landscape. Labrador also has populations of woodland caribou, harlequin ducks (*Histrionicus histrionicus* Linnaeus) and marten (*Martes americana* Turton).

The cultural environment in Nitassinan is one with ties to the past and looking towards the future. Traditionally the Innu have depended on nature to provide the necessary materials for tools, food, shelter and medicine. Canoes paddles, snowshoes and fishing equipment all came from the forest (Innu respondent 2 pers. comm. 2006). Even today there is a reliance on the environment to maintain traditional Innu ways of living (Wyatt et al. 2011).

Development projects in Labrador have not always taken the values of the Innu people into consideration. Often development has come without consultation or

consideration of the community and its needs (Innu 2006). Beginning in the 1950s with the low-level flying of military aviation training, hydroelectric development and forestry, outside influences put pressure of their traditional lands (Wyatt et al. 2011). Forestry in particular has been difficult to sustain in Labrador. Fluctuating market values and mill requirements for timber have resulted in on-again-off-again harvesting operations that are economically unreliable.

In the 1980s and 1990s the Innu Nation began taking a proactive approach to protecting their lands. Road blockades were set up to limit clear cutting in sensitive areas, and science was beginning to play a role in documenting the harmful environmental impacts of harvesting in Labrador (Innu 2006).

Current economic developments in the Innu territory include hydroelectricity, mining, hunting and fishing, forestry and tourism (Innu respondent 2 pers. comm. 2006). The Innu state that development projects must protect the needs of the land, animals and people of Nitassinan using an ecosystem-based approach. Economic stability will mean providing a future for the community while also maintaining the subsistence lifestyle (Innu respondent 2 pers. comm. 2006). Providing for the future while protecting the past can strengthen the community.

The Innu Nation and the Government of Newfoundland and Labrador signed a historic agreement in 2001 called "The Forest Process Agreement" (Innu respondent 2 pers. comm. 2006; Wyatt et al. 2011; Innu 2006). The agreement entailed full participation of the Innu Nation in forestry operations using an ecosystem-based approach (Forsyth et al. 2003). The agreement paved the way for the Ecosystem-Based Forest Management Plan for District 19 in central Labrador. District 19 is divided into

three units, 19A, 19B and 19C totaling 7.1 million ha. The management plan focuses on unit 19A which has an area of 2.1 million ha.

Through the Forest Process Agreement, the Innu became co-authors of the Forest Ecosystem Strategy Plan for Forest Management District 19 Labrador/Nitassinan 2003-2023 (FESP). It is in this plan where a set of objectives and actions—similar to C&I—are defined in order to inform and define objectives of the plan and the strategies to be implemented in order to meet community objectives (Innu Respondent 1. pers. comm. 2006). The data used to create the objectives and actions was gathered by public consultation and through the work of the Forest Guardian program (Innu Respondent 1 and Innu Respondent 2 pers. comm. 2006). The Innu Nation continues to work with the government of Newfoundland and Labrador to produce Forest Management Plans, the most current is for the 2018-2022 operating period.

The Forest Guardian program was developed in 2001 to implement the Forest Process Agreement (Innu 2005); the program is a subset of the Innu Environmental Guardian Program developed in collaboration with the Gorsebrook Research Institute at Saint Mary's University in Nova Scotia Canada and Environment Canada (Sable 2018). It employees 14 Innu members as Forest Guardians, Voisey's Bay Monitors, Fisheries Guardians and Environmental Guardians (Sable 2018). The main objective of the program was to develop capacity in the community through education on the management and protection of the land and of traditional values in order to combine both traditional and western ways of knowing (Sable et al 2006).

The Forest Guardians consist of Innu community members trained as forest technicians and community liaisons who were responsible for being the "eyes, ears and

voice of the Innu on forestry issues" (Innu 2005, Sable 2018). There were several main focus areas of the Guardian program: monitoring harvesting operations, conducting research, surveying of proposed harvest blocks, designing stand level Protected Areas Networks, conducting community consultations, translation and communications and partnerships and ecosystem-based forest planning and practice (Innu 2005, Sable et al. 2006)). All of the work in these core areas was coordinated by the staff of the Innu Nation Environment Office and fed into the development of the FESP and continues to support stewardship of the land (Innu 2005, Sable 2018).

DRIVERS AND CONTEXT FOR INDICATOR DEVELOPMENT

All of the case studies had government policies that provided an institutional mechanism for participation, as well as partnerships with ENGOs, academics or consultants that provided them access to advisors and support for their initiatives (Table 2). All but one of the communities entered into some form of planning agreement with their respective provincial governments that would enable community input to be included in forest management planning. Tl'azt'en partnered solely with the University of Northern British Columbia, although the Little Red River Cree Nation was also partnered with the SFM Network, a research institute based at the University of Alberta.

In addition to participation in the planning process, three of the communities were given timber rights on their traditional lands. In BC the Nuu-chah-nulth and the Tl'azt'en were granted Tree Farm Licences, and the Little Red River Cree were granted a Special Management Area—all area rather than volume based. Iisaak and LRRCN

partnered with forest industry companies to co-manage the licences. This gave those communities opportunities for direct economic gains.

Five of the six case studies are located within the boreal ecosystem. Iisaak is located in a unique ecosystem in the country, the coastal temperate rainforest. This area was the focus of national resistance to forestry operations and development because of its uniqueness. It is this long history of forestry and its negative impacts that caused concern for the First Nation communities living in that area that helped to drive their involvement in forest management planning. For example, it was the Cree of Northern Quebec's who sued the Province of Quebec and logging companies over what they considered environmentally and culturally destructive practices that led to the Paix des Braves Agreement (2002) and the establishment of the Cree-Quebec Forestry Board (Passelac-Ross and Smith 2013)

All of the C&I frameworks were developed in a team setting led by researchers or forest planning consultants. These development teams differed in their approach within the community. In the case of Tl'azt'en and the LRRCN, community members were trained in research design and methods in order to engage their community through interviews and other means of data collection. The communities were split evenly on those that developed community-based results and those that used outside resources to develop the C&I that afterwards the community reviewed. All six communities prepared at least one published paper that contributed significantly to the body of literature around Aboriginal participation in the development of local-level criteria and indicators.

Monitoring mechanisms as a means of contributing to adaptation over time were put in place by some of the communities. Those initiatives with a forest management

plan were associated with indicators that outlined monitoring as a requirement of those plans. The Algonquins of Barrière Lake and the Waswanipi Cree spoke of their C&I as being dynamic, implying they could be changed if there was a need determined through monitoring.

Table 2. Drivers and context for development of Aboriginal criteria & indicators for forest management in Canada (Smith et al. 2010).

	Nuu-chah-nulth (BC)	Tl'azt'en Nation (BC)	Little Red River Cree Nation (AB)	Algonquins of Barriere Lake (QC)	Waswanipi Cree (QC)	Innu Nation (LABRADOR)
Policy and/or arrangements with the Crown	Clayoquot Sound Science Panel, Interim Measures Agreement, Comprehensive Planning Board, Tree Farm & other timber licences, FSC certific'n	Tree Farm Licence, co-management with Univ of Northern BC of John Prince Research Forest with Special Use Permit from BC	Treaty 8, 1899, Co-operative Management Planning Agreement, 1999-2002, Alberta Forest Planning Manual	Trilateral Agreement with Quebec & Canada for Integrated Resource Management Planning	James Bay & Northern Quebec Agreement, 1975, Canadian Model Forest Network, 1997, Quebec timber licences, Paix des Braves	Comprehensive land claim, Forest Process Agreement with Government of Newfoundland and Labrador, 2001, for District 19
Ecosystem type	Coastal temperate rainforest	Boreal	Boreal	Boreal/Great Lakes-St. Lawrence	Boreal	Boreal
C&I development method	Forest Stewardship Council BC standard	Led by researchers, developed with community	Community-based, research-driven	Expert-driven using outside consultants, reviewed by community	James Bay Advisory Committee on the Environment, Cree Trappers Assoc., Model Forest Network Local C&I program	Expert-driven based on ecosystem planning framework, reviewed by community
Key document(s)	Sustainable Forest Management Plan 2006-2011, Spiro & Hoberg 2004	Wilkerson and Baruah 2000, Karjala et al. 2003 on Aboriginal Forest Planning Process, Karjala et al. 2004		Elias n.d. , Trilateral Agreement	Ndoho Istchee: An Innovative Approach to Aboriginal Participation in Forest Management Planning, 2007	Forest Ecosystem Strategy Plan for Forest Management, District 19, Labrador/Nitassinan 2003-2023
Community involvement	Public fora within First Nations and with external stakeholders	Interviews with community members, focus groups, field trips, archival research	Interviews with community members, field trips, focus groups	Map biographies, field trips	Focus on input from trappers & families still practising traditional activities	Public stakeholder meetings, Innu Forest Guardians
Use in forest management planning	Used in development & implementation of forest management plan & to support FSC certification	Use in management of John Prince Research Forest	Used in discussions with industry to modify forestry practices	Used in negotiations with industry & Quebec to modify forestry practices, but little implementation to date	Integration Round Table in which Cree trappers & forest managers share knowledge & address Cree values	Incorporated into forest management plan
Outside partnerships	ENGOs, forest industry joint venture	University of Northern BC	Sustainable Forest Management Network, Tolko Industries Ltd.	Governments of Canada, Quebec	Canadian Model Forest Network, Quebec, industry	Government of NF & Labrador, Canadian Model Forest Network, Canadian Boreal Initiative
Monitoring	Implementation & effectiveness monitoring included in FMP as part of adaptive management approach	Tl'azt'en Nation Community-Based Environmental Monitoring developed in 2009 with 252 environmental indicators (Yin 2009)	No specific mention in LRRCN C&I process, but monitoring a component of provincial forest planning	Little mention of monitoring except for social indicators which are "dynamic", to be refined over time by monitoring, data collection & analysis (Anonymous n.d.)	Cree-Quebec Forestry Board with link to local communities (WCMF 2007)	Province & Innu as laid out in chapter on ecological, cultural & economic research & monitoring in FMP; Forest Guardian Program

SUMMARIZING CRITERIA AND INDICATORS

A total of 587 indicators were collected from the literature.[6] A breakdown of the

total indicators by criterion for each of the communities is shown in Table 3. The

environmental criterion had the most indicators at 163. Iisaak had the greatest number of

indicators under this category (96), while Little Red River Cree identified with only

five. The rights criterion had the fewest indicators with a total of 30. Waswanipi had 18

of these rights indicators. Some communities had no criteria for the institutional and

rights categories. The number of indicators under each criterion is affected by the

initiatives undertaken to develop the sets. For example, the Iisaak environmental set is

so comprehensive due to the recommendations of the Clayoquot Sound Scientific Panel

report and the requirements of FSC certification.

Table 3. Total number of original community indicators by criterion categories
(Smith et al. 2010).

Community Name	Environmental	Economic	Social	Cultural	Institutional	Rights	Total
Innu	17	46	6	16	35	0	**120**
Iisaak	96	12	26	19	66	7	**226**
Algonquins of Barriere Lake	7	12	15	8	0	0	**42**
Tl'azt'en	22	13	22	3	30	0	**90**
Little Red River Cree	5	5	10	5	0	5	**30**
Waswanipi	16	6	26	5	8	18	**79**
	163	**94**	**105**	**56**	**139**	**30**	**587**

After the indicators were re-organized under each criterion using the new

definitions, some changes occurred to the total number of indicators under each theme

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[6] Indicators for the LRRC Nation are not complete. They are a subset of the full criteria published in the
Natcher and Hickey (2002) paper.

(Table 4). The institutional criterion was associated with the largest number of

indicators (215) and the social criterion the lowest (57). All of the criteria have a

representation of indicators by community, but the number in the social criteria dropped

by 48 from 105 to 57 indicators. The majority of these were moved into the cultural

criterion due to their focus on maintaining a traditional way of life and cultural values.

Table 4. Total number of re-grouped community indicators by criterion categories (Smith et al. 2010).

Community Name	Environmental	Economic	Social	Cultural	Institutional	Total
Innu	39	15	4	11	51	120
Iisaak	89	12	15	18	92	226
Algonquins of Barriere Lake	3	10	11	15	3	42
Tl'azt'en	15	9	20	20	26	90
Little Red River Cree	9	1	4	11	5	30
Waswanipi	11	7	3	20	38	79
Total	166	54	57	95	215	587

For most of the communities, the development process was triggered by a

response to existing forestry programs such as the Model Forest Network or as a

reaction to current dissatisfactory resource use by government and industry. The

research conducted for most of the communities was done in partnership with

government agencies, industry, universities, research agencies, consultants and experts

such as anthropologists and economists. The C&I development was funded in part by

these partnerships, as well as by provincial and federal programs depending on the

initiative location. Each initiative was aware of other sets of criteria and indicators being

used in Canada and internationally, although most did not implement these other sets

because they were too broad to capture local concerns and/or the uniqueness of the

forest.

Community participation was key to these indicator development projects, through focus groups, interviews, community meetings and joint committees between the First Nations and others, such government, industry or consultants. Those participating in the development were selected from the larger community because of their ability to understand the concepts of C&I; however, a general theme for all the communities was the limited understanding of the importance of C&I and how they can be used. All of the sets are thought of as "living documents" that are ever changing and dynamic. The indicators are flexible in order to adapt to changing needs in the community and the environment.

Figures 3 through 7 illustrate the rolled-up community indicators by criterion: Improve Opportunities for Participation, Collaboration and Research, labelled the institutional indicators (Figure 3); Maintain Forest Integrity and Health to Ensure Sustainable Use, the environmental indicators (Figure 4); Protect Aboriginal Cultural Values in Forest Management Planning, the cultural indicators (Figure 5); Increase Economic Benefits from Forests for Aboriginal Communities and Improve Equity, the economic indicators (Figure 6); and Health and Stability for Individuals and the Community, the social indicators (Figure 7). These results were first presented in Smith et al. (2010) but were reviewed and updated in 2017 for inclusion in this paper. The rolled-up indicators are groupings of common themes under a criterion. The themes under each criterion move clockwise from the highest number indicators to smallest.

The largest numbers of indicators are categorized in the "Improve opportunities for participation collaboration and research" criterion. Fourteen headings capture the most common themes of indicators. These include research and monitoring programs to measure aspects of all the other criteria, provisions for forest management planning, and First Nation consultation as the highest-ranked themes. The least number of indicators were found under protected areas, conflict resolution and incorporating Traditional Ecological Knowledge (TEK) and western science.
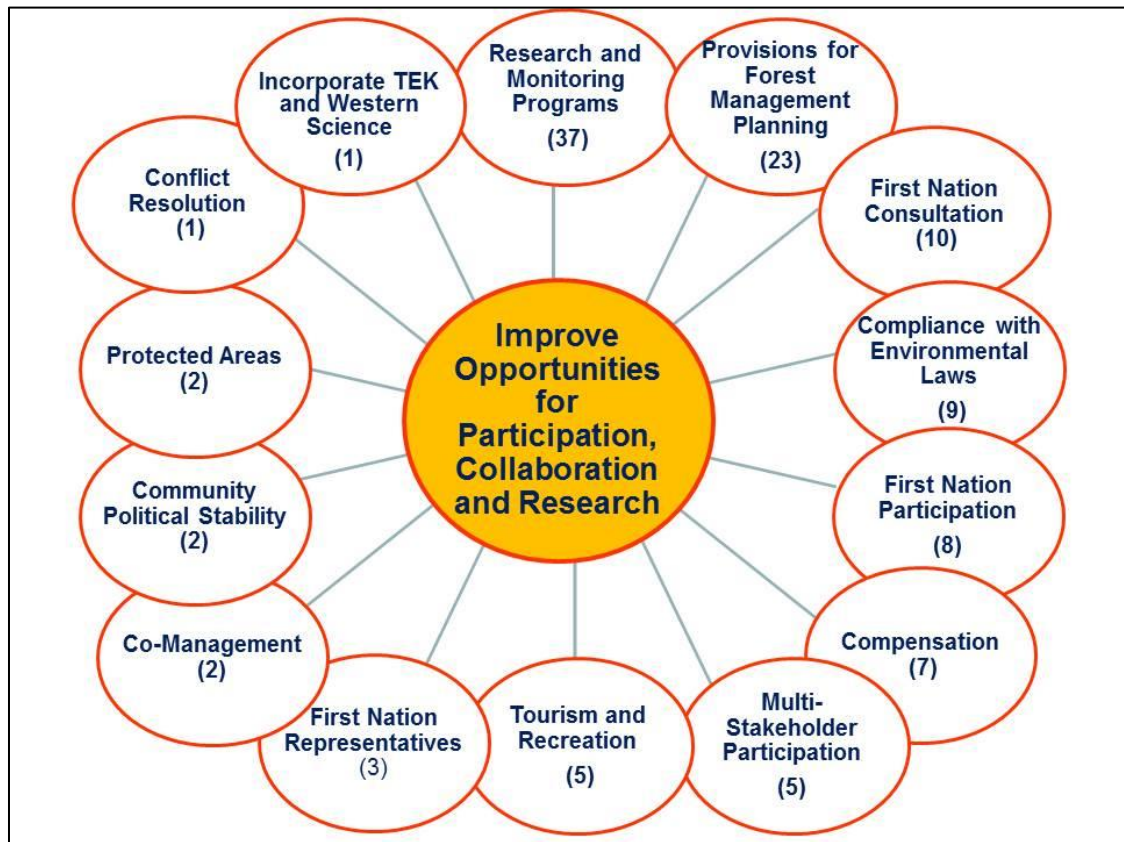
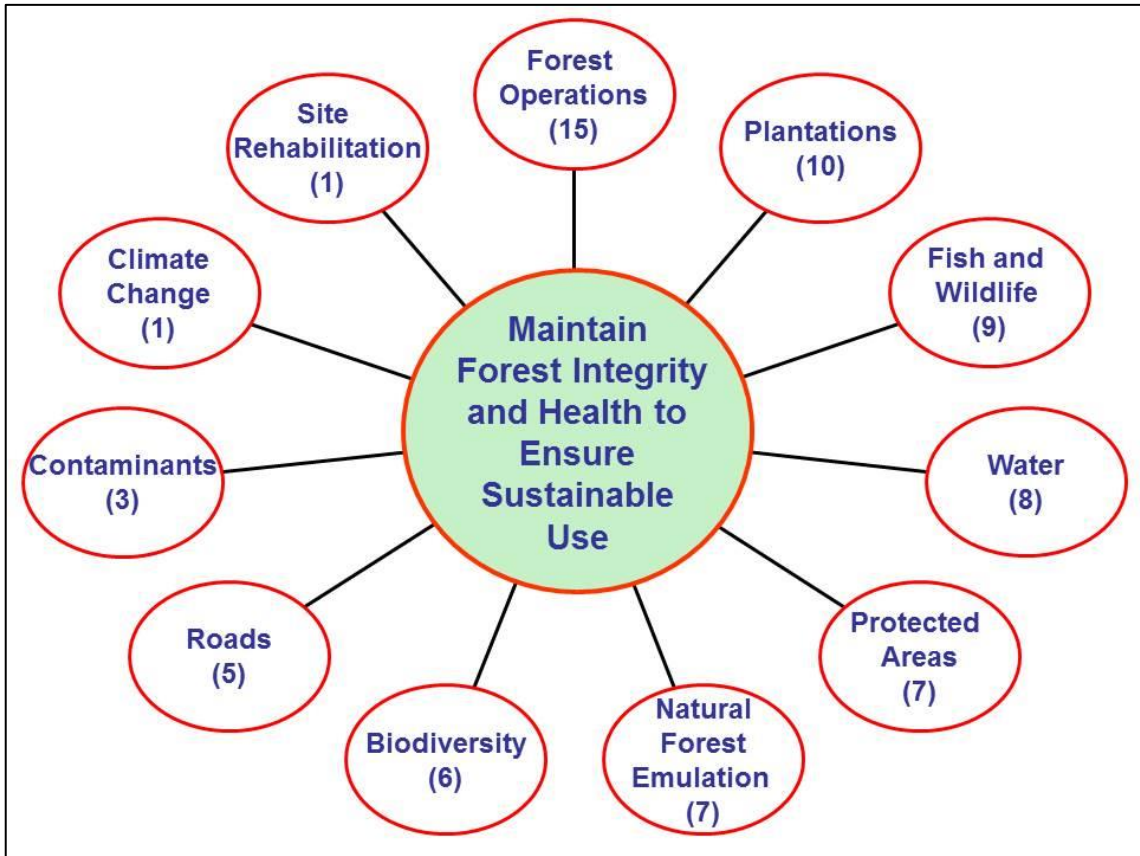Figure 3. Institutional Indicators (Symington-Armstrong 2017)

Figure 4. Environmental Indicators (Symington-Armstrong 2017)

Indicators in the "Maintain forest integrity and health to ensure sustainable use" criterion captured concerns about forest operations, plantations, and fish and wildlife, with the highest number of indicators addressing climate change and the least number of indicators addressing site rehabilitation. The common indicators under the environmental criterion were: timber harvesting and road building regulations; silvicultural direction; fish and wildlife habitat requirements; forest health and ecosystem biodiversity; and watershed and sensitive areas protection. Indicators for species protection were often unique to a First Nation's ecosystem location.

Figure 5. Cultural Indicators (Symington-Armstrong 2017)

Indicators in the "Protect Aboriginal cultural values in forest management planning" criterion ranged from protection of traditional land-use values to cross cultural learning for a total of seven headings. Common indicators were the protection of culturally significant areas, using traditional ecological knowledge in management planning, and identifying and recording cultural values. Other indicators were unique to certain First Nations such as cultural areas identified for protection.
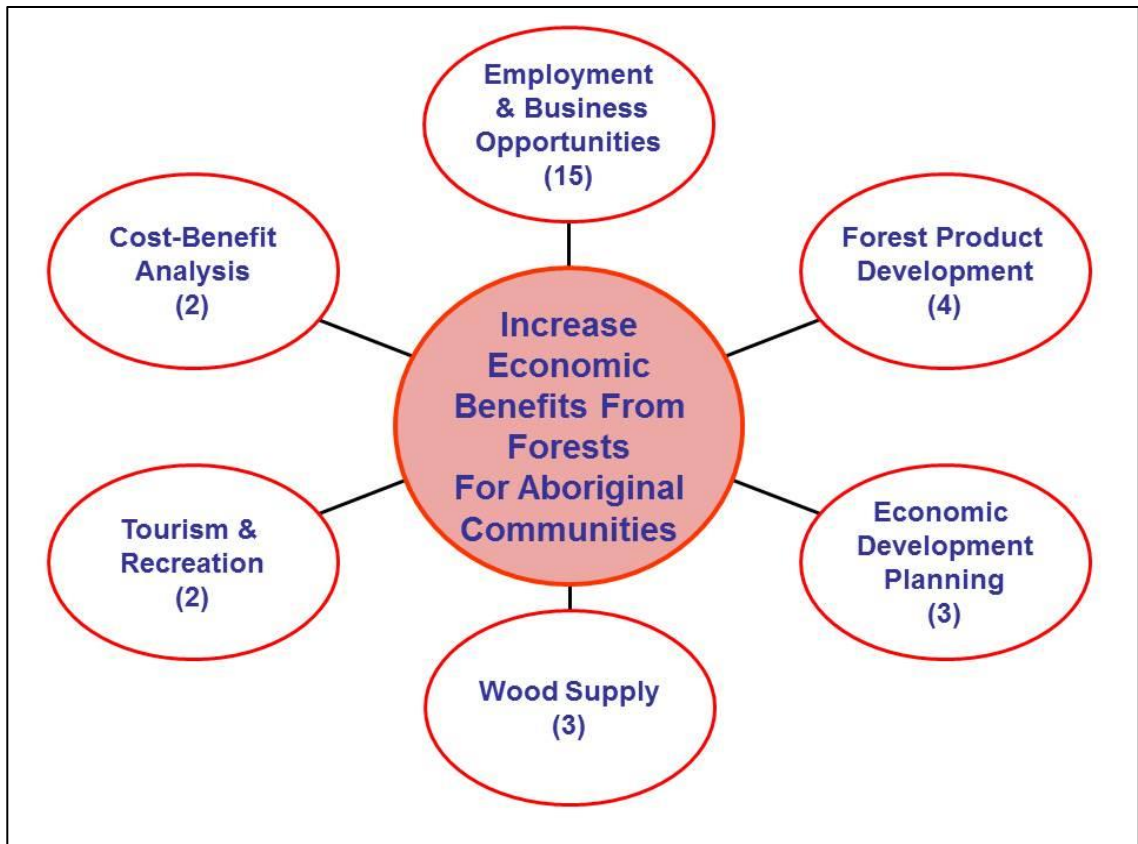
Figure 6. Economic Indicators (Symington-Armstrong 2017)

Under the "Increase economic benefits from forests for Aboriginal communities" criterion, indicators included employment and business opportunities, forest product development, economic development planning, wood supply, tourism and recreation, and cost-benefit analysis. A total of six headings captured common indicator themes. Those themes include job creation for community members both in and out of the forest sector, increased income for community members, and timber utilization.

Figure 7. Social Indicators (Symington-Armstrong 2017)

The "Improve equity health and stability for individuals and the community" criterion has four headings: community health and well-being with the largest number of indicators; capacity building; fair distribution of opportunities in forest sector; and workers' rights and safety with the lowest number of indicators. The common indicator themes are improving education and health and ensuring a fair distribution of wealth within communities.

A common theme heard in the interviews was that the criteria and indicators are all important because they are linked to each other. Researchers have found that separating indicators based on a hierarchical scale mutes their interconnectedness and

that First Nations do not separate environment from culture, or society from individuals

(Adam and Kneeshaw 2008, Bunnell and Huggard, 1999, Davidson-Hunt and Berkes

2003). In the Tl'azt'en example, researchers felt it might be important to prioritize the

results but struggled with deciding at which level, criterion or indicator: "The input from

the community made it seem wrong" to separate (Tl'azt'en respondent) In the case of

the Innu, a respondent described the rankings: "The framework was ecosystem based.

The ecosystem is first, culture is linked to the ecosystem and if the ecosystem and the

culture are healthy, then economics will be healthy." The Waswanipi Cree respondent

provided this feedback when asked about ranking the indicators:

> By the nature of the beast you have to rank them if you want them to be
> useful outside of the community. Outside groups will have to know
> which ones are more important and choices will be made….For the
> Cree…..they want to protect everything, not one or the other.

From the community's perspective, they want to protect the whole but understand they

may be required to look at criteria and indicators in a different way to participate in the

formal government resource management context.

DESCRIPTION OF INDICATOR SETS BY COMMUNITY

Iisaak Forest Resources Ltd.

For Iisaak, the FSC criteria and indicators and the recommendations given by the

CSSP provided very specific direction for forestry in the region. The set used in the

forest management plan also used specific targets and goals to guide sustainable

forestry. Economically the focus was on strengthening the local economy through

sustainable management and minimizing resource waste.

The four major themes that are found in the environmental indicators were restoration, water, roads and silviculture. Iisaak was unique with indicators addressing plantations, the disposal of contaminants, and site rehabilitation because they adopted the FSC framework and developed an intensive set of regulations with the results from the Clayoquot Sound Scientific Panel Reports. The CSSP gave very specific recommendations on buffers, the application of silvicultural treatments, the construction and use of roads, and restoring sites that have been altered by forestry operations. All of the indicators aimed to protect sensitive areas while using harvestable areas responsibly.

The majority of Iisaak social indicators dealt with providing training opportunities for both Nuu-Chah-Nulth and non-Nuu-Chah-Nulth to learn about each other's forestry management strategies. They also focused on building relationships between First Nations and industry by opening the lines of communication in forestry discussions. Jobs and economic benefits were to lean in favour of the First Nation in order to provide socio-economic stability.

Restoration was also a concern under the cultural criterion. Altered sites of cultural importance to the community were to be restored. All traditionally important sites and areas throughout the management area were to be protected using buffers. Research and inventory were indicators that were meant to help to provide information on the location of these sites for better protection and monitoring.

Tl'azt'en Nation

Indicators in the Tl'azt'en set ranged from general to very specific. The economic indicators generally focused on conditions of economic development and

economic stability. In order to improve economic development, Tl'azt'en listed self-employment and band-owned businesses as indicators of success. Economic stability was to be measured in several different terms. Capacity building within the community and equal opportunity for employment by Tl'azt'en members was an indicator of stability. Sustaining traditional economies from hunting, trapping, fishing and gathering was also a measure of economic stability. All economic development needs to benefit the Tl'azt'en Nation and the success of economic development will be measured in terms of social impacts.

Land management, resource and environmental concerns, and ecological sustainability were the three main areas of interest for the Tl'azt'en's environmental indicators. Current and traditional land management practices were to be researched to determine their extent. The health of the forest was to be measured in terms of fish, wildlife and plant species. Ecosystem and landscape diversity was to be promoted and protected. There were indicators to maintain culturally significant plant species such as cottonwood (*Populus sect. Aigeiros*) and jack pine. Other indicators were chosen to provide direction for the placement and size of buffers around sensitive areas.

The social indicators chosen by Tl'azt'en highlighted the importance of education, employment, the community, and social sustainability. The number of Tl'azt'en attending all levels of education was to be measured. Life expectancy, health and mortality statistics, as well as the number of volunteers and locally employed, were to be indicators that reflect community stability. Indicators related to social sustainability were to measure cultural revitalization and relationship building within the

community. Stability was also to be measured in terms of capacity building initiatives for Tl'azt'en members.

The few cultural indicators found for Tl'azt'en were intended to measure the use of the Carrier language. Reading, writing and speaking Carrier were addressed by the indicators, as well as the number of children who are learning the language. The number of people involved in traditional activities was an indicator of cultural sustainability.

Little Red River Cree Nation

The economic indicators selected by the LRRCN centered on training and employment opportunities for the community to increase capacity building. Education was to be gained in all areas of forest management from planning to operations. There was also an aim to increase the number of individually-owned businesses in the community.

Environmental targets focused on protecting significant habitat and reducing the negative impacts of harvest operations on the natural environment. Bison is a culturally significant wildlife species and its habitat was to be protected by indicators under the environmental criterion.

The social criterion emphasized the importance of community access to traditional lands. There were a number of indicators dealing with harvesting methods and the placement of buffers to maintain physical access to lands by people. There was also direction on how to better involve community members in forestry decision-making processes.

Cultural indicators were designed to track the use and location of important cultural and historic sites as well as those sites that hold high biological significance. Medicinal plants, burial sites and local geographic treasures were to be protected by the use of buffers to ensure their safety from harvesting operations.

Cree First Nation of Waswanipi

Locally-owned businesses, both forestry and secondary, played a role in the economic indicators chosen by Waswanipi. These businesses were thought to be able to improve the economic stability of the community and increase local employment. Joint ventures between community members and outside businesses were also to help to provide stability.

The environmental indicators focused on diversity at the landscape and stand level in the management area. Mapping, data collection and emulating natural disturbance indicators all focused on information that could be used in monitoring environmental processes. Waswanipi would also have liked to see an incorporation of Traditional Ecological Knowledge into management plans.

The social indicators of the Waswanipi Cree had the goal of protecting First Nation people, their societies, communities and economies. Indicators in this category addressed: protecting hunting, trapping and fishing; land use; and researching the number of days that community members are active in the bush. The dependence on the land for social stability was evident in the number of land-related indicators.

Cultural indicators focused on values mapping to collect and categorize important sites. Once mapped these sites were to be protected and conserved. The

amount of land available for subsistence use was to be researched and monitored so this tradition could be maintained by the community.

Algonquins of Barrière Lake

Economic indicators for the Algonquin focused on strengthening the local economy. Indicators were chosen to measure the decline in the dependence on social assistance and the increase in income for individuals, households and the community. An increase in income gained from traditional production was also to be measured by the indicators.

Landscape availability was the focus of the indicators under the environmental criterion. Lands and resources were to increase in availability to the Algonquins for traditional and current use. The Algonquin planned to measure and increase the amount of land repatriated and to increase the number of protected areas. A balance was to be found between sites that are managed and sites that are to be managed naturally with consideration of Algonquin silvicultural knowledge.

The social indicators were chosen to measure the health status and the social fabric of the community. Health indicators pointed to decreasing lifestyle diseases, decreasing use of health care services and a decrease in negative social behaviours including substance abuse, violence and crime. Indicators concentrating on the social fabric of the community sought to increase the strength of the community through bettering family stability, increased participation in community events, and improved local knowledge. A feast was to be an example of a community event where participation could be increased, particularly that of women, children and elders.

Community strength was also to be measured by the Algonquins in terms of participation in local elections as voters and candidates. Increasing local knowledge was to be measured in terms of the use of the traditional language, an increase in education levels, and an awareness of local toponymy.

Cultural indicators for the Algonquins were to be used to protect and measure the amount of land occupied for traditional purposes as well as timber harvesting. There was to be a balance between these two types of forest use. Traplines were not to be decreased nor was the number of protected cultural sites. Emulating natural disturbance was to be used as an indicator to include the traditional knowledge of silvicultural practices by Algonquins.

Innu Nation

The indicators under the economic criteria addressed issues concerning missed opportunities for local processing of wood products and for tourism and recreation development. Processing wood products locally would address the historic log export to the island of Newfoundland that excluded the Innu from any economic benefit. The development of Akami-Uapishk^U-KakKasuak-Mealy Mountains National Park Reserve was to provide an opportunity for the Innu to gain income from tourism activities. While improving the economic situation was important to the criteria and indicator set, the benefits of economic opportunities were to be examined against their impacts in ecologic and cultural terms.

The environmental indicators concentrated on the development of an Environmental Protection Areas Network (EPAN) and Environmental Protection

Guidelines (EPG). These were designed to protect sensitive and important habitats

throughout the planning area. Indicators also gave direction for protecting the Red Wine

Mountain woodland caribou herd, a locally significant wildlife species. The contribution

that District 19A provides to the global storage and cycling of carbon was also to be

measured by the environmental indicators.

Social indicators focused on local forestry jobs for the Innu community. These

jobs were to be measured per meter cubed of timber. The focus was on encouraging

Innu business proposals and increasing Innu participation, specifically targeting the

participation of women in the forest sector. Research and monitoring of socio-economic

factors were also represented by indicators.

Cultural indicators measured heritage values, landscape aesthetics, hunting and

trapping, non-timber forest products (NTFP) and domestic forest products. As well as

protecting ecologically sensitive areas, the EPAN was also designed to protect culturally

significant areas and NTFP for Innu use. In consultation with trappers, animal habitat

for hunting and trapping was to be protected. The creation of a database for archiving

culturally significant areas was part of an indicator to protect heritage values. The use of

timber at the domestic level was to be protected by the management plan. Timber use is

to be researched in order to measure the resource.

DISCUSSION

The purpose of criteria and indicators is to define forest values that can be assessed over time to determine whether forest management is moving towards or away from sustainability. These tools are being used at different scales (international, national, provincial) and for a variety of initiatives (forest management, certification, model forests, co-management arrangements). First Nation peoples bring to the table a unique perspective on forest management. This section will discuss the results in relation to the following themes: participation, cultural values, measures of sustainability and monitoring and adaptive management.

It is important to note that although final numbers of indicators by theme have been tallied and the figures where weighted to show a digression from highest number of indicators to lowest, this in no way illustrates the importance of some indicators over others.

IMPROVE OPPORTUNITIES FOR PARTICIPATION COLLABORATION AND RESEARCH

Interviewees associated with all six of the study communities expressed the importance of participating in the development of their C&I sets. Both interviewees and the C&I gathered from the literature pointed to participation as a value. When asked how important it was to develop their own sets of C&I, respondents had the following to say: "It was critical, because they needed to define what values and concerns represented their values" (Tl'azt'en respondent); "It was imperative to develop our own.

No other set would have worked; we needed to find out what was acceptable to the Innu" (Innu respondent); and "There is no sense in conducting C&I research, or any research for that matter unless it's going to reflect the members who are most affected by those decisions" (Little Red River Cree respondent).

Not only was it important for communities to participate in the development of the criteria and indicator sets, it was also a common theme in the indicators gathered from each community that participating in forest management be used as a marker of sustainability. Five of the six communities had indicators under the "First Nation Participation" heading. In the final charts, "engage First Nations during all phases of forest management planning" had the highest number of related indicators from communities. Other indicator themes included participation in decision-making processes, meaningful community engagement, and adequate capacity to participate in the planning process.

Community participation was key for these projects; nevertheless, none of these sets was created from the bottom up. Each of the six communities partnered with an outside group or used an outside process to develop their local C&I frameworks. Community involvement ranged from one initiative to another. In the case of the Tl'azt'en set, the work began from a student's thesis project funded by the University of Northern British Columbia (UNBC). The community was "involved in focus groups, as analysts, as researchers, as group members doing analysis to make the framework and define it, as UNBC partners who will apply it. They have participated at all levels" (Tl'azt'en respondent).

In other cases, such as the Waswanipi Cree example, Waswanipi partnered with the Model Forest Network and used a large amount of information that came out of the James Bay Advisory Committee on the Environment, which was established as part of the James Bay and Northern Quebec Agreement, 1975. In that instance the community was "not involved very much with the development of criteria and indicators. The JBACE is based in Ottawa. Some community members were involved at that level, but mostly they were developed at the regional level with the Grand Council of the Crees" (Waswanipi respondent).

The reliance on outside advisors and the need to seek their expertise are not necessarily an indication of failure on the part of communities to develop sets on their own. It points to other arguments that perhaps in order for C&I to be taken seriously by others, the sets need to endorsed by experts in the field or there is a lack of capacity at community level for such a technical exercise. Sherry et al. (2005) found that community analysts struggled with the concepts of C&I and had limited capacity in forest management theory, qualitative data analysis and computer skills. For Iisaak, there was an understanding that there is a capacity-building component to the process: "As time goes on, it will become clearer and clearer what C&I are and that will feed back into the process" (Iisaak respondent).

In creating C&I for their individual endeavours, different community participants were engaged to elicit a range of responses and values to be included in their frameworks. As Natcher and Hickey (2002) point out, there are often inequalities in representation of some groups within communities during resource management planning such as gender and generations. The values of these underrepresented groups

are often overshadowed by dominant community perspectives. Some communities

sought out the participation of women, elders and children, who offered different

perspectives to resource use, while others only used information from those who

voluntarily participated, who were typically men more interested in wildlife

management, harvesting and processing of forest resources. Some examples discussed in

the interviews include: "In general, women really emphasize education and health,

children and the family. How can forest partnerships address these concerns?" (Tl'azt'en

respondent). When asked about the gender differences in indicator development,

respondents had the following comments:

> There were some women giving input at the community meetings but not
> a lot. The men were represented more than the women and they spoke up
> more. The women's input came in mostly in the studies that were done in
> Phase 1, like the social customs study related to the division of labour
> between gender and family kinship patterns and how meat was shared.
> (Algonquins of Barrière Lake respondent)

> The women I interviewed had a lot to say about participation in decision
> making and management, and they had some really interesting
> suggestions about job shadowing; where[as] a lot of men would say
> employment, time in the bush, women were thinking about enhancing
> distance education for single mothers. (LRRCN respondent)

> Men speak more about physical things, they speak more about harvesting
> and the effects of wildlife and women speak more about how things feel
> and how things look. The subject of the concern is the same, it's usually
> animals, but the way they're looking at it is different. (Innu respondent)

According to a Tl'azt'en respondent (pers. comm. 2006) and McGrath and

Stevenson (1996), there are a lot of barriers to women's participation, including the

colonial influence of undermining the matriarchal paradigm. First Nation families thrive

with the support and knowledge of their mothers. The cultural identities of Aboriginal

women are inseparable from their families, histories, communities and spiritualties

(Bourassa et al. 2004). After colonization, the Indian Act imposed sexist and racist

practices that marginalized Aboriginal women, lowering their social status within and

outside their communities (Bourassa et al. 2004). Aboriginal women are in direct

contact with the natural environment, using its resources to provide food, medicines and

cultural practices for their families. Forest management cannot be adequately informed

without their representation. Women need to be valued as land managers outside of their

traditional cultural roles (VFA 2009).

Some of the communities were able to make comparisons between the voices of

elders and youth. In the interview with a respondent from the Tl'azt'en comes this

example:

> The youth focused on economic development, employment….mills,
> silviculture and contemporary views…economics and jobs. Elders want
> to improve the quality of life, education, good health, inter-generational
> communication, co-operation…. Both groups are concerned with
> ecological sustainability.

An LRRCN interview revealed that:

> there was the realization [of a gap] between economic realities and 80%
> unemployment by the youth and kids who were entering the workforce
> and the view of elders who see the industrialization of their traditional
> territories. That said a lot of the elders are also very realistic and
> understand what the future holds for their youth so they do want to see
> employment.

Even in communities without strong participation by youth there were comments

about the significance of their taking part in C&I development that also explain the

challenge of garnering their involvement.

> The youth really haven't been involved too much. That's something
> we've been trying to encourage them to do. They're starting to
> acknowledge that they need to do more, that they haven't really involved
> them a lot yet. There are a lot of drop-outs; a lot of them don't make it

through school, so there are some challenges there through education development. (Algonquins of Barrière Lake respondent)

Youth and adults perceive their surroundings in very different ways. Understanding the feelings of youth members about their natural environments and the resources they contain is an important part in managing those resources. The interaction that children have with nature through their experiences, practicing their traditions or simply playing or being outside, can deeply affect personal and mental health and can influence the type of steward they become as adults (Bayne et al. 2015). In New Zealand it was found that children living near forested areas had an awareness of the ecologic and economic benefits they can provide, as well as an awareness of its impact on their identities in terms of the recreational activities they enjoyed (Bayne et al. 2015).

As the inheritors of our natural environments, it is crucial to foster the role of youth in natural resources management now in order to benefit the future. The forest industry in Canada will be affected by shortages in workforce and Aboriginal youth populations are one of the fastest growing in Canada, providing an opportunity to bridge the gap in forestry careers (NRCan 2011). Over the years, several initiatives have been created in different regions in Canada to engage Aboriginal youth in forestry. The focus of these initiatives has been to provide forestry education and training to youth from the ages of six to 18. Aboriginal youth who participated in these programs are an asset to their communities; they can become local experts who help to develop future C&I frameworks.

The data collected for this thesis also reflected the influence of politics in resource management discussed in the literature. Politics determine who participates and

to what extent. First Nation communities are aware of political influences and have been making strategic partnerships in order to "play the game." In the case of Little Red River Cree First Nation, when the interview respondent was asked why the community looked to forestry and the SFM Network, this is what was said:

> It's far beyond forestry. [The community's] relationship with the Network was very strategic. It was to regain control over their traditional lands and they saw the Network as a way to get public access to a lot of other people. Forestry is just one aspect of activities that they think might be able to occur on the traditional lands. It has very little to do with finding better ways to do forestry and was political as much as anything and so is this C&I…..It's not about how to cut trees better or how to manage the forest; it is very political…The access that Little Red River has achieved out of the Network has enabled them to leverage a lot of resources.

Due to the nature of provincial government responsibilities related to Crown forests, some First Nations have participated in co-management arrangements or as stakeholders in multi-stakeholder initiatives. Co-management assumes that a partnership between Aboriginals and governments in decision-making will recognize Aboriginal rights over natural resources (Smith 2013). Furthermore, efficiency and equality in the process is achieved by including stakeholders most affected by decisions about resource use (Castro and Nielson 2001, Grimble and Wellard 1997, Moog et al. 2015).

All of the communities examined took part in some form of partnership, either co-management or multi-stakeholder, to develop their sets of criteria and indicators. The Little Red River Cree and Tl'azt'en Nation initiatives began as multi-stakeholder arrangements. The Little Red River Cree partnered with forest and oil and gas industries and the SFM Network based in the University of Alberta. Tl'azt'en partnered with the University of Northern British Columbia. The Nuu-chah-nulth, Algonquins of Barrière

Lake, Waswanipi Cree and the Innu Nation all formed co-management arrangements with either federal or provincial government programs. The Nuu-chah-nulth also included the forest industry in the partnership. In their indicator sets, several communities specifically addressed aspects of co-management: clear and equal representation of forest management partners; multi-stakeholder participation; and representation of various stakeholders on the planning committee.

Although there are several benefits to co-management and the multiple stakeholder approach, there are also a number of disadvantages. This type of management is often a result of longstanding conflicts between groups (Castro and Nielson 2001, Edmunds and Wollenberg 2001, Smith 2013). Mandating their cooperation may foster an atmosphere of negativity that produces little more than increased conflict. In some instances, cooperation between groups has been seen as more of a nuisance than a productive method of decision making, where disadvantaged groups continue to experience a power struggle against the forest industry and governments (Castro and Nielson 2001, Edmunds and Wollenberg 2001). However, Beaudoin et al. (2015) concluded that the influences over decision making that resulted through consultations during co-management were real and required further research to examine how Indigenous communities can be effectively engaged.

Within the institutional criterion—Improve Opportunities for Participation, Collaboration and Research—the theme with the highest number of indicators was "Research and Monitoring Programs." Under all the criteria there were indicators for research and monitoring of some kind. Environmental monitoring indicators showed that communities were concerned with the ecosystem impacts of timber harvesting

operations and silvicultural methods. Others were concerned with wildlife habitats, tracking species health over time and monitoring species at risk. Economic indicators were focused more on researching business opportunities, looking for trends in recreational uses of the forest and tracking economic indicators. Social indicators sought to research, monitor and report on the socio-economic indicators under that criterion. There were cultural monitoring indicators meant to track the incorporation of TEK in the cultural criterion. Even institutional indicators were included to monitor First Nation participation in forest management planning, youth participation in the forest sector and how efficiently information was being communicated to community members. These were moved to the institutional criterion upon re-classification. With the roll-up of duplicate indicators, this theme had 37 indicators, far more than any other theme under any other criterion.

Moller et al. (2004) offered an explanation for this emphasis on research and monitoring. They asserted that traditional land users do not always have confidence in science. Moller et al. (2004) further differentiated between two monitoring methods: science, using defined methods that can be exclusive to those with specialty skills and technology but are not realistic for remote communities, and cultural monitoring, using quick, inexpensive and easily understood assessments based on observations of the hunters while they are on the land. Traditional Indigenous methods may be seen as unreliable due to their qualitative nature, but they can also be valuable as they are dependent on observations over long periods of time and traditional land users participate as researchers (Moller et al. 2004). TEK is the knowledge of humankind, as

present civilizations are built upon it, and that collaboration between TEK and western science has a lot to offer our understanding of the natural world (Mozzocchi 2006).

From the interviews conducted, five of the respondents discussed reviewing and adapting the C&I develop through their initiatives. The Algonquins of Barrière Lake, the Innu and Iisaak mentioned that through resource planning cycles for either forest management or integrated resource management, the C&I would be re-examined when the plans were reviewed. For the Innu, the signing of the Forest Process Agreement in 2001 "…gave the guardians jurisdiction over monitoring for forestry…" (Innu Respondent), and they had plans "...to put together an environmental advisory committee from the community and when that comes into place they'll be doing that kind of exercise…" (Innu Respondent). As discussed in the literature, the Innu have developed a robust monitoring program through their Forest Guardian program that has had influence over other Indigenous communities in the country in establishing similar programs (ILI 2018).

In the final roll-up charts, there is only one indicator that specifies that adaptive management processes be used to update plans with research findings; however, imbedded in that indicator were several indicators from Iisaak. In simple terms, adaptive management is the process of learning from observing. In natural resource fields, adaptive management is formalized in experimental design over several iterations to incorporate new information as it becomes available into resource-based management plans (Tyler 2008). Some of the communities did not get as far in their projects at the time of this research to discuss how adaptive management would be addressed if it was found to be important by the community. Others discussed the possibilities for dealing

with indicators that could become no longer useful. Respondents talked about updating

and changing the indicators over time and exchanging them for less useful or obsolete

ones. One respondent mentioned keeping a data set of the indicators that get discarded

to track that they were once important to the community and could be revived again.

In most policy and planning models, there is a monitoring of outcomes; however,

adaptive management in natural resources assumes that management policies are in

themselves experiments that are designed, implemented and monitored (Lee 1993). For

example, within forest management, there are policies on how to manage according to

numerous guidelines, including those on natural disturbance, silviculture, and species at

risk. Each of these policies is supported by current science. As those policies are

implemented and re-evaluated, new information becomes incorporated and the policy is

updated and applied.

The LRRCN respondent raised concerns about how adjustable this community's

plan could truly be:

> My concern is that there are such stipulations and requirements set out by
> the government of Alberta in terms of wood supply that First Nations and
> Little Red River in particular have very little room to adjust their plans
> based upon identified values....And the province really creates those
> realities if they don't bring that wood in they would lose their allocations
> and their company would go under. Reviewing that C&I will be a big
> part of that process.

Government policies and planning processes may not always be flexible enough

for adaptive management. This could be problematic for communities who see these

initiatives as living documents, as referred to by the Iisaak respondent: "It should be

considered a 'living document' that will be updated as information is obtained. The

Sustainable Forest Management Plan (SFMP) intent is to be flexible. Adaptive management is key; it should be evolving, never stagnant."

Even though there are few mentions of formal methods for incorporating adaptive management into the C&I frameworks, when community respondents were asked about its importance, the common response was that adaptive management is necessary and at a very basic level could be implemented through planning exercise timelines.

MAINTAIN FOREST INTEGRITY AND HEALTH TO ENSURE SUSTAINABLE USE

The long-term health, productivity, and diversity of forest ecosystems are important values for Indigenous communities. The criterion for environmental values is described as to "Maintain Forest Integrity and Health to Ensure Sustainable Use." In order to sustain Indigenous communities, forests need to provide benefits for generations to come. The results showed that the number of environmental indicators was second only to institutional indicators, demonstrating their importance to communities. It seems obvious that people who are directly dependent on the forest environment would pay the most attention to these types of indicators.

During the initial data collection of the six community sets, the cultural undertones of the environmental indicators were present; however, once the indicators were re-organized under the new definitions and the cultural indicators were separated, the environmental indicators that remained were similar to those in the national and provincial certification sets. Sherry et al. (2005), Adam and Kneeshaw (2008, 2009),

and Saint-Arnaud et al. (2009) described a comparable result in their Indigenous C&I research. Regardless of the similarities to the national frameworks, there are two significant differences. The first is that the community's values are grounded in traditional knowledge as opposed to western scientific methods (Bombay 1993, Sherry et al. 2005), and the second is that the community's C&I sets are geographically specific to concerns of the local ecosystem (Smith et al. 2010). A Tl'azt'en respondent said "Indicators have to be locally developed because every ecosystem is different. They need to be specific and we need to acknowledge that communities and regions are different."

Forest operations indicators were the highest populated theme in the environmental criterion. Current industrial logging uses heavy machinery that causes environmental impacts on soil and water. First Nation peoples would like to decrease these effects (Natcher and Hickey 2002). One of the largest drivers behind the development of the six community C&I sets was a dissatisfaction with logging and its negative environmental impacts. Developing operational indicators serves to protect the quality of the environment to practice traditional activities (Adam 2012). The second highest theme was that of plantations. Indicators in these two themes came almost entirely from Iisaak. Their connection with the Clayoquot Sound Scientific Panel can explain the degree of specific environmental indicators.

The themes of "natural forest emulation" and "forest operations" look at indicators that measure silvicultural practices to promote natural patterns, preferred ratios of natural to managed stands. They also relate to assessing disturbance and stress, as well as to appropriate harvesting techniques and limitations to herbicide and pesticide

applications. In the interview with an Innu respondent, the desire for "more imaginative silviculture methods" was discussed, likely out of frustration with current forest practices. Traditional knowledge about the ways silviculture practices change the landscape and the wildlife it supports should be seen as providing an opportunity to incorporate diversity into forest management planning (Kayahara and Armstrong 2015).

Provision of ample wildlife habitat and healthy wildlife populations, and forest health in general, are all common concerns among First Nation and non-First Nation people. Indicators addressing all of these concerns are illustrated in all iterations of data analysis. The final charts show that local concerns for fish and wildlife emphasize data tracking for populations, habitat protection and the number of non-First Nation wildlife kills. Traditional knowledge held by Indigenous peoples is invaluable information that combined with Western science has the potential to contribute positively to managing species populations (LeBlanc et al. 2011). At the local level, the habitat indicators are very specific to culturally significant species—caribou and salmon for the Innu, bison for LRRCN. According to an ABL respondent "…moose hunting areas: those sites would be updated every five years because forest dynamics change over time."

Climate change indicators are of interest because Indigenous communities contribute relatively little to climate change but are among the most vulnerable due to the ecosystems they live in, their heavy dependence on the land, and their poor and marginalized status (Ramis-Castillo et al. 2017). Changes in the environment make it increasingly harder for Indigenous people to practice traditional land use, particularly in more northern environments (Cunsolo Willox et al. 2013). Reports from Indigenous communities can make significant contributions to understanding the effects of climate

change because of the in-depth knowledge members hold about the environments and

the changes they have seen from one generation to another (Ramis-Castillo et al. 2017).

In the Whitefeather Forest example, elders "read the signs" and have noticed new bird

species on the landscape, perhaps as a result of climate change (Shearer et al. 2009).

Climate change triggers rapid changes in comparison with long-term

generational observations that are held in communities (NRCan 2004). Historically,

Indigenous communities were highly resilient to environmental changes likely as a

result of TEK on how to manage the land in the face of change through community

mobility, use of fire and changing harvesting techniques (Leonard 2013). C&I that

collect TEK as baseline data can help to measure the effects of climate change and help

people to understand and adapt to them. In several cases, including Iisaak, LRRCN,

ABL and Tl'azten, baseline data in the form of TEK has already been documented from

either Traditional Land-Use Studies or other land use planning.

> The watershed planning process [and] land use plan for Clayoquot Sound
> [were] undertaken by the provincial government and First Nations
> through the interim measures agreement. They looked at everything…a
> lot of the targets came from these plans and CSSP. The recommendations
> made it easier to develop targets. (Iisaak respondent)

Several indicators address protecting water sources through limitations in

harvesting operations and tracking water quality. Other themes with fewer indicators

include biodiversity, roads, contaminants, climate change and site rehabilitation.

PROTECT ABORIGINAL CULTURAL VALUES IN FOREST MANAGEMENT
PLANNING

Indigenous cultural values are an important point of consideration at resource

management tables. Cultural values are understood to be community based and

represent land management rooted in traditional use and knowledge, as well as social

systems (Wyatt 2008). In the Iisaak example, the cultural criterion—"protect cultural

values in forest management planning"—was a driver behind the company developing

its own set of C&I. According to the interview respondent,

> it was critical [to develop their own set] because of the cultural element. I
> researched other areas and they don't distinguish social and cultural
> indicators. Iisaak felt it was important to develop its own set of C&I
> because of the uniqueness of the Clayoquot Sound context. The rich
> cultural, ecological and social mix that is found in Clayoquot cannot be
> found anywhere else in Canada. It was very important to develop within
> that context.

In the Innu example, their indicator framework was developed as part of a provincial

forest management plan. Their respondent had this to say:

> Even if we didn't have the opportunity to do the cultural work, we
> figured that if we could do the ecological work it was easier at the time,
> just because it was the piece that was here. If we could do the ecological
> work, and land supports culture, then we could at least be precautionary
> from the cultural side.

The theme with the largest number of indicators is "protection of traditional

land-use values." Indicators track values such as the availability of sites growing

medicinal plants, resource use for sustenance over sport, and distribution of harvesting

operations in registered trapline areas. Waswanipi focused on the amount of available

land for hunting, trapping, fishing and gathering. These indicators illustrate that access

to the land is highly valued and necessary in order to carry out traditional activities.

Not only is the protection of the land-use value important, but also the indicators that addressed the identification and protection of cultural values. Burial sites and other spiritual sites are respected as these values are of high importance (Natcher and Hickey 2002, Spiro and Hoberg 2004). Indicators from the case studies express that forestry should limit its impact on cultural values through identification and protection of cultural sites, by restoring sites damaged by logging operations, and by carefully distributing harvest areas in traditional areas. Areas of wildlife habitat should be protected in order to ensure populations of game for food sources. Medicinal plant sites are very important to guard from destruction because of the importance of these plants in treating different ailments. Culturally significant values, for example the LRRCN's Harper Creek caves, require protection and promotion to ensure their continuation.

Participation in traditional ways is valued by First Nation communities as these ways are beginning to be lost (Elias 1997, Karjala and Dewhurst 2003, Karjala et al. 2004). This research found indicators that measure the number of community members participating in feasts, increasing knowledge of local toponomy, and an overall number of people participating in traditional activities. Learning traditional crafts passes on the legacy of the ancestors. Feasts gather the community together for sharing food in celebration. Hunting, trapping, gathering, and fishing are valued for the food and materials they provide. According to Oster et al. (2014), traditional culture and languages provide a collective Indigenous identity and promote community health and well-being.

Maintaining language is an important measure of cultural livelihood (Elias 1997, Karjala and Dewhurst 2003, Karjala et al 2004). Tl'azt'en and the Algonquins of

Barrière Lake identified the use of traditional language as an important indicator under culture. The Indigenous language is seen not only as a way of communicating with people, but also as a way of communicating philosophies, cultures and relationships with the land (Czaykowska-Higgins 2014, TFALC 2005). Oster et al. (2014) describe language as an inseparable aspect of culture that maintains everything a person believes in and what they have "been born from." Traditional language provides a tool for healing. Communities are strengthened in identity and well-being when they retain their language (Czaykowska-Higgins 2014, Whalen et al. 2016).

Traditional forms of learning are also very important to communities. The way of learning by observing elders is highly valued by First Nation peoples (Chapeskie 2005). This way of learning teaches respect, traditions, acceptable behaviour, and the values that are important to a community. Indicators like the "amount of traditional knowledge being transferred between generations for cultural revitalization" support these sentiments. The role of elders in forest management is an important part of teaching traditional practices to younger generations (O'Flaherty et al. 2009). Elders hold the traditional teachings of their ancestors, the Indigenous vocabulary that describes their natural environment, and the knowledge of traditional land use that has sustained communities for hundreds of years.

Indicators around Traditional Ecological Knowledge proved difficult to organize under our criterion headings. TEK encompasses the way ecosystems are understood in a traditional sense and so indicators that addressed ecosystem integrity were placed under the environmental criterion. However, upon re-examination it was decided to move these indicators into the cultural criterion because use of TEK is a specific way of

knowing the environment held by the community through culture. Each of the six communities had indicators for the use of TEK in their sets; collectively there were 13 indicators, the majority of which came from the Tl'azten set. Traditional ways of knowing is an important determinant of the sustainability of forest management and the results shown here compare with those in the research by Natcher and Hickey (2002), Schramm et al. (2008), Rathwell et al. (2015) and others.

Booth and Skelton (2011) and Robitaille et al. (2017) make recommendations for First Nations, governments and industry proponents to develop better relationships in order to understand each other's values. A collaborative relationship between these groups provides an arena for cross-cultural learning (Davidson-Hunt and O'Flaherty 2007). Iisaak and Tl'azt'en both identified cross-cultural learning as important in their indicator sets as well as in interview responses: "…Elders thought in terms of education; they emphasized the intersection of Western/traditional education…" (Tl'azt'en respondent); "It was important for capacity building not only for the community but for forest managers and researchers. It was a real alliance and cross-cultural exchange that was beneficial for everyone not just the community" (Tl'azt'en respondent).

Cross-cultural learning is important for developing solutions to resource management issues that serve to address community needs and educate governments and industry in forest values other than timber (Adam and Kneeshaw 2009, Shearer et al. 2009, Davidson-Hunt and O'Flaherty 2007). Both the Iisaak and the Tl'azt'en indicator sets addressed learning opportunities for non-First Nation people to learn about the First Nation communities with which they worked. The attention given to this

concept could be a direct result of the working relationship with university researchers

and/or provincial governments through which their indicator sets were developed.

INCREASE ECONOMIC BENEFITS FROM FORESTS FOR ABORIGINAL
COMMUNITIES

Benefits to the community that will generate income are desperately needed to

implement health and social programs that will assist in the betterment of First Nations'

quality of life and well-being (Karjala and Dewhurst 2003, Karjala et al. 2004). The

remote locations, small land bases, and the limited resources on reserves make economic

growth very difficult. Many Indigenous communities have sought economic gains from

the forest industry in the form of individual jobs and partnerships as well as direct

community access to harvesting rights, and this trend will continue to grow (Fortier et

al. 2013, Nikolakis and Nelson 2015, Wyatt 2008).

Despite the discussion from Stevenson and Perrault (2008) about the decline of

forest industry, under the economic criterion the theme with the highest number of

indicators was "employment and business opportunities" with a total of 15 indicators

after roll-up. Employment in this category is related strictly to indicators for jobs and

income. From the perspective of the ABL respondent:

> There really isn't enough (reserve land) for economic purposes, so there
> is a need with the increasing population of reserves to access their natural
> resources, and in that context if they're going to develop criteria and
> indicators to measure the community development, access to lands and
> resources have to be key measurements. It can't just be education levels
> or employment indicators.

Not surprisingly, increasing employment through forestry and increasing income were

mentioned in several different ways, similar to the findings of Teitelbaum (2014). What

was surprising was that the indicators around employment were not just jobs, but also included self-employment, Band or First Nation-owned businesses and joint ventures. First Nations and government or industry objectives for the distribution of economic benefits may be conflicting (Wyatt 2008). Perhaps the reason for these indicators focusing primarily on benefits to First Nations is a means to avoiding this conflict through independent ventures.

Other economic indicators measured forest product development and wood supply. Value added products, a diversity of forest products and traditional wood supply evaluations were addressed. Almost all of these indicators came from the Innu process. This is likely due to the absence of forestry markets in Labrador, as was discussed in their community profile, which provides them an opportunity to develop new ways of thinking about the forest industry. Teitelbaum (2014) found that in four case studies, communities did not address value-added forest products, as the types of processing mills they require operate at smaller scales than traditional mills, therefore limiting their profitability.

First Nation communities seek to diversify the economic benefits of forestry. This involves using the forest resource for several purposes, such as tourism, non-timber forest products, recreation, and commercial timber extraction (Natcher and Hickey 2002, Saint-Arnaud et al. 2009). The Innu and Iisaak listed several indicators related to diversifying forest products and protecting tourism and recreational areas. This is likely to expand economic development beyond the logging industry to diversify opportunities in order to have a stable flow of income and jobs year-round. The Innu Nation identified non-timber forest product marketing as an indicator of economic benefits. Perhaps as a

result of the bulk of these C&I sets being developed with industry and government partners, there is a strong focus on timber harvesting as a means of economic development.

Interestingly, not one of the six communities in this study mentioned profitability in their indicator set as a measure of economic sustainability. The case studies examined by Teitelbaum (2014) showed that they were able to cover costs but rarely made enough profits to be able to invest in the community. This is supported by Trosper's (1998) indication that economic goals may not be the most important goals of communities and that other objectives and approaches to economic development should be considered such as training and job creation.

IMPROVE EQUITY, HEALTH AND STABILITY FOR INDIVIDUALS AND THE COMMUNITY

For the purpose of this research, social values are captured in the criterion "improve equity, health and stability for individuals and the community." The main themes of indicators in this criterion were: community health and well-being; capacity building; fair distribution of opportunities in forest sector; and workers' rights and safety. As communities consist of individuals for this thesis the term community health applies to both the individuals as well as the whole of the community. Of note is that all of the communities had indicators under the social criterion from the initial data collection from the literature. These results are contrary to the findings of Gough et al. (2008) and Lim et al. (2015) that social indicators are often lacking in C&I frameworks. These types of indicators begin to fill a knowledge gap in terms of First Nation social

values. The application of social indicators is poorly understood by forest managers. "We pushed for some of the social indicators to be added in there and the province didn't really want them but they agreed to satisfy Barrière Lake" (ABL respondent). Although this criterion has the fewest indicators, the social indicators are the most unique of all the indicators compared between sets.

There has been significant work done to examine the health impacts of resource extractions on local communities, specifically Indigenous communities; however, the bulk of that research is with respect to oil and gas and mining (Jones and Bradshaw 2015, Parlee 2015). In the field of forestry, the C&I framework from the CCFM has two criteria that aim to measure social and well-being indicators: Criterion 5, Economic and Social Benefits, speaks to diversifying timber products, financial benefits, employment and sustainable harvest levels; Criterion 6, Society's Responsibility, speaks to diversifying local economies, education, employment and income. No mention is made of the physical, mental, or cultural health of communities in terms of its members or the community as a whole.

It is of interest that the majority of indicators in the social criterion fall under the theme of community health and well-being. The importance of healthy communities cannot be stressed enough. Without a mentally, physically, emotionally healthy population, communities are bound to stagnate. No amount of economic gain will achieve these qualities. The cycles of abuse and addiction in First Nation communities touch all members. First Nation communities value a decrease in dependence on health care systems. They value a decrease in lifestyle diseases, such as diabetes, all forms of abuse, and other health issues that are currently hindering the opportunities that could be

achieved in their communities (Elias 1997, Karjala and Dewhurst 2003, Karjala et al 2004). These values are reflected in the indicators under this criterion.

Indicators from the six communities include measuring the rate of infant mortality and increasing life expectancies, the percentage of population affected with diabetes, the population affected with lifestyle diseases, freedom from social pathologies, and community satisfaction with forest management planning. These types of indicators might seem unrelated to measures of sustainable forest management, but if we look closely, we can see a connection. Land is an essential part of Indigenous lifestyle and their connection to it promotes health and healing (Jones and Bradshaw 2015) The social determinants of health approach (SDOH) is a relatively new approach of seeing health as holistic health and well-being as opposed to using only medical definitions of health (Beck 2008). This holistic approach allows for consideration of the land or environment or place to be considered an important determinant of health and, although this is generally understood, it has only recently been used to connect land with the physical, mental, social spiritual well-being of Indigenous people (Beck 2008, Kant et al. 2013, Kant et al. 2014). There are challenges to understanding how social and ecological systems are linked (Beck 2008); however, separating them can be detrimental to measuring the health of Indigenous people, who are deeply connected to their environments (Berkes et al. 2003, Bombay et al. 1995, Parkes 2011).

The heading with the second highest indicators under the social criterion was "capacity building." With forest harvesting occurring on traditional lands, Aboriginal people are looking to access jobs in the forest sector, as well as education and training that better position communities to take advantage of economic opportunities

(Stevenson and Perreault 2008). Achieving higher levels of formal education is valued in First Nation communities, where there are currently low graduation rates (Karjala and Dewhurst 2003, Karjala et al. 2004). From Blanchet-Cohen (2009), two of the three critical components to improve community health were creating employment and increasing formal education. Education provides the community with the skills to negotiate with governments and industry, provides the skills for entrepreneurial opportunities, and empowers the community. LRRCN addressed implementing forestry education at the elementary school level. Other indicators dealing with education were classified under the capacity building theme. The number of graduates from educational programs, increasing education and skills levels, and developing forestry education programs for elementary school curricula were three indicators addressing education. Not only forestry education, but education in general, and not just programs for adults, but for those as young as elementary school, were viewed as important. Through education it is possible to build healthy Indigenous communities (Greenwood and deLeew 2007). According to Chrona (2016), learning supports the well-being of self, of families, and of the land. Those who go to school can return to communities to set examples for younger generations to do the same, creating a positive cycle of education and giving back to the community. This helps to raise the well-being of communities as goals are achieved through education.

Other themes under the social criterion deal with the fair distribution of opportunities in the forest sector and workers' rights and safety. Participation as it relates to First Nation involvement in the forest sector is listed as an indicator in the social category. Unique in this category is the specific mention of creating initiatives for

women in the forest sector. First Nation participation in the forest sector and employment for women are listed under the social criterion as a result of the definition in Table 1. Both of these indicators provide capacity for communities as a whole and equity and distribution of wealth for a specific portion of the population to address a gap in existing C&I frameworks.

Social values tend to be inadequately addressed in today's forest management regimes (Gough et al. 2008, Lim et al. 2015, Kant et al. 2014), likely as a result of social sciences being seen as a soft science that is inferior to the natural sciences (Innes 2001). The importance of including the social aspects of natural resources management should not be underestimated. Some of the more important considerations that the social sciences incorporate involve understanding public perceptions, relationships of power, institutional structures, and socio-economic impacts (Beckley and Korber 1995, Haider and Morford 2004). According to Booth (1998), meeting the social needs of a community may be more important than gaining economic benefits.

CONCLUSION

The issues surrounding natural resources use and First Nation peoples are numerous and complex. There are many different players who all have an interest in their management and each player has a role. Government at all levels, the private companies who hold forest licences, their shareholders and contractors, environmental groups, research organizations and local communities, both First Nation and non-First Nation, can gain from forest management. These gains come by way of revenue from stumpage or timber sales, wildlife and habitat protection platforms, research grants, and employment opportunities, both direct and indirect, from forestry.

In order for community-based forestry to be successful for First Nation communities, several key aspects need to be incorporated in management plans. First, community participation is critical. Without it, conflict may present itself in the form of protests, civil disobedience and litigation (Floyd 2004). In order to ensure community values are included, participation is key. Second, capacity building needs to be built into the resource management plans so that a viable workforce is available in the community to manage resources. Third, First Nations title and treaty rights need to be respected in order to honour the unique relationship between First Nations and the land that is constitutionally protected.

Communities were motivated to develop local-level sets of C&I for several different reasons. Some began as a result of dissatisfaction with the historical forest management regime in their traditional territories; communities, industry and governments conflicted over natural resource extraction planning and processes. For

Iisaak, Algonquins of Barrière Lake and the Waswanipi Cree conflict advanced forest agreements where C&I development was a requirement. Some were motivated by partnerships with research institutions. The Tl'azt'en example was motivated by their partnership with the University of Northern British Columbia and the management of the John Prince Research Forest. The Little Red River Cree example was driven by their partnership with the SFM Network. The purpose of all the C&I sets was to be implemented in forest management planning.

The process for developing the C&I sets at the local level involved outside partnerships with a range of organizations: forest industry, ENGOs, graduate students and researchers, as well as provincial and federal governments. These partnerships allowed communities to access resources important to carrying out their projects that they may not have necessarily have had access to otherwise. Community members were engaged and participated in their C&I development using qualitative research methods such as focus groups, interviews, questionnaires, public meetings and field trips to communicate values.

In comparing the six sets of C&I for this research project a wide variety of values were categorized. Headings of environmental, social, environmental, cultural, Aboriginal rights and institutions were used originally to capture the indicators developed by the communities. In general, these C&I were similar in some ways to the national and international sets and to each other, and yet differed when indicators were examined specifically. Similarities were found in the types of indicators for employment and education, preserving lands and resources, including TEK, maintaining cultural practices and traditions, with an ever-present Aboriginal worldview in every indicator.

The most significant gains to be made through local level C&I are the identification and measuring of health and well-being indicators.

Some indicators that stood out as unique were those that included women and youth when deciding "who" from a community should participate in indicator development; specific cultural indicators for protecting indigenous language; attention to cross-cultural learning; and indicators under the social criterion that addressed community well-being. No other criteria and indicator framework has defined their social criteria in the way that was done by the Indigenous communities in this research. If a lack of human capital is a major concern for Indigenous communities, then measuring well-being indicators with the goal of improving the lives of community members is of utmost importance. Amongst the six communities examined here, three had accounted for social criteria in their local sets. Once their C&I were organized using the definition in Table 1, all six communities were represented in this criterion and four communities now had indicators under the community well-being theme.

The degree to which the developed sets of C&I have been implemented during the timeframe of this thesis is unclear. As discussed in the case study results, several community initiatives are no longer in existence. Those that are still functioning, for example the Innu and Tl'azt'en, are in provinces that incorporated C&I development in provincial forest management planning guidelines. Perhaps the initiatives are no longer functioning because of the downturn in Canada's forest industry. The lack of commitment to report on C&I in the National Forest Strategy, combined with a federal government funding cycle that no longer funds research programs such as the Sustainable Forest Management Network and the Canadian Model Forest Network—

drivers for some of the local C&I development—could also explain the diminished use of C&I.

Despite their fading use, C&I can serve as a tool that may benefit Indigenous communities that are embarking on land-use planning exercises. C&I help people to frame the way they participate and to secure benefits such as employment and training for the community. They are important for the collection of baseline data for monitoring and adapting to the environmental impacts of resource use. C&I can also aim to preserve culture, revitalising community resilience. Different approaches to C&I can be taken by each community. The areas of emphasis and level of description of indicators may vary, but all the indicators capture what is important at the time of development specific to each community.

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APPENDIX 1

Semi-Structured Interview Guide

CONTEXT:

1. What is the history of your indicator set?

2. When did it occur?

3. What prompted the indicator development?

4. How important is it that you developed your own set?

METHODS

5. How did you develop your set of indicators?

6. How was the community involved in indicator development?

7. Are you satisfied with the results of your indicator development?

DATA

8. Do you have baseline data?

9. How will you measure you indicators over time?

THEORETICAL BACKGROUND

10. Are you aware of other indicator sets? (CCFM, FSC, CSA, other First Nation

    examples)

11. Did you model your indicators after someone else's?

12. Who did you learn from in developing these indicators?

13. Is there a reason you chose this particular approach? PROMPT: any critique of

    existing approaches?

14. Were the indicators developed in partnership with others? (consultants, community-developed, researchers)

15. Did you learn from other Aboriginal communities/organizations?

16. Do you have any guidance for other First Nations undertaking the development of local level indicators?

FUTURE ADAPTATION

17. Do you have a process for review and adaptation of your indicator set? Please describe.

18. Who will do it and who will pay?

19. What happens to indicators that become unsatisfactory?

20. Is there a way of ranking more or less important?

21. Does the community endorse the set?

DIFFERENCES BETWEEN COMMUNITY MEMBERS

22. Was there a division between elders and youth during indicator development?

23. Were there any gender differences in development?

24. Would neighbours have similar values?