UNIVERSITÉ DU QUÉBEC À MONTRÉAL

INTEGRATION OF ABORIGINAL ENVIRONMENTAL VALUES IN FORESTRY : USING CRITERIA AND INDICATOR FRAMEWORKS AND THE EXPERIENCE OF A COMMUNITY

DISSERTATION

PRESENTED AS

A PARTIAL REQUIREMENT OF

THE DOCTORATE OF ENVIRONMENTAL SCIENCES

BY

MARIE-CHRISTINE ADAM

JANUARY 2012

UNIVERSITÉ DU QUÉBEC À MONTRÉAL

L'INTÉGRATION DES VALEURS ENVIRONNEMENTALES AUTOCHTONES EN FORESTERIE : LES CADRES DE CRITÈRES ET INDICATEURS COMME OUTILS ET LE TÉMOIGNAGE D'UNE COMMUNAUTÉ

THÈSE DE DOCTORAT

PRÉSENTÉE

COMME EXIGENCE PARTIELLE

DU DOCTORAT EN SCIENCES DE L'ENVIRONNEMENT

PAR

MARIE-CHRISTINE ADAM

JANVIER 2012

"Look ahead into the past, and into the future,

until the silence"

Margaret Laurence- the diviners

This work is dedicated to Jimmy, Charlie, Louisa, Sagaan

and the beautiful community of Kitcisakik

ACKNOWLEDGEMENTS

There are many people that have supported me throughout all my adventures during the elaboration, analysis and completion of this thesis. I would of course like to thank the community of Kitcisakik of course without whom; this work would not have been a reality. I would like to thank all the members of the forestry committee which have taken me in and shown me the beauty, richness and culture of Kitcisakik. I would like to thank Dan Kneeshaw for his patience, advice, and encouragement. I am glad to have been associated with such a great director. I would also like to thank Tom Beckley and Andrew Fall for the valuable input and advice. They have led me through and out of the interdisciplinary puzzles of my thesis.

I would like to thank my parents who are yet again and I think will always be the pillars of my life. If it isn't them exactly, they help and support me in building the necessary cement blocks to hold it up.

I would also like to highlight the involvement of many people who have kept me sane and alive during this time. Thank you Ben for those noon outings where we could both emotionally and physically vent our frustrations … there is nothing like a great jog with you. Thank you Anne and Melanie for listening to all of my nonsense. Thank you Annie-Claude for letting me know that I am allowed to be: who I want to be, when I want to be, and how I want to be.

Thank you to the capoeira world who gives me passion and energy which I always hope to be able to give in return. To Camara (CM Bola) and Equipe (M Peninha) .... Muito axé.

Finally but not least, I would like to thank the man of my life: Liam. There are no words that can describe my love for you, nor the joy and hope you bring me every day.

FOREWORD

It is important to note that the initial strategy and that which was executed differ. In short, the driver for this thesis was to understand the impacts of forestry practices on Aboriginal communities, at a level which would tap into Aboriginal socio-environmental systems. The ultimate goal was to arrive at an idea of the necessary changes to be made in forestry which would better accommodate Aboriginal values. As an overzealous doctoral student I expected to get to some specific changes which could occur in forestry practices. As a scientist, I expected to come out with some sort of packaged information composed of measurable parameters and thresholds which industry and Aboriginal communities could apply. In reality, this is not what happened. It is not to say that I did not find anything, but I certainly did not find what I expected nor was it in any way the shape and form I wanted it to be in. At first I was inclined to say that throughout my PhD I was wrong. I wrote a thesis proposal with clear steps, expected results and a research orientation which would drive me towards some conclusions of forestry impacts on Aboriginal communities. As I entered the community with some questions and asked them for direction to help me understand forestry issues on their territory I was consistently led in unexpected directions.

If I look back on how my proposal was constructed and how it changed, I note that a principle which was guiding my thesis was challenged. More specifically, like O'Flaherty et al. (2008) I was of the opinion that resolving cultural differences in a forest-management planning context is not entirely necessary to move forward with collaborative planning. According to O'Flaherty et al. (2008), partners need to agree

on specific outcomes and means of evaluating them while remaining committed to a respectful cross-cultural dialogue. So technically I sought outcomes which had socio-environmental and Aboriginal cultural relevance using C&I as a means to evaluate them. The initial strategy was straight forward: define appropriate ecological C&I to use in evaluating Aboriginal forestry and subsequently assess their effects on forest practices. The plan was to:

- Compare Canadian case studies of local level C&I frameworks from aboriginal and non-aboriginal origin to define common forest ecological C&I for Aboriginal communities that can be used in evaluating forest management.
- Evaluate the relevance of common Aboriginal C&I determined above, in a given community and assess their thresholds.
- Identify the effects of current forest management practices on the identified Aboriginal forest C&I.
- Identify the resulting changes which need to occur in forest management when the identified Aboriginal forest C&I are incorporated.

Unfortunately, I couldn't get to the outcomes without having a clearer understanding of how and why they were different. I needed to acknowledge and understand cultural differences before even getting at their effects on forest management practices. This dissertation therefore differs from the original purpose in that it is entirely dedicated to identifying how and why the differences in Aboriginal C&I play out in forest management. So do I agree with O'Flaherty et al. (2008)? Well they do play it safe when they say that it isn't entirely necessary, but I do think that some effort is necessary. I however shift my focus on the importance of a cross-cultural dialogue and to establish this you need to at least acknowledge cultural differences. How to do this is a challenge and this dissertation probably opens up the debate!

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

RÉSUMÉ

Les objectifs autochtones envers la forêt, et leur droit d'accès et de participation dans l'aménagement forestier ont été reconnus comme un droit fondamental. La question n'est plus d'identifier pourquoi mais plutôt comment les ressources et les terres productives comme les forêts peuvent être partagées lorsqu'un intérêt autochtone a été identifié. Plusieurs initiatives existent pour incorporer les valeurs autochtones en foresterie. Toutefois, le sentiment que les causes autochtones sont minimisées et que leur valeurs ne sont pas effectivement considérées persiste parmi les organisations et les communautés autochtones. L'importance de mieux incorporer les valeurs environnementales autochtones se démarque. En explorant les différences autochtones dans les valeurs environnementales et en explorant l'utilisation des outils développés pour intégrer les valeurs environnementales autochtones, cette thèse vise la compréhension des faiblesses dans les efforts d'intégration ainsi qu'une meilleure définition des valeurs environnementales autochtones.

Les critères et indicateurs(C&I) ont été l'outil choisi dans cette thèse. Cette thèse explore donc les C&I de l'élaboration à l'utilisation avec une attention particulière pour les cadres de C&I autochtones. Les C&I sont présentement les outils les plus populaires et reconnus dans l'aménagement forestier. Lorsqu'il s'agit de l'intégration des valeurs autochtones, les C&I sont à la fois considérés comme un bon point de départ(milieu) pour discuter des intérêts autochtones mais aussi un moyen qui rend les interprétations holistiques des écosystèmes forestiers et le rôle des façons autochtones difficile à incorporer. Par le biais des C&I cette thèse espère caractériser les valeurs environnementales autochtones en: 1) faisant une revue de la littérature des méthodes utilisées pour incorporer les valeurs autochtones dans les cadres de C&I au Canada; 2) comparant les cadres locaux de C&I autochtones et non-autochtones au Canada; et 3) explorant les objectifs autochtones justifiant l'utilisation de cet outil en interviewant des experts sur la présente utilisation de l'outil.

Cette thèse utilise aussi une approche par étude de cas pour mieux décrire des valeurs environnementales autochtones reliées à l'aménagement forestier. Suite à une présentation des changements environnementaux connus associés aux activités forestières dans le territoire autochtone de Kitcisakik, les membres du comité forestier de Kitcisakik ont choisi de discuter et d'élaborer sur les impacts des routes

forestières sur leur territoire. En explorant les perceptions autochtones et les impacts des routes, un indicateur souvent utilisé dans l'aménagement forestier, cette thèse explore les diverses dimensions associées aux valeurs environnementales autochtones. D'après les résultats, cette thèse s'est permis l'utilisation de d'autres outils pour aider la compréhension des routes sous l'angle des valeurs environnementales autochtones.
Cette thèse a permi d'identifier les faiblesses et les forces dans les C&I ainsi que les valeurs environnementales autochtones que les C&I peuvent révéler. Plus précisément, la révision des cadres de C&I autochtones et les méthodes utilisées pour les élaborer a souligné les difficultés dans la conceptualisation de certains paradigmes autochtones ainsi que des dynamiques socio-environnementales. Les liens entre la culture, la société et l'environnement qui sont importants dans les cultures autochtones sont difficiles à intégrer dans les cadres de C&I. De plus, traduire et intégrer des valeurs autochtones dans le langage et l'hiérarchie des C&I peut produire une perte d'information et doit donc être fait avec précaution.
Toutefois, malgré que plus de travail soit nécessaire pour incorporer les valeurs autochtones, il existe un consensus que les C&I sont une plateforme efficace pour discuter des valeurs sociales et des connaissances scientifiques associées a l'environnement. Cette revue a permis de souligner que l'élaboration des C&I autochtones a créé un dialogue interculturel entre ceux qui aménagent la forêt et les communautés autochtones.
Lorsque les perspectives environnementales autochtones définies dans les cadres locaux de C&I au Canada ont été comparées avec celles provenant des cadres locaux de C&I non-autochtones, différentes valeurs autochtones ont fait surface au niveau des indicateurs. En résultat, les C&I sont capables d'exprimer une différence autochtone dans les valeurs environnementales. La différence était exprimée comme une nuance culturelle surtout associée aux indicateurs de l'accès, de l'esthétique des opérations forestières ainsi que des indicateurs écologiques appartenant aux pratiques traditionnelles. Il est donc important d'inclure les valeurs forestières dans les cadres de C&I parce que: (1) les communautés autochtones ne font pas le partage entre la culture et l'environnement ni entre les valeurs forestières et les conditions forestières; (2) elles ont un impact sur les stratégies d'aménagement forestier et les décisions qui en résultent; et (3) elles offrent une approche holistique pour la durabilité et un meilleur portrait du contexte local environnemental.
Les entrevues avec des experts au sujet de l'utilisation des C&I et les besoins futurs pour les améliorer pour les communautés autochtones a permis d'extraire des objectifs communautaires autochtones qui devraient être explicitement inclus. Ceux-ci comprennent: l'engagement, la représentation, l'accroissement de la capacité et une augmentation de pouvoir. Les experts sont de l'avis que même si l'élaboration des C&I considère les valeurs autochtones, ces valeurs ne sont pas facilement traduites lors de l'évaluation et de l'implémentation de l'aménagement forestier durable (AFD). Les C&I risquent de devenir "un autre point de référence" et pourraient ne pas servir

les objectifs forestiers autochtones dans leur territoire. Plus précisément, malgré qu'une augmentation de pouvoir soit une solution clef pour atteindre certains droits autochtones, une occupation autochtone, des opportunités économiques, et le sentiment d'appartenance; le control a émergé comme l'objectif dans ces catégories. En effet, les communautés autochtones veulent pouvoir occuper et accéder à leur territoire et leurs ressources comme ils le jugent nécessaire.

Explorer les réactions autochtones face au développement des routes lors d'une étude de cas a permis de caractériser certaines interprétations holistiques reliées aux écosystèmes forestiers. L'accès était une valeur environnementale autochtone importante exprimée en tant que relation complexe inter et intra autochtone ainsi qu'entre autochtones et leur environnement. L'utilisation de la théorie de l'accès a aidé à organiser et décrire les valeurs autochtones face aux routes. Cette théorie perçoit l'accès comme étant une problématique de nature personnelle allant plus loin que le processus d'accès physique aux ressources et que les influences portées par la propriété et les lois. En laissant place à l'expression des valeurs sociales et environnementales, la théorie de l'accès a permis de mieux caractériser les relations socio-environnementales et les dynamiques culturelles associées aux changements causés par les routes. Les valeurs environnementales autochtones exprimées en discutant de l'impact des routes étaient caractérisées par des relations entre la communauté, l'environnement et la culture. Malgré que les réponses fassent allusion aux effets positifs causés par les routes, elles étaient surtout concentrées sur les relations et les liens affectés entre le territoire, l'environnement et les membres autochtones de la communauté.

Une autre étude de cas a démontré qu'en utilisant les institutions locales et informelles pour essayer de comprendre les impacts des routes, les caractéristiques des valeurs environnementales autochtones ont été révélées. Les principes communautaires connus dans la communauté et le comité forêt ont été utilisés pour les entrevues ainsi permettant l'expression de l'importance de la culture et de différentes formes de connaissances. En résultat, l'environnement était décrit par les répondants comme étant : une place pour la trappe et la chasse, un habitat pour la faune et la flore, une source de nourriture, une culture, une source pour l'identité et un chez soi, une connaissance spirituelle, une connaissance traditionnelle, une connaissance historique, et importante pour les pratiques traditionnelles et l'art de vivre. De telles références démontrent une association envers l'environnement qui va plus loin que celle de cause à effet entre l'impact des routes et l'environnement pour inclure des interrelations entre la culture, la société et l'environnement.

En considérant tous les résultats, il est évident que plus d'efforts sont nécessaires pour améliorer l'efficacité des C&I malgré qu'ils puissent intégrer les valeurs environnementales autochtones. L'intégration de la culture et des dynamiques sociales associées à l'environnement a été soulignée comme ayant besoin

d'amélioration. L'interprétation des valeurs autochtones une fois intégrée dans les cadres de C&I a aussi été soulevée comme une problématique à considérer.

Dans cette thèse, les perceptions autochtones face à l'accès persistaient comme étant différentes. Les impacts de l'accès ne se limitaient pas aux ressources et aux effets sur celles-ci. Les C&I ont permi d'extraire une compréhension de cette différence autochtone, toutefois c'est en utilisant la théorie de l'accès et en se référant aux institutions informelles et locales qu'une caractérisation de l'accès en tant que valeur environnementale autochtone a été établie. L'accès a été caractérisé par les répondants autochtones comme porteur d'importantes relations dynamiques et sensibles au changement entre les communautés, la culture et l'environnement.

Même si les C&I peuvent incorporer les valeurs autochtones, plusieurs méthodes sont nécessaires pour rendre ces relations visibles. Plus d'efforts doivent être consacrés à l'utilisation des institutions autochtones dans le but d'assurer le maintien du contexte culturel autochtone et de leurs objectifs. En explorant et en élaborant sur les valeurs environnementales autochtones, les méthodes utilisées doivent décrire les systèmes sociaux, culturaux et environnementaux tels que l'a démontré la théorie de l'accès. Ce n'est qu'en reconnaissant l'importance que porte la culture pour différencier les valeurs autochtones, que ces valeurs seront bien caractérisées et ainsi intégrées.

ABSTRACT

Aboriginal forest goals, access and participation in forest management have been recognized through legislative mandates. The question is no longer why but how productive resources and lands such as forests might be shared where there are Aboriginal interests. Various initiatives exist to incorporate Aboriginal values in forest management. However, there is a persistent feeling among Aboriginal organizations and communities that their issues are being minimised and that Aboriginal values are not effectively considered. Notably, the need to better incorporate Aboriginal environmental values persists. By exploring the differences in Aboriginal environmental values and by exploring the use of tools to integrate Aboriginal environmental values, this thesis seeks to understand some of the weaknesses in integration efforts as well as further defining Aboriginal environmental values.

This thesis chose to explore C&I as a tool from its elaboration to its use with particular attention to Aboriginal C&I frameworks. C&I are one of the most popular and recognised tools to date. When it comes to integrating Aboriginal values, on one hand C&I are considered a good platform to discuss Aboriginal interests while on the other hand the holistic interpretations of forested ecosystems and Aboriginal ways have been difficult to incorporate. Through C&I this thesis seeks to characterise Aboriginal environmental values by: 1) reviewing the methods used to incorporate Aboriginal values into the C&I framework; 2) comparing Aboriginal versus non-Aboriginal local level C&I in Canada; and 3) exploring Aboriginal community objectives for using this tool by interviewing experts on the present use of C&I.

This thesis also uses a case study approach to further describe Aboriginal environmental values related to forest management. After presenting known environmental changes associated with forestry activities in the Aboriginal territory of Kitcisakik, members of the Kitcisakik forestry committee chose to discuss and elaborate on the impacts of forest roads on their community. By exploring Aboriginal perceptions and impacts of roads, a widely used indicator in forest management, this thesis explored the various dimensions involved in Aboriginal environmental values.

Based on the results of the interviews, this case study sought the use of other tools which could help understand roads as an Aboriginal environmental value.

This thesis was successful in further identifying the weaknesses and strengths of C&I, and the Aboriginal environmental values they can portray. More specifically, the review of Aboriginal C&I frameworks and the methods used to elaborate them highlighted challenges in conceptualising some of the aboriginal paradigms and socio-environmental dynamics. The important links made in Aboriginal cultures between society, environment and culture seem difficult to integrate into the C&I frameworks. Furthermore, the act of translating and integrating Aboriginal values into the language and hierarchy of C&I frameworks is cautioned as it may lead to a loss of information. Although further work is needed to effectively incorporate Aboriginal values, it is however agreed that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions. The review does highlight that the elaboration of Aboriginal C&I has created a cross-cultural dialogue between forest managers and Aboriginal communities.

When Aboriginal forest ecological perspectives defined by Canadian local level C&I frameworks were compared with non-Aboriginal local level C&I frameworks, differing Aboriginal environmental values emerged at the indicator level. As a result, C&I can express some of the different Aboriginal environmental values. The differences were that Aboriginal indicators demonstrated a cultural nuance which was especially evident in indicators pertaining to access, aesthetic concerns for forest operations and in ecological indicators relevant to traditional practices. Results show that Aboriginal forest sustainability issues are in effect a combination of forest conditions and values. Inclusion of forest values in C&I frameworks is necessary because: (1) Aboriginal communities do not dissociate culture from the environment and thus forest values from forest condition, (2) they have an impact on resulting forest management strategies and decisions, and (3) they offer a holistic approach to sustainability issues and a better picture of local environmental contexts.

When experts were interviewed on the use and future needs of C&I for Aboriginal communities, we extracted Aboriginal community objectives which need to be explicitly accounted for. These include: empowerment, engagement, representation and capacity building. Experts believed that although the elaboration of C&I can account for Aboriginal values, those values are not easily translated for use in the evaluation and implementation of Sustainable Forest Management (SFM). C&I are at risk of becoming "just another reference point" and may not appropriately account for underlying Aboriginal objectives on their territories. More specifically, although increased power was requested as a key solution to attain Aboriginal rights, territorial occupation, economic opportunity and the maintenance of a sense of place; control emerged as the objective in these categories. In effect Aboriginal communities want to occupy their territory and access their resources as they see fit.

Exploring Aboriginal responses to the development of roads in a case study was successful in characterising some of the holistic interpretations of forested ecosystems. Access was a key Aboriginal environmental value expressed as complex inter-intra and environmental-Aboriginal relations. The use of the theory of access helped organise and describe Aboriginal values related to forest roads. This theory views access as a personal issue involving much more than the physical process of getting to a resource and the influences of property and laws. By allowing a place for social values as well as environmental values, the theory of access enabled a better characterisation of the socio-environmental and cultural dynamics associated with changes caused by roads. The Aboriginal environmental values expressed by discussing the impacts of roads were characterized by the relationships between community, environment and culture. Although the positive effects provided by roads were alluded to, focus tended towards the affected relationships and ties between the territory, the environment and Aboriginal members.

Another case study showed that when trying to understand the impacts of roads, the use of informal institutions and locally developed institutions were successful in revealing characteristics of Aboriginal environmental values. Known community guiding principles and the local forestry committee were interviewed in this case study allowing culture and different forms of knowledge to be expressed. In the results the environment was referred to by the respondents as: a place for hunting and trapping; habitat for the fauna and flora, a source of food, culture, identity and a home, spiritual knowledge, traditional knowledge, historical knowledge, traditional practices and the art of living. These references go beyond a cause and effect association between roads and the environment to one which involves inter-relating associations between culture, society and the environment.

Compounding the results, although we see that C&I as a tool *can* integrate Aboriginal environmental values more efforts are required to improve its effectiveness. The need to better integrate culture and social dynamics with environmental values was highlighted. There were also concerns as to the interpretation of Aboriginal values once integrated in the C&I frameworks.

In this thesis, Aboriginal perception of access issues persisted as being different. The results show that Aboriginal perception is different from current means of treating access issues which are generally limited to the impacts on resources and access to resources. Although an understanding of these differences was extracted with C&I, access as an Aboriginal environmental value was best characterised with the use of the theory of access, and reference to informal and local institutions. Access was characterised by Aboriginal respondents with important relationships between community, environment and culture which are dynamic and sensitive to changes.

Therefore although C&I can incorporate Aboriginal values, many methods need to be elaborated to make these relationships visible. More efforts need to be placed in using Aboriginal institutions and keeping in context with Aboriginal culture and objectives. In exploring and elaborating on Aboriginal environmental values the methods used need to describe social, cultural and environmental systems as was shown by access theory. It is only by truly acknowledging the importance of culture in differentiating Aboriginal values that they will be appropriately characterized and thus integrated.

INTRODUCTION

In Canada, 80% of First Nation communities are located in the productive regions of the boreal and temperate forests (Hickey et al, 2005) and are likely faced with forestry operations near or on their traditional lands. Legislative mandates exist recognizing Aboriginal forest goals, access and participation in forest management (Ross and Smith, 2002). "The involvement of indigenous peoples in the management process is being recognized as both an unrelinquished right (e.g., Report of the Royal Commission of Aboriginal Peoples in Canada 1997), as well as a necessary factor to achieve sustainable environments (e.g., Brundtland 1987)..." (Natcher et al, 2002). In light of their vested interest and rights in forest management, it is important to develop forest management that is based on Aboriginal perspectives. As highlighted by Lane (2004), the real question is no longer why, but how in a practical sense, productive resources and lands such as forests might be shared where there are Aboriginal interests. Ultimately, forest scientists, engineers and managers have the responsibility to build the foundations for forest management strategies which are well adapted to indigenous people's values, objectives and social realities. This is in effect the goal of Aboriginal forestry.

Wyatt (2008) highlighted the necessary elements which would differentiate Aboriginal forestry from forestry by/for/with First Nations. According to this author true Aboriginal forestry would require: 1) full recognition of Aboriginal rights, 2) economic participation based on achieving Aboriginal goals, 3) traditional consultation within First Nations and a separate process for non-Aboriginals, 4)

processes of impact assessment and monitoring based on both traditional and scientific knowledge, 5) management based on Aboriginal knowledge and institutions combined with western science, 6) comanagement of resources with First Nations retaining the final right of approval, and 7) management based on Aboriginal paradigms for forest lands supported by professional paradigms.

The reality is that management strategies are still far from achieving this status. According to Wyatt (2008) evolution towards Aboriginal forestry is still asking whether "Aboriginal participation (will) lead to a new form of forestry that improves Sustainable Forest Management (SFM) with the incorporation of Aboriginal values and knowledge or will First Nations be obliged to trade their values and knowledge for access to the forest resource and a share in economic benefits?"

Some steps to realise Aboriginally acceptable changes in forest management are being attempted where there are Aboriginal interests. Some focus on providing opportunities such as sharing forest development interests to benefit and contribute to Aboriginal communities. For example, attempts have been made to create benefit sharing opportunities with Aboriginal communities in forest management by investigating economic partnerships and co-management agreements (Hickey and Nelson 2005; Wyatt 2008). Some have focussed on strengthening and defining Aboriginal rights issues (Ross and Smith 2002).

Other initiatives seek to include Aboriginal peoples in evaluating the sustainability of forest management processes such that Aboriginal interests, as defined by their values and objectives are included. Evaluation of sustainability on Aboriginal terms has been attempted by characterising Aboriginal land use patterns through traditional land use and occupation studies (Natcher 2001; Robinson and Ross 1997). Some initiatives have focused on consultation strategies to access Aboriginal values and objectives in the decision making processes (Côte and Bouthillier 2002; Yamasaki et al. 2001).

However, this dissertation is especially interested in one approach which has been used and has gained in popularity since the 1990's: criteria and indicators (C&I). C&I for use in forest management were initiated through the Statement of Forest Principles signed at the 1992 United Nations conference on the environment and development. C&I are used to conceptualize, evaluate and implement SFM. They have evolved from a top-down/bottom-up process applied at a national level. In some cases Aboriginally relevant indicators have been incorporated to local level C&I frameworks for and by Aboriginal communities. Indeed, it was soon understood that to ensure sustainability and a fair and effective process, C&I had to include and address the unique role of Aboriginal peoples needs, their knowledge as well as their values (Smith, 2000). The elaboration of local level C&I by and for Aboriginal communities recently began and is rife with expectations from both managers and Aboriginal communities. By defining C&I based on and for Aboriginal values and objectives, SFM would theoretically be evaluated, conceptualized and implemented in accordance with Aboriginal values. C&I therefore go beyond a consultation approach to integrate Aboriginal information into the management process. In addition to policy and government to government discussions, C&I could therefore help achieve Aboriginal forestry.

The efforts to include Aboriginal values therefore exist and some methods and tools are available to do that. In general however, there is a persistent feeling among Aboriginal communities and organizations that efforts have not been sufficient to accommodate Aboriginal values and objectives. Specifically referring to C&I they express: a need to increase the incorporation of Aboriginal environmental values; and that the importance of Aboriginal issues has been minimized (NAFA; Smith, 2004). To understand why this persists regardless of the efforts and tools available for integration, I chose to explore the elaboration and use of C&I as a tool to identify where weaknesses may be and if they can be resolved. The goal of this dissertation is

to explore Aboriginal environmental values using C&I: Is it in elaborating C&I or is it in the use of C&I that Aboriginal environmental values are not well represented?

For this dissertation I decided to focus on C&I because of its popularity both in Aboriginal and non-Aboriginal forest management strategies. In general, C&I are considered well developed and a good tool in guiding forestry efforts towards SFM (Innes et al. 2004; Holvoet and Muys 2004; McDonald and Lane 2004). A large body of literature and research has been dedicated to the definition of Aboriginal values and objectives and the elaboration of C&I. Elaborating C&I with Aboriginal values and objectives has been successful in stimulating Aboriginal communities to express and represent values and objectives pertaining to their relationship with the forest (Natcher et al., 2002).

By keeping in context culture and community, we can determine if it is the tool which is failing or the use of the tool which needs fine tuning. It is also hoped that by identifying some of the weaknesses in representing Aboriginal environmental values through C&I, the Aboriginal environmental values that need to be included can be clarified. I hope that the ideas which are addressed in this dissertation could help ensure that appropriate changes in forest management can occur and thus help define Aboriginal forestry in a practical sense.

STRATEGY

This thesis explores Aboriginal environmental values through the use of C&I and a case study. An ultimate goal is that the research conducted here could provide information to promote the inclusion of Aboriginally adapted values in forest management. As such I am interested in identifying environmental indicators which would both have the most impact on the development of forestry strategies and promote Aboriginal expression of environmental values.

I divided this dissertation into 2 sections. In the first section I explore C&I as a tool in representing Aboriginal environmental values. I explore C&I as a tool to integrate Aboriginal environmental values from its elaboration to its use. Through a literature review I explore the methods used to translate Aboriginal values into C&I to determine where the weaknesses may be.

I compare Aboriginal environmental C&I with non-Aboriginal C&I to see *if* an Aboriginal expression of environmental values emerges in this tool. Is the tool capable of capturing a difference which can be attributed as Aboriginal in nature? If Aboriginal C&I are an expression of their culture and values, the elaboration of Aboriginal C&I should also describe the different Aboriginal values of the environment they wish to sustain. A difference should therefore exist when Aboriginal and non-Aboriginal C&I frameworks are compared. The modifications needed in forest management to better accommodate Aboriginal values should surface when Aboriginal and non-Aboriginal C&I are compared.

The nature of that difference in Aboriginal expression is then defined to better understand Aboriginal environmental values using various means. I analyse the indicators which are Aboriginally different, what they can measure, and if they are qualitative or quantitative. I also explore how Aboriginal C&I are being used today and if they are meeting objectives. By identifying Aboriginal objectives for using C&I I hope to further understand some of the environmental values they seek to sustain and thus better define Aboriginal environmental values. There is very little research on the use of Aboriginal C&I in forest management mostly because the efforts are too recent to have led to measurable changes in the field. I therefore turn to interviews and literature reviews.

The second section is a case study approach which occurred in Kitcisakik (Québec) to elaborate on Aboriginal environmental values. This community has recently developed its own C&I framework, its land has been marked by a history of intensive forest management, and the community is expecting to see changes made when it comes to forest management. By exploring their issues with forest management in their territory, I wish to define important Aboriginal environmental values. By compounding the Aboriginal environmental values which emerge in the different chapters of the first section and the case study, the characterisation of what are Aboriginally important in environmental values can begin.

SECTION I CRITERIA AND INDICATORS AS A TOOL FOR INTEGRATING ABORIGINAL ENVIRONMENTAL VALUES

C&I are used to evaluate, conceptualise and implement forest management strategies. They are a flexible response to public perceptions of the role of forestry, and "while selecting indicators may seem to be within the realm of science, choices are conditioned on informed political deliberation about what to sustain" (McCool and Stankey, 2001; Yamasaki *et al*, 2002). Recently, the elaboration of local level C&I for and by Aboriginal communities has occurred. The elaboration of C&I based on and for Aboriginal values should theoretically lead to Aboriginally adapted Sustainable Forest Management (SFM). They should reflect Aboriginal choices about what to sustain. Aboriginal C&I can therefore be perceived as a tool to package Aboriginal values as available information for managers as well as a potential tool to generate change in forest management strategies. I therefore use C&I as a tool to create a picture of emerging Aboriginal environmental values.

In this section, I explore C&I as a tool and their effectiveness in meeting Aboriginal environmental values. I first review the literature to determine the strength and weaknesses in C&I as a tool. I review the methods used to elaborate Aboriginal C&I. What are the limits and constraints in elaborating Aboriginal C&I?

I then compare Aboriginal with non-Aboriginal environmental C&I. The premise is that in order for C&I to be an effective tool for Aboriginal values, there should be a difference found between Aboriginal and non-Aboriginal C&I frameworks. That difference should reflect the different Aboriginal environmental values. It should be remembered that there is a persisting feeling among Aboriginal communities that the incorporation of Aboriginal environmental values and the importance of Aboriginal issues should be increased (NAFA; Smith, 2004). C&I frameworks made for and by

Aboriginal communities should theoretically be trying to translate these issues into the frameworks. If differences occur between Aboriginal and non-Aboriginal C&I frameworks, C&I could become an effective tool to incorporate Aboriginal environmental values.

Canadian case studies of local level C&I frameworks from Aboriginal and non-Aboriginal origin used in evaluating forest management are compared. I focus on identifying different Aboriginal environmental values: Are they really different and how? Do Aboriginal environmental C&I express different environmental attributes to evaluate? Are the differences based on ecosystem or on community sustainability issues? By looking at C&I elaborated for and by Aboriginal local communities I hope to attain a better understanding of the environmental values they seek to incorporate.

I then ask how are C&I being used, and do they meet Aboriginal objectives? I was interested in Aboriginal objectives because Aboriginal values whether they be for environmental, social or economical objectives, are not mutually exclusive. They all fall within the charged political context regarding ancestral rights, independence and territory. More specifically, there are politically related issues to increase Aboriginal empowerment, representation, engagement and capacity building in forest management (Hernes and Sanderson 1998; NRCAN, 2002; Natcher and Hickey, 2002; Karjala and Dewhurst, 2003; Stevenson and Webb, 2003; Stevenson and Perreault, 2008; Wyatt, 2008; Adam and Kneeshaw, 2009) will figure in the elaboration of Aboriginal C&I used towards SFM. By understanding Aboriginal objectives in using C&I I keep in mind the Aboriginal context which can help us better define Aboriginal environmental values. I am therefore interested in exploring Aboriginal objectives through C&I. I explore what, how, and where Aboriginal objectives are treated in the use of C&I towards SFM. Once Aboriginal values are translated into C&I are they also incorporated into the conceptualization, evaluation and implementation of SFM?

Exploring Aboriginal objectives becomes important in promoting a respectful cross-cultural dialogue within C&I to ensure that Aboriginal values are treated with relevance to Aboriginal communities. To date, it is unclear whether the use of this Aboriginal information in devising forestry strategies also incorporates Aboriginal objectives for their territory. This is highlighted by the persisting feeling by Aboriginal peoples that their issues are minimized (Smith 2004). It is by exploring Aboriginal objectives and their integration that determining if Aboriginal values are treated in context with Aboriginal community realities can occur.

CHAPITRE I

FORMULATING ABORIGINAL CRITERIA AND INDICATOR FRAMEWORKS

ÉLABORATION DE CADRES DE CRITÈRES ET INDICATEURS AUTOCHTONES

ADAM, M-C AND D. KNEESHAW

SUSTAINABLE FOREST MANAGEMENT NETWORK, EDMONTON, ALBERTA 40 PP 2009.

1.1 Abstract

Adapting forest management strategies for Aboriginal cultures, needs and objectives has been challenging. The C&I process has been a popular tool used to conceptualize, evaluate and implement sustainable forest management globally and has recently been used with Aboriginal communities. To date however impressions among Aboriginal communities and organizations are dominated by a feeling that Aboriginal values and objectives are being minimized.

Through a literature review and case studies, this report investigates whether the dissatisfaction of Aboriginal communities with the C&I process is due to a lack of understanding by decision-makers and thus incorporation of Aboriginal values or the methods used to access them. It also determines whether the process of C&I is appropriate to Aboriginal communities by determining the conceptual challenges which may be faced when integrating scientific and Aboriginal worldviews. When the contents of Aboriginal and non-Aboriginal local/regional frameworks are compared, five recommendations can be made to improve the integration of Aboriginal values. These recommendations largely relate to differences pertaining to the cultural needs expressed in the Aboriginal indicators and the need to emphasize relationships between criterion rather than strict hierarchical categories.

Regardless of these recommendations for improvement, it is generally agreed that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions. A review of the methodology used to elaborate C&I frameworks in Canadian case studies highlights:

1) the importance of participation methods and the influence of community context on their effectiveness, and

2)the differences in the objectives of using top-down versus bottom-up approaches to C&I.

This review also introduces the potential for a hybrid approach between top-down and bottom-up approaches to enable the C&I process to collect local information for C&I such that they can be compared and integrated at all scales of management. Finally, case study examples and a review of the literature are used to evaluate the conceptual challenges of using the C&I process in Aboriginal communities. They stress the importance of recognizing the existence of different worldviews in order to achieve a dialogue which should lead to collaboration. In this report, the benefits of this collaboration are compared to those of social learning. It is in this light that further recommendations are made to improve the C&I process:

1) learning and evidence of learning by all involved parties needs to occur; and

2) efforts towards the sharing of power between worldviews is noted as an important step to create a learning environment which can promote true collaboration, reflection and innovative responses.

The report concludes with a discussion of the issues regarding the implementation of Aboriginal C&I to achieve sustainable forest management with Aboriginal values and objectives.

1.2 Résumé

Adapter les stratégies d'aménagement forestier aux cultures, aux besoins et aux objectifs des Autochtones représente un défi. Largement utilisé pour la conceptualisation, l'évaluation et la mise en oeuvre de stratégies d'aménagement forestier durable partout dans le monde, le processus C et I (critères et indicateurs) est employé depuis peu avec les collectivités autochtones. Pourtant, les collectivités et organismes autochtones ont l'impression que leurs valeurs et leurs objectifs sont minimisés.

Par une analyse documentaire et des études de cas, les auteurs de ce rapport tentent de déterminer si l'insatisfaction exprimée par les collectivités autochtones à l'égard du processus C et I est due aux méthodes utilisées pour accéder aux valeurs autochtones ou au fait que les décideurs les comprennent mal et que, par conséquent, ils les intègrent difficilement au processus. Les auteurs cherchent également à déterminer si le processus C et I est effectivement applicable aux collectivités autochtones en précisant les défis conceptuels qui peuvent se présenter quand il s'agit d'intégrer les points de vue des scientifiques à ceux des peuples autochtones. La comparaison des cadres de références locaux et régionaux des peuples autochtones et des peuples non autochtones (allochtones) permet de dégager cinq recommandations pour améliorer l'intégration des valeurs autochtones. Ces recommandations sont principalement liées aux différences dans les besoins culturels exprimés par les indicateurs autochtones et la nécessité de mettre l'accent sur les relations entre critères plutôt qu'entre categories hiérarchiques strictes.

Néanmoins, il est généralement convenu que les C et I représentent une plateforme valable pour la discussion des valeurs sociales dans un contexte de connaissances scientifiques des conditions environnementales. Une analyse des methods utilisées pour élaborer des cadres de références C et I dans des études de cas menées au Canada souligne :

1) l'importance des méthodes de participation et l'influence du context communautaire sur leur efficacité, et

2) les différences d'objectifs selon le recours à une demarche « du haut vers le bas » (HB) ou « du bas vers le haut » (BH) dans le processus C et I.

Cette analyse aborde la possibilité d'une approche hybride entre les démarches HB et BH pour faciliter la cueillette d'information locale par le processus C et I, de manière qu'elle puisse être comparée et intégrée à toutes les échelles de gestion. Enfin, les exemples tirés d'études de cas et de l'analyse documentaire servent à évaluer les défis conceptuels du recours au processus C et I auprès des collectivités autochtones. Ils soulignent l'importance de reconnaître l'existence de différences dans les points de vue pour réussir un dialogue menant à la collaboration. Dans ce rapport, les avantages de cette collaboration sont comparés à ceux de l'apprentissage social, ce qui mène à la formulation de recommandations supplémentaires pour améliorer le processus C et I :

1) toutes les parties en cause doivent tirer des enseignements évidents du processus; et

2) les efforts voués au partage du pouvoir entre intervenants possédant des points de vue différents constituent une étape importante pour créer un milieu d'apprentissage susceptible de favoriser une réelle collaboration, une réflexion approfondie et des réponses inédites.

Les auteurs concluent par une discussion des enjeux relatifs à la mise en oeuvre du processus C et I chez les peuples autochtones en vue de définir des pratiques d'aménagement forestier durable tenant compte de leurs valeurs et objectifs.

1.3 Introduction

Achieving sustainable use of forest resources is a challenge. Balancing and optimising social, economic and environmental values while ensuring their heritage for future generations has become the primary objective of many development efforts. Society and social values are therefore an important part of this equation. However, difficulties have occurred in trying to include those most dependent on forest resources and thus most affected by forest development issues. More specifically, inclusion of Aboriginal interests in forestry has been especially problematic. Their inclusion requires the interpretation of Aboriginal culture and values which can be a difficult process as they are influenced among other thing by the effects of differing sets of social and environmental contexts. The development of forest management strategies that are well adapted to indigenous people's values, objectives and social realities is thus one of the current challenges of forestry in Canada.

More specifically in Canada, Aboriginal interests have been recognised as an important component of forest sustainability because:

1. Many Aboriginal communities live on or near productive forest areas. In Canada, 80% of First Nation communities are located in the productive regions of the boreal and temperate forests (Smith 2004). The effects of forestry operations near or on traditional lands will impact these communities.
2. Aboriginal people are an essential element of sustainable forest management (SFM) in Canada (Smith 1998). Aboriginal peoples can contribute to SFM as a result of their forest practices, traditional knowledge and the unique relationship they hold with the land (Gladu and Watkinson 2004). As mentioned in Natcher and Hickey (2002), this has been recognised in important Canadian proceedings:

> *"The involvement of indigenous peoples in the management process is being recognized as both an unrelinquished right (e.g., Report of the Royal Commission of Aboriginal Peoples in Canada 1997), as well as a necessary factor in achieving sustainable environments (e.g., Brundtland 1987)...".*

3. Inclusion of Aboriginal peoples in resource use is a constitutional right. Under the National Forest Strategy (2003-8), the government is required to "accommodate Aboriginal and treaty rights in the sustainable use of the forest recognizing the historical and legal position of Aboriginal Peoples and their fundamental connection to ecosystems"(National Forest Strategy Coalition 2003).

Various initiatives exist to include Aboriginal interests in the development of forest resources. Some initiatives focus on providing opportunities which would benefit the social context of Aboriginal communities by sharing forest development interests. Other initiatives seek to include Aboriginal peoples in the evaluation of the sustainability of forest management processes such that Aboriginal interests as defined by their values and objectives are included. For example, some initiatives have tried to create benefit sharing opportunities with Aboriginal communities in forest management by investigating economic partnerships and co-management agreements (Hickey and Nelson 2005; Wyatt 2008). Also, opportunities have been created by focusing on Aboriginal rights issues (Ross and Smith 2002). Evaluation of sustainability on Aboriginal terms has been attempted by characterising Aboriginal land use patterns through traditional land use and occupation studies (Natcher 2001; Robinson and Ross 1997). Some initiatives have focused on consultation strategies to access Aboriginal values and objectives in the decision making processes (Côte and Bouthillier 2002; Yamasaki *et al.* 2001). One approach, which has been used and has gained in popularity since the 1990s, is that of criteria and indicators (C&I). The purpose of this report is to specifically address criteria and indicators as a tool used to include Aboriginal interests in forest management. In this report:

1. C&I will be described as a tool and how they have included Aboriginal interests.
2. Aboriginal and non-Aboriginal C&I will be compared to evaluate the understanding of Aboriginal ecological interests. Identifying similarities and differences between C&I selected by Aboriginals versus non-Aboriginals helps clarify our understanding of the goals the frameworks seek to portray.
3. Methods used to include Aboriginal interests in C&I will be reviewed. How Aboriginal values and objectives have been used to create a C&I framework and the issues of using a top-down versus bottom-up strategy will be discussed. The advantages and disadvantages of methods used to involve Aboriginal communities in forest management will also be explored.
4. The conceptual challenges of using the C&I process in Aboriginal communities will be reviewed.
5. Finally, the management implications of using C&I to include Aboriginal interests in SFM will be investigated.

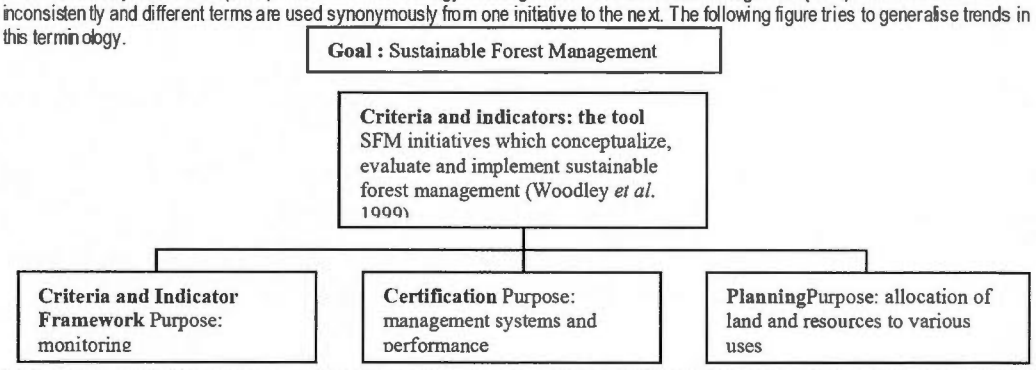
This report will review existing Canadian C&I for Aboriginal communities, discuss the methods used to develop them and assess whether the C&I are appropriate to Aboriginal forest interests. Not all initiatives aimed at including Aboriginal forest interests in the development of forest resources have been effective. Although the goal is to include Aboriginal communities in forest management, persistent failure has resulted in the feeling that there is a lack of commitment to achieve it. What is it about these efforts that prevent the effective translation of identified Aboriginal interests to their inclusion in management? Is the problem in understanding Aboriginal interests or the methods used to define them?

1.3.1 Criteria and Indicators as a strategy

C&I are tools used to conceptualize, evaluate and implement sustainable forest management (SFM) (Woodley *et al.* 1999). There is international agreement amongst C&I frameworks. They are one of the most popular tools used to define and assess SFM as more than 150 countries have developed C&I sets or approaches (Castañeda 2000; Holvoet and Muys 2004). These initiatives came out of the Statement of Forest Principles agreed to at UNCED in 1992 (United Nation Conference on Environment and Development, Rio de Janeiro, Brazil, June 13, 1992). Many comparisons have been made between sets of C&I and have demonstrated that besides expected differences attributed to scale and geography (Holvoet and Muys 2004), there is growing consistency in defining C&I for SFM. For example, in a comparison using C&I from the International Tropical Timber Organisation (ITTO), the European Union (EU) and the Montreal Process (MP), sufficiently specific and agreed principles and C&I were found which could guide policy-makers towards SFM (McDonald and Lane 2004). According to these authors, there is substantial conformity between the philosophy and intent, scope and content of C&I while differences merely reflect the contexts within which C&I were developed. Therefore as a tool, C&I approaches are considered to be well developed (Holvoet and Muys 2004; Innes et al. 2004). It is in this light that C&I have become a valuable source and tool to be used for the inclusion of Aboriginal interests.

Criteria and Indicator (C&I) Terminology

As mentioned by Innes *et al.* (2004) much of the terminology referring to Sustainable Forest Management (SFM) initiatives are used inconsistently and different terms are used synonymously from one initiative to the next. The following figure tries to generalise trends in this terminology.



It is important to note that C&I can be used for different objectives. The objective of C&I can either be to provide information on the state of the forest under management as done with national and local framework initiatives; or to provide guidelines for management systems as done by certification efforts (Neimann and Innes 2004). They can therefore take the form of trends or standards which will be used to implement SFM.

Each management initiative organises sustainability issues into a hierarchical format with its component parts defining its respective emphasis (ie. monitoring, management systems and performance). The hierarchy will vary between a three dimensional framework at minimum to a multi-dimensional framework with five to nine levels. These levels are defined in the following table.

Available SFM framework levels, their general definitions and notes on their comparability and presence in SFM initiatives.

Framework levels	General definition	Notes on levels
Principle	Fundamental rules for action	Usually the base-line for most frameworks. It is in effect a separation of sustainability issues into ecological, social and economic categories.
Criteria	Desired conditions resulting from adherence to principles (Innes *et al.* 2004), a category of conditions or processes by which sustainable forest management (CCFM) may be assessed	Across frameworks these two levels (Criteria and Principles) can easily be compared as one level.
Element	A subset of indicators that can be grouped within a criteria	
Indicators, standards	Has been defined as a parameter, scientific factor or variable to assess a criterion	The number of framework levels following the indicator level will depend on its definition as a variable or factor and parameter. Both factor and parameter indicators need further definition and thus more levels.
Critical local values	The spectrum of values and priorities community members associate with the forest (Sherry *et al.* 2005)	These two levels are more usually found in frameworks designed for smaller scales such as regional and local scales. However, the goal may be integrated at the indicator level by specifically mentioning desired trends and values in its formulation.
Goals	The desired trends (maintenance, protection, restoration, decrease, increase)	
Measures	Define the characteristics to monitor (Wright *et al.* 2002)	
Norms, Reference values, Benchmarks, Target values, Threshold	Comparisons against which the data may be evaluated (Wright *et al.* 2002)	The use of these levels will depend on the SFM initiative either to monitor, implement or conceptualise SFM.
Verifiers, Data element	The specific information collected for each measure (Wright *et al.* 2002)	
Actions/strategies	Define the methods to use	This level is useful in the application of the SFM initiative at the local level.

In general the number of levels attributed to the SFM initiative will depend on: 1) the definition assigned to indicators; 2) the target management unit; and 3) the role of SFM initiatives. More specifically, indicators defined as processes and parameters require more levels to define the quantitative or qualitative measures needed to assess sustainability. Furthermore, the need for measures is dependent on the scale at which the initiative will be applied.

At the national scale, definition of these measures is left at the discretion of the framework user. The national initiatives deal with trends which require further definition should they be applied in a specific region. At the local scale, frameworks are devised to answer specific sustainability issues for which measures will generally be assigned. Finally, the different SFM initiatives require different levels of flexibility in their frameworks. Certification, for example, provides standards which need to be met. As such, verifiers, target levels and goals are expected in the design of the framework. On the other hand C&I used to monitor management, focus on performance trends and as such target values will be omitted from the frameworks while benchmarks and reference values should be present.

Many efforts have had to be made to ensure appropriate use of C&I at the local level, with national scale C&I often serving as foundations for the development of C&I sets at the local level. For example, Canadian Council of Forest Ministers (CCFM) C&Is were used by the model forest network to develop 10 local C&I sets (Canadian Model Forest Network 2000). More recently, local and regional C&I application efforts have also attempted to characterise and include local Aboriginal interests (Sherry *et al.* 2005; Natcher *et al.* 2002; Saint Arnaud *et al.* 2005). Although both national and local C&I sets have undergone rigorous research and expertise in their development, they have had little revision. A review of the methods used to develop C&I as well as their effectiveness in including Aboriginal interests, is therefore necessary.

1.3.2 C&I: effective inclusion of Aboriginal interests?

In Canada, the C&I sets developed at the national and local scale have had varying results in their effective inclusion of Aboriginal interests. Although it has been established that C&I are a well developed tool, it has also been recognised that further work is required to include Aboriginal forest values and objectives (Natcher *et al.* 2005; Parrotta and Agnoletti 2007; Smith 2004). For example in the CCFM C&I

set (Canadian Council of Forest Ministers 1995), a suggestion by the National Aboriginal Forestry Association (NAFA) and the Aboriginal community at large to include a seventh criterion specific to Aboriginal interests has been repeatedly rejected. Reference to Aboriginal elements in the CCFM's Criterion 6, Accepting Society's Responsibility, which recognizes treaty rights, traditional land use and forest based ecological knowledge is not sufficient to accommodate Aboriginal values and objectives in SFM. The general impression among Aboriginal communities and organisations such as the NAFA is that the importance of Aboriginal issues has been minimized (Smith 2004).

1.4 Inclusion of Aboriginal interests in C&I frameworks

1.4.1 State of the research on Aboriginal interests and C&I

Research efforts are showing a shift in approaches used to incorporate Aboriginal interests, from increasing participation efforts such as consultation, to defining Aboriginal forest perspectives through values and objectives. This shift is occurring because, without an understanding of how Aboriginal people perceive benefits from the forest by including their values and objectives, translating consultation and participation processes into information available for managers will remain problematic. Holistic patterns of Aboriginal-forest relationships are difficult to translate into the more hierarchical system of frameworks found in science and management (Parrotta and Agnoletti 2007). Many Aboriginal communities do not separate society from individual, culture from nature, nor society from environment (Davidson-Hunt and Berkes 2003). The socio-ecological dynamics found within

> There are few examples which include aboriginal values and goals in C&I and forest management. As of 2003, only 286 out of 610 Aboriginal communities in Canada had management plans, of which only a few include social values (138), cultural values (104), or spiritual values (40) (Smith 2004). The case studies presented in this report only represent a small fraction of the work which needs to be done and further action is required to include Aboriginal communities in SFM initiatives.

Aboriginal cultures are not easily reduced to sets of criteria and indicators. There needs to be emphasis on understanding Aboriginal values and objectives before attempting to increase their participation in management processes (Stevenson and Webb 2003).

Although C&I offer a hierarchical framework to represent social, environmental and economic issues, they have been used as a tool to define Aboriginal forest perspectives. When applied at the local level, the development and selection of C&I can stimulate Aboriginal communities to express and represent values and objectives pertaining to their relationship with the forest.

Natcher *et al.* (2002) developed a local level C&I framework for the Little Red River community in Alberta to "articulate value diversity, transparent to both community members and resource managers and would follow for ongoing learning, adjustment and improvement in the management process". Karjala *et al.* (2003) developed an Aboriginal Forest Planning Process (AFPP) with the Tl'azt'en Aboriginal community to:

1. incorporate Aboriginal land values into local forest management plans in a proactive way;
2. improve communication between Aboriginal and non-Aboriginal land user groups; and
3. raise non-Aboriginal land users' awareness about, and appreciation for, Aboriginal land values.

Saint-Arnaud *et al.* (2005) used the intercultural dialogue generated by the process of criteria and indicators to define forestry strategies which respect Aboriginal values. Finally, the Waswanipi Cree Model Forest project used C&I to develop Cree standards for SFM. The model forest is viewed as: "a vehicle for cultural demonstration of environmental stewardship approaches; requiring

Aboriginal perspectives to be prominent in all forestry programs and operation" (Natural Resources Canada 2002).

Although there are few examples which compare C&I developed for specific Aboriginal communities, each has led to valuable results exposing the complexities of representing Aboriginal values and objectives. Sherry *et al.* (2005) published a comparison of an Aboriginal C&I framework set up for the Tl'azt'en community with national and international scale C&I frameworks to determine the effective incorporation of Aboriginal concerns. General conclusions about the applicability of national and international C&I frameworks to Aboriginal values and objectives included that:

1. C&I focussed on environmental processes are the most compatible across all frameworks,
2. There is a need to further develop Aboriginal C&I pertaining to process, economic sustainability and to incorporate cultural values, and
3. When compared to top-down national and international frameworks, those developed using a bottom-up process increased the Aboriginal relevance of C&I.

Common Aboriginal issues which need further C&I development have been identified through research. These include: economic opportunities, economic diversity, youth issues, and traditional land use patterns (Beckley 2000; Ettenger *et al.* 2002). Gladu and Watkinson (2004) compared Aboriginally defined C&I from local level frameworks and found 17 common Aboriginal indicators dominated by the following Aboriginal concerns: treaty rights, knowledge, resource use, land ownership, protection, traditional activities, economic opportunities, continued and monitored participation, education, compensation and health issues.

1.4.2 Comparing local Aboriginal C&I and non-Aboriginal local C&I

Previous comparisons of Aboriginal C&I have highlighted common concerns among Aboriginal communities at the local level. They also raised some issues and exposed a divide between C&I sets derived from bottom-up versus top-down approaches. Such comparisons are frustrated by issues of scale and motive. So how do Aboriginal and non-Aboriginal C&I compare at the local level? This section addresses this question by comparing the previously mentioned case studies with the local and regional non-Aboriginal frameworks from Woodley *et al.* (1999) (the North American Test of Criteria and Indicators of sustainable forestry framework (NATCI)) and from the FSC certification (2004) (Forest Stewardship Council (FSC) Canada Working Group National Boreal Standard).

In order to move beyond a case study approach, the contents of C&I frameworks should be compared but such comparisons are faced with many limitations:

1. each framework hierarchy is different and has different goals including monitoring and certification;
2. the selection of indicators for each framework serves to answer a select number of issues and thus not all frameworks are complete in terms of sustainability issues; and
3. not all frameworks are at the same stage of development and some may be more optimal than others in dealing with certain sustainability issues.

As a result of these shortcomings, caution is advised when analysing results. However, these comparisons are useful to formulate questions and identify information gaps.

In order to sort through the limitations of comparing C&I framework contents, the distribution of indicators across frameworks and sustainability issues was observed. The presence of indicators within sustainability issues indicates that the community has either considered the issue or has been approached to reflect upon the

issue. On the other hand, a lack of indicators shows a gap in the information and suggests that further research is required. The number of indicators within a sustainability issue indicates a level of complexity and raises many questions. For example, is an increased number of indicators in one criteria due to an increased number of components which need to be considered, or does it reflect a lack of optimisation in the framework? If the increased number of indicators is due to an increased number of components to be dealt with, then it may be more useful for managers to look at management "hot topics".

One can also ask whether an increased number of indicators reflects the challenge of translating sustainability issues to indicators and thus whether efforts have been made in aggregating issues? On the other hand, some criteria may be so complex that selecting appropriate indicators may be difficult. In such a case, the lack of indicators justifies a need for further research on the issue. Where this complexity lies and where it is omitted is worth studying as it can serve to advance research, identify information gaps, as well as identify potential areas of frustration that are important to communities but difficult to quantify.

This report focuses on ecological indicators because:

- According to Sherry *et al.* (2005) C&I have largely focused on environmental processes which render issues regarding ecological sustainability more comparable across frameworks,
- Aboriginal organizations such as NAFA have explicitly requested increased inclusion of Aboriginal environmental values, and

It should be noted that FSC and NATCI originate from two different SFM C&I initiatives described earlier. FSC is used for certification purposes while NATCI is a C&I framework used for monitoring purposes. Based on NAFA concerns for CCFM and the fact that NATCI originates from CCFM, it was believed that differences would be overestimated if the comparison was limited to this framework. FSC on the other hand is the most Aboriginally accepted SFM initiative and comparisons may underestimate differences with Aboriginal C&I. Therefore both were used for this comparison with the hopes of averaging out Aboriginal and non-Aboriginal C&I differences.

- Aboriginal communities live in and are part of the environment and as such, culture and other social values emanate from, and are embedded in their relationship with the environment.

Table 1.1 shows the distribution of indicators across frameworks. The distribution of ecological and non-ecological indicators in proportion with total framework indicators deserves attention. More specifically, in non-Aboriginal local level frameworks half of the total indicators are ecological indicators. On the other hand, ecological indicators contribute 13-20% of Aboriginal frameworks. This raises the following questions:

1. Are Aboriginal socioeconomic issues in SFM management hot topics, or do these indicators need to be optimised in the frameworks? If the proportion of indicators reflects concern levels and hot topics, this would support previous conclusions for increased development of Aboriginal socioeconomic sustainability issues in C&I found by Sherry *et al.* (2005), Beckley (2000) and Ettenger *et al.* (2002).

2. Are all ecological sustainability issues addressed by Aboriginal C&I frameworks? Adam and Kneeshaw (2008) analysed the distribution of ecological indicators in detail. They found that the distribution of indicators in the criteria for the maintenance of the physical environment, the maintenance of genetic diversity and incidence of disturbance and stress did not lend to comparisons between C&I sets. Some Aboriginal frameworks included indicators in these categories while others didn't. This could indicate: a gap of information; that either further understanding or avenues to express these issues is required; an impression that these values were globally covered by other indicators in Aboriginal C&I frameworks; or a need to put emphasis on more encompassing or culturally important indicators. Further research is required to address and understand these issues.

Table 1.1 demonstrates that a total of 13 different Aboriginal ecological indicators were extracted when all Aboriginal frameworks were compiled. Do these 13 ecological indicators render Aboriginal C&I frameworks truly different from non-Aboriginal frameworks? Before approaching this question it should be determined whether and how Aboriginal C&I frameworks should be different. Because of the differences in values and objectives between Aboriginal and non-Aboriginal communities, differences in the expression of C&I are expected. However, it can be argued that these differences may originate more from the organisation of indicators

Table 1.1Distribution of indicators used for comparison by framework. The grey area represents non-Aboriginal frameworks

	Amalgamation of C&I appropriate for the North American test	FSC boreal standard	Waswanipi Cree Model Forest	Tl'azt'en C&I, AFPP	Little Red River Cree Nation (LRRCN)****
# indicators (critical values)/ framework	57	201	125	143	30
# ecological indicators/ framework	20	102	19	20	6
# ecological indicators used*/ framework	20	65	26	23	7
# ecological indicators used but different / 13**	0	4***	10	7	6

* the ecological indicators used are those referring to the ecological themes found in Adam and Kneeshaw (2008)

** A total of 13 indicators were identified in Aboriginal frameworks which are not covered or only partially covered in non-Aboriginal frameworks

*** These were only partially covered in this non-Aboriginal framework

**** Based on the sustainability matrix

within the framework than solely from the indicators themselves. Various methods can be used to assess a criterion and different indicators can be used for the same ultimate purpose. Determining indicators to measure a healthy forest for example, will be influenced by the values and the objectives of those defining a healthy forest. In the Anicinapek community of Kitcisakik, a healthy forest is one which is considered both as "dark" (or primeval) and as "good food storage" for the community. At first glance, such statements suggest that the identification and availability of specific species may be used as indicators of forest health. On the other hand, from a forester's perspective, a healthy forest could be determined based on long-term wood production. Therefore although the ultimate goal of maintaining a healthy forest is stated as being the same, different values and objectives influence the way in which criteria may be described.

Similarly, the same indicator can be used to assess various criteria. Indicators reflecting issues of high value for a community will often be found in many criteria. For example, important game species have the tendency to be incorporated in many criteria (conservation, ecosystem health and economic sustainability). Aboriginal forest values and objectives therefore influence the organisation of environmental issues in C&I frameworks which may lead to differences with non-aboriginal frameworks.

The influences of values and objectives on the determination of C&I for environmental issues will also be strongly affected by geography. It is therefore difficult to predict how one Aboriginal community versus another will organise C&I. When one observes only the indicators as shown in Table 1.1, the number of different indicators present is variable amongst and between Aboriginal and non-Aboriginal frameworks. Within Aboriginal frameworks, not all different Aboriginal indicators were included in each (e.g., the Waswanipi Cree model forest included 10 of the 13 different ecological indicators within the 26 ecological indicators used for

comparison). More specifically, the different indicators make up between 30 and 85% of the ecological indicators in Aboriginal frameworks. Because of their varied presence within Aboriginal frameworks, and the fact that FSC partly includes 4 of the 13 different indicators, it is difficult to assess which non-Aboriginal framework is more different than the grouped Aboriginal frameworks.

In this context, it may be that Aboriginal frameworks are as different from one another as they are from non-Aboriginal frameworks. If this is indeed true then an approach evaluating only case studies could be defended. However, if differences between communities are among priorities and expression of C&I whereas differences with non-Aboriginal frameworks are systematically similar then comparison is useful. Further investigation as to the nature of the differences in indicators between/among frameworks is thus necessary since differences may be related more to local environmental experiences than to differing viewpoints. In their review, Adam and Kneeshaw (2008) noted that different indicators in Aboriginal frameworks had the following common themes:

1. ecological indicators with cultural importance (e.g. hunting, trapping, protection of Aki);
2. aesthetic concern for forest operations which affect those practicing Aboriginal land use activities; and
3. increased complexity of indicators regarding access to resources where sustainability of productivity, proximity, integrity and quality of resources used in Aboriginal land use activities was introduced.

Briefly, the authors found that although ecological C&I appear compatible when comparing issues of forest conditions (fragmentation, populations, biodiversity, etc.) there was a recurring need to integrate cultural components with forest conditions in local Aboriginal frameworks. These recurring cultural components point towards some similarities in values between Aboriginal communities. It is therefore perhaps

the influences of place and community objectives which render Aboriginal C&I different from one another, especially at the indicator level. As such, a case study approach is an important step to appropriately understand Aboriginal interests.

Aboriginal culture emphasize relationships (see Berkes (2008) for more details), while there is a tendency for science to focus on components (Cheveau et al. 2008). This has led to some difficulties evident in the development of C&I for Aboriginal interests. For example, there is a tendency in C&I development to categorize cultural issues such as trapping in the social principle or with regards to its economic implications. From an Aboriginal perspective, although trapping is strongly affected by the distribution and abundance of the species, it is also affected by the health of the forest and how productive the environment is in providing the expected experience for the trapper (remoteness and aesthetics). As explained by Stevenson (2006) trapping is not limited to wildlife but involves a relationship between the individual, the land, the animal and the activity itself. As such isolating C&I into strict categories and hierarchies is not applicable to Aboriginal values and objectives where the relationship to land is closely tied to culture, tradition and subsistence methods (Berkes 2008; Adam and Kneeshaw (2008).

It is therefore recommended that to improve C&I for Aboriginal values and objectives:

1. Further understanding of Aboriginal socioeconomic issues in SFM is necessary,
2. Further integration of ecological C&I to include Aboriginal cultural values and objectives is required,
3. Further development of ecological C&I to include Aboriginal indicators in the criteria for the maintenance of the physical environment, the maintenance of genetic diversity and incidence of disturbance and stress is needed,

4. Concerted efforts must be made at-and between all scale levels (global, national, regional and local) such that Aboriginal C&I and the issues they encompass can be discussed jointly. This would allow a degree of comparability of Aboriginal C&I from one scale or region to the next while respecting the distinct objectives of each community, and
5. C&I categorisation and hierarchy needs to be expanded and less isolated such that Aboriginal forest values and objectives which emphasize the relationships between humans and environments can be included.

Regardless of the improvements required to gain effective incorporation of Aboriginal values and objectives in C&I development, there is increasing support that C&I are a valid platform to discuss social values with scientific knowledge of environmental conditions (Adam and Kneeshaw 2008; Fraser *et al.* 2006). The local level Aboriginal frameworks which have been developed have allowed increased incorporation and expression of Aboriginal values and objectives in terms which can be used by science and managers (St-Arnaud *et al.* 2009). Further incorporation of Aboriginal values and objectives which emphasize relationships between environment and culture could also benefit C&I frameworks which have been criticised in general for their reductionism and long list of unconnected indicators (Bunnell and Huggard 1999; Kneeshaw et al. 1999; Natcher and Hickey 2002).

1.5 Including Aboriginal values and objectives in C&I: comparing the methods used

The previous sections focused on the use and understanding of Aboriginal values and objectives as C&I. It is also important to question whether the methods used to access Aboriginal values and objectives are appropriate and specific to Aboriginal communities. In general, the methods used for the development of C&I can be

separated into two parts: participation methods and a bottom-up or top-down approach.

There is a trend in the literature to critique methods used to develop C&I. However, these criticisms do not consider the context for C&I development nor do they differentiate between up or down methods and participation methods. As a result, top-down and bottom-up approaches are often referred to in opposition. It is unclear whether criticisms truly originate from the up or down approach or from the participatory methods used. Karjala *et al.* (2003) and Natcher and Hickey (2002) for example, argue that sustainable management should be determined using "bottom–up" approaches rather than standardized frameworks. According to these authors, conventional participatory approaches and generic sets of C&I derived from top-down approaches are often inappropriate for engaging Aboriginal involvement and result in the removal of indigenous peoples from decision and policy making processes. However, it is argued that it is the participation methods used which have the responsibility of engaging Aboriginal involvement. Another important issue is that the effects of context are rarely identified when C&I methods are being critiqued. The Aboriginal community context can strongly influence the methods available for C&I development. Aboriginal communities are not equal in terms of their social conditions and grassroots institutions and this affects the available expertise and the dialog between community and managers. Communities and their individuals differ in their capacity to engage in dialogue on forestry issues and the development of C&I.

The criticism regarding the methods used to develop C&I can be approached in two ways. The first is to create a dichotomy and definition of each method with their positive and negative effects. The second is to tend towards a hybrid approach between methods. This section reviews and compares up or down approaches and participation methods at the local scale to clarify their advantages and disadvantages in accordance with community contexts.

1.5.1 Top-down and bottom-up approaches

Creating a dichotomy between a top-down and a bottom-up approach is a difficult task because of the effects of scale and origin. More specifically, each C&I framework is developed to function within specific scales (from local and regional to national levels). It is important to decide and be specific about the scale of application of each C&I framework. In effect, scale defines the scope of application of C&I frameworks. The origin of C&I development relates to who developed them and how C&I were selected and as such relates to the intent of using C&I frameworks. Therefore the scope and intent of using the top-down or bottom-up approach can vary and lead to different sets of C&I. C&I sets can differ in the numbers of C&I, in the organization and themes of principles, in their hierarchical organization, as well as the degree to which values and objectives are incorporated into the frameworks. This section discusses why the determination of which approach is better requires some generalizations be made and suggests that it may not necessarily be beneficial to C&I development in the end.

The methods used to develop C&I frameworks are often differentiated based on the origin or intent for development. More specifically, it has been suggested that top-down approaches are often developed by outside influences while bottom-up approaches are based on local initiatives. In an Aboriginal context, top-down methods are often associated with non-Aboriginal responsibility in C&I development and the idea that external sets of values and goals are imposed on Aboriginal communities. Indeed there are few examples of management plans which effectively include Aboriginal goals and values, however most focus on a few easily identifiable constraints (Smith, 2004). Using methods which describe and translate well to Aboriginal local issues and culture is necessary to ensure Aboriginal interest and collaboration in the C&I process. To date, there are also no Aboriginal top-down approaches. However, should top-down approaches refer to the development of C&I

by external sources, it could be argued that all C&I sets would be top-down from an Aboriginal perspective. The initiative originates from non-Aboriginal sources and, by definition, to an external influence. However, the possibilities of developing top down Aboriginal C&I frameworks is not excluded. An Aboriginally led top-down approach could be used as a means to voice Aboriginal concerns on larger landscape issues and expand the role of Aboriginal peoples beyond local level decision making processes.

The methods used to develop C&I frameworks could also be differentiated based on scale where top-down approaches apply at larger scales (national) and bottom-up at finer scales (local). In this case, top-down approaches are criticised for not accurately portraying the finer issues which are included in local bottom-up approaches. At the same time, bottom-up approaches are criticised for being too local in nature to achieve an aggregation and application of information into frameworks developed at larger scales. In the case of top-down approaches, some national level C&I have been used as a reference and it was found that they did not translate well to local scales for all categories (Kneeshaw *et al.* 2000). Woodley *et al.* (1999) tested CCFM and CIFOR national level C&I frameworks at the forest management unit scale in North America. They found that the tested indicators did not translate well from one scale to the next and thus rejected 65 out of 207 C&I. Furthermore, C&I which were initially developed for national scale issues may not effectively describe nor engage communities in the development of local issues. Woodley *et al.* (1999) suggested that should the selection of C&I have started from scratch, results would have been different.

From an Aboriginal point of view, the different values and objectives associated with Aboriginal communities have generally introduced different characterisations of SFM issues which have been difficult to integrate into non-Aboriginal frameworks of management, planning and decision making. These are especially difficult to include

in top-down approaches which have to incorporate many other Aboriginal and non-Aboriginal SFM perspectives. Although bottom-up approaches ensure that the different values and objectives expressed at the local level are well incorporated in the development of C&I, they cannot account for the pluralistic character of Aboriginal values, perceptions and objectives (Natcher and Hickey 2002; Adam and Kneeshaw 2008). A comparative analysis of the characteristics of different top-down C&I (LUCID, CIFOR, CCFM) with the bottom-up approach used in the Tl'azt'en Nation by Sherry *et al.* (2005) also showed these differences. Not only were hierarchical definitions different among top-down C&I frameworks but in terms of social criteria, none clearly identified the importance of community health or well-being - which was identified by the Tl'azt'en Nation as a key element in social sustainability (Sherry *et al.* 2005). Furthermore, issues such as climate change and species at risk, which may fall beyond the boundaries of a single community, and the issues gathered with a bottom-up approach, are more likely be discussed when implementing a top-down approach that is participatory and focuses discussion points in an existing framework.

To assess the value of the top-down versus bottom-up approaches, one needs to question motive. More specifically, is the objective to access the values and objectives of one local community, many local communities or is it to address national issues? Bottom-up approaches tend to have greater focus at the local level, are performed in isolation of regional or national interests, and lack any intent to achieve consensus amongst Aboriginal cultures. These efforts become problematic when there is a need to portray different values, perceptions and objectives existing within and amongst Aboriginal communities (Natcher and Hickey 2002). It can perhaps be argued that it is precisely a top-down approach which facilitates aggregation of local issues into higher scales. However, top-down approaches can be limiting by forcing indicators into defined boxes. This raises the importance of

aggregation from one scale to the next. According to Fraser *et al.* (2006), indicators need to be collected at as local a level as possible, and then aggregated using a relatively simple and transparent process. This allows information to be both summarized quickly for policy makers, and unpacked for more careful monitoring and follow-up.

In the Aboriginal context, although a definition of Aboriginal values and goals requires bottom-up efforts, there are also advantages to the top-down approach. For example, despite the absence of local concerns and the use of a hierarchical language in the top-down approach, C&I frameworks that would be applied by many Aboriginal communities and seek national relevance could be of interest. Such observations invite researchers and multiple forest users to create new proposals for forest management that are not only better anchored in local and cultural realities, but also in the perspective of sustainability that is consistent with their vision of the forest. The challenge is in accurately portraying this pluralism and to incorporate it at a higher scale. In effect, this resembles what may be a hybrid approach between the top-down and bottom-up approach. The criteria could be influenced by the top-down approach to ensure the inclusion of certain issues while some indicators could be determined locally. More research is required to effectively develop such a method and to ensure its relevance to Aboriginal communities.

1.5.2 Participation methods and context: collecting Aboriginal values and objectives at the local scale

There is often a link made between bottom-up or top down approaches and Aboriginal engagement and collaboration. A higher level of participation and involvement methods for Aboriginal peoples is too often associated with bottom-up approaches. Such an association limits public participation to fine scale issues which is unfair and discouraging. In reality, participation can occur at all scales and the degree to which certain participation methods are effective varies as much at the local

as at the national scale. For example, the identification of C&I in a local level initiative may have been imposed by interview questions pertaining to large scale issues. These large scale issues may not warrant local participation or interest in C&I development. Therefore if criticisms are based on seeking the most effective methods to engage Aboriginal communities, the participation methods used to engage the community should be investigated rather than the approach employed.

Participation methods used in the development of C&I have received very little attention in the literature yet they require the most investment in terms of time and human resources. Various participation methods have been used to access community values and objectives for SFM. These range from the use of archives, community reports, consultation with community experts and stakeholders in forest related issues, to extensive individual and family interviews. It should be noted that this section presents participation and engagement of Aboriginal peoples as a means to access their values and objectives. In reality, the participation and engagement of all parties involved in C&I development is important for collaboration and learning purposes. This is discussed in the next section. Table 1.2 describes different case studies and the variety of participation methods used as well as a brief description of the community context when C&I were developed. A number of points can be drawn from these studies.

Participation method depends on the initial level of community activity and capacity in forest related issues. Various indicators can be used to describe a community which is active in forest related issues such as the presence of formal or informal grassroots institutions involved and knowledgeable with forestry issues. The presence and involvement of these institutions in forest related activities will affect the ability of a community to express relevant forest related issues. A comparison of Kitcisakik with Waswanipi demonstrates two communities with different activity levels. In Kitcisakik, although forestry operations significantly affected their

Table 1.2 A description of the case studies used based on scale, up or down approach and participation method. Names in parentheses in the first column are of the person who wrote up the indicators

	Up or down approach	Scale	Participation methods	Context- first evidence of studies and contact on forestry related issues
Waswanipi Cree Model Forest	top-down	Local	Consultation process with a development team composed of both Aboriginal and non-Aboriginal members to develop guidelines to improve Cree participation in forest management planning process. This was preceded by 2-year activities with problem setting, direction setting and structuring activities to determine the composition and process of the development team.	Population 12,000. 1998 court action by Cree tallymen and chiefs against federal and provincial governments and 27 forestry companies which had been active on their land for the last 25 years.
Kitcisakik (Asselin)	top-down	Local	Consultation process with Aboriginal forest committee.	Population 400. 2001 collaboration with university researchers to discuss forestry issues. Publication in 2004 on territorial and resource exploitation in Kitcisakik.
Kitcisakik (St Arnaud)	bottom-up	Local	Consultation process with Aboriginal forest committee. Interviews/education initiatives to define community relationship with the forest and forestry. Scenario planning approach.	
Tl'azt'en C&I, AFPP	bottom-up	Local	Generating scenarios based on Tl'azt'en values, and using forest planning models to simulate various management alternatives. Uses existing archived information (traditional use studies, community based and other research projects, journal article, interviews and photographs) to identify community values. consultation process with community leaders, elders and interest parties and an advisory group.	Population 640. Archival data demonstrates that the community has been contacted for research on land use and occupancy, oral history, traditional knowledge, community well being and the impacts of forest development since 1965. Since 1998 they have their own department of natural resources which administers forest, fisheries and traditional use programmes.
Little Red River Cree Nation (LRRCN)	bottom-up	Local	Based on natural and social science research projects, technical reports, oral histories and map biographies. A joint university and community team oversaw the research. Interviews and open-response surveys asking: what is it about this area that you value? What needs to be maintained or protected for you to retain your relationship with the land? And what needs fixing or improving upon for the community to be healthy socially, culturally, economically and environmentally? Using participatory action research, community driven research design.	Population 2,500. 1991 the community entered in dialogue with the federal and provincial government to ensure their constitutional rights to lands and resources. Also the community established research partnerships with Sustainable Forest Management Network (SFMN) since 1996 which have accumulated more than 20 research projects on social and scientific issues

traditional territory, the small size of the community, its lack of expertise in resource use and the community's isolation from forestry decision making processes made it difficult for them to voice their concerns. The organisation of the community into institutions which specifically dealt with these issues was not immediately obvious and required years of work with the community, researchers and forest managers.

Participation methods in the early stages could not rely solely on consultation methods because the limited capacity of the community to understand forestry concepts and participate did not guarantee community interests were addressed.

In the other case, in 1998 the Waswanipi community formally filed court injunctions against the federal and provincial governments and forestry companies (Table 1.2). This community demonstrated a high level of activity on forest related issues with organised and mobilised institutions specifically dealing with these issues. This activity is a reflection of the capacity of the community with respect to individuals and institutions able to respond to imposed forestry practices. It should thus be expected that the participation methods necessary to access the community's reflection should be different between the two communities.

The need for certain participation methods also depends on institutional capacity of the community in relation to forestry issues. Although preoccupation with forestry related issues may be present in all communities, the presence of formal or informal institutions with a mandate to address these issues will differ from one community to the next. This will affect the use of participation methods and the time required to effectively involve the community in the development of C&I. For example, although the community of Kitcisakik maintains traditional patterns of forest resource use, such institutions were not prepared to specifically deal with all forestry related issues. A forestry committee had to be developed as part of the participation methods to develop appropriate C&I. On the other hand, the AFPP was fortunate in that the community already had its own department of natural resources administering forest, fisheries and traditional use programs. This explains why Kitcisakik required much more time and extensive participation efforts to ensure the development of representative C&I.

Community contact with researchers and managers who have addressed forest related issues will also influence the use of certain participation methods. The

presence of other development efforts in the community and the expertise acquired as a result is an indication of contact. Relative to other Aboriginal communities mentioned in this report, Kitcisakik had limited previous contact with the research community with respect to forestry issues (Table 1.2). Therefore the methods required to achieve participation from this community were extensive. On one hand the participation methods had to effectively reach the community, as well as introduce and educate the community on forestry related issues. On the other hand participation methods also had to reach industry and government as well as introduce and educate them of aboriginal community issues and functioning.

The differences in community context mentioned here are a few examples demonstrating the effects of context on participation methods. Ideally a combination of methods should be used to accommodate for community attributes such as activity, institutional capacity and contact. Caution therefore needs to be exercised when comparing participation between case studies without differentiating community context.

1.6 Challenges for harmonising C&I and Aboriginal values and objectives

1.6.1 Conceptual challenges between C&I and Aboriginal values and objectives

As a cultural expression of community land ethics, there has been a lot of emphasis on accessing Aboriginal values and objectives for C&I. It is therefore important to approach the conceptual challenges embedded in C&I and Aboriginal cultures in order to clearly identify the limitations of this tool in effectively including Aboriginal interests. The concept of sustainability where economic growth operates where natural resources are maintained for future generations and respects cultural diversity is coherent with Aboriginal cultures and their relationship to the environment (Davidson-Hunt, 2006). Although there have been developments concerning Aboriginal participation in forest management, one cannot neglect the fact

that many of the more modern concepts of sustainability and criteria and indicators are foreign ideas to Aboriginal peoples. Interpretation of these concepts, especially as it applies to forest management, could therefore run the risk of going against Aboriginal values.

The following are critiques and questions raised by researchers who have used C&I to include Aboriginal forest interests:

- In effect, C&I identify important issues for forest sustainability. Therefore when it comes to including Aboriginal interests, the issue is approached in the same way: important Aboriginal issues for forest sustainability. However, rather than focusing on forest related indicators that have a community dimension, it is suggested that the focus be on the community dimension itself and how forests contribute as a means of sustaining the community (Beckley *et al.* 2002; Sherry *et al.* 2005). More specifically, it should be asked whether the approach offers a nurturing environment for the community.

- C&I is a tool developed for managers. Although public participation and inclusion of Aboriginal interest are sought, and Aboriginal values and objectives are recognised as important, their inclusion in C&I benefits whom and how? More specifically the objectives of C&I in SFM need to be revised to more directly include the objectives of Aboriginal peoples within the national arena to ensure their voice in forestry is heard at the national level. To do so, the role Aboriginal communities should and want to have in forest management needs to be defined. Until Aboriginal goals and their relationship with the land are recognised, Aboriginal values will never truly be included in C&I. Forest management may thus never achieve social sustainability unless Aboriginal communities achieve the right to live and use their territory as they see fit. According to Colfer *et al.* (2001) although CIFOR has developed C&I it was found that no real changes in management were occurring. There was

therefore a need to address empowerment and the C&I feedback mechanism. In other words, what mechanisms need to be put in place for indicators to have meaning to a community and be used by that community to achieve change in their forest and its management (Colfer *et al.* 2001).

- The C&I approach itself may not be conducive to the inclusion of Aboriginal interests. In C&I, forest sustainability issues are reduced and organised into hierarchical formats which have little resemblance to Aboriginal language and modes of expression. Some argue that by imposing a management language which requires the conversion of Aboriginal values and objectives, it may in effect render Aboriginal ways invisible:

  "adoption of the language, concepts and procedures of environmental resource management (ERM) by aboriginal parties to co-management, whether coerced or not, has served to disarm them in their engagement with the state by inculcating in them: 1) a belief in the rationality, objectivity and superiority of ERM practices, and the western scientific knowledge and economic reasoning that informs them, and 2) a conviction that their own ways of knowing and relating to the 'natural' world are inferior, backward and in need of significant reform." (Stevenson 2006)

  Although NAFA and many Aboriginal communities are interested in the criteria and indicator approach to evaluate SFM, C&I should not be used as a means to integrate but rather they should offer the necessary space for the expression of Aboriginal knowledge and management systems.

- Including Aboriginal knowledge and management systems in the compartmental evaluation methods proposed in C&I frameworks can be challenging. Although both groups may be making observations about trends or changes over time, managers like to create units while Aboriginal managers will not necessarily manage specific resources but the relationships to their lands and resources and to each other (Stevenson 2006). A study by Davidson-Hunt and Berkes (2003) demonstrated the important link between

society, culture and environment. More specifically, territory (and access to it), environment and land use were shown to be important factors determining community resilience and identity. Expressing and reducing such a link in C&I may be challenging. However, according to Berkes (2008), Aboriginal knowledge can be described in terms of fuzzy logic:

> "a *mathematical approach for dealing with complex systems where only approximate information on components and connections are available. It is a way to deal with uncertainty and uses rules of thumb. It is suitable for concepts and systems that do not have sharply defined boundaries, or where the information is incomplete or unreliable.*"

Berkes (2008) suggested that a useful way of viewing the difference between Aboriginal knowledge and science is that science will seek a small number of indicators which will be specific and provide quantitative results. On the other hand, Aboriginal systems tend to seek to simultaneously use a large number of less specific (and probably multicausal) indicators. C&I, by compartmentalising the effects of forest management, then tend to separate society from nature whereas Aboriginal peoples tend to see society as part of nature. It could thus be argued that in a C&I context, the fuzzy logic approach would be applicable. Evaluating social, economic and environmental sustainability is complex and the boundaries are not sharply defined in reality. However there has been a strong tendency in C&I development to streamline and reduce indicators. This would diminish the role and contribution of Aboriginal knowledge. It would be pertinent to determine whether C&I can indeed provide the space for Aboriginal systems of knowledge and explicitly provide this space.

- It is important to recognise the adaptive efforts required by Aboriginal communities interested in C&I approaches. These efforts can take many forms: financial, technical and language. These efforts need to be matched by facilitating efforts from researchers and managers to ensure their success. Managers should also demonstrate some adaptive efforts to accommodate and include Aboriginal knowledge and management systems. Changes in management systems should result.

According to Argyris and Schon (1978) social learning is the beneficial outcome of collaboration which occurs when experiences, ideas and environments are shared between parties (in this case First Nations and forest managers and decision makers) in an approach which involves flexible institutional and organizational arrangements encouraging reflection and innovative responses. The benefits of social learning are to strengthen socio-environmental systems through the production of flexible, multilevel governance systems in which institutional arrangements and ecological knowledge are tested and revised in an ongoing process (Berkes and Turner 2006). Multilevel governance systems are important because according to Folke *et al.* (2002) many environmental problems are in fact systems problems which cannot be dealt with entirely through science and management. According to these authors the sharing of management power and responsibility between government and local people is necessary. The notion of resilience therefore emerges where perturbations affecting social and environmental balance can be re-equilibrated through the dynamic dialogue created within multilevel institutions.

It is only by recognising the different sets of values and objectives that conditions for an intercultural dialogue can be established to define foundations for a new forestry which will be better adapted to the Aboriginal context.

1.6.2 Moving beyond the collection of information

Although participation methods used in the C&I process are used to access community values and objectives, their impact and their success extend beyond the goals of data collection.

In effect, participation methods can be used to promote social learning as defined by Argyris and Schon (1978). More specifically, community participation efforts used in the development of C&I can collectively stimulate local interest of all parties in research efforts and the management and monitoring of forest conditions (Colfer *et al.* 2001). This interest can influence communities and forest managers to develop

institutions and capacities to promote collaboration. It is in this collaboration that social learning can occur. The use of participatory methods can create the necessary dialogue between different worldviews and knowledge systems. Participatory strategies well anchored in the cultural, historical, economic and political realities of Aboriginal people contribute to define the parameters of a forestry with Aboriginal people (Karjala *et al.* 2004; Wyatt 2008).

The following sections illustrate some of the better examples of the contributions of C&I participatory research to social learning. The process of C&I development has served as a learning vehicle stimulating the capacities of Aboriginal peoples and forest managers to at least partially adapt to an economic, social and ecological environment that is in a state of constant change. However, it will also highlight the need for learning on all sides. More specifically, the participatory methods used in the development of C&I demonstrate the possible collaboration between scientific and community objectives to define the basis for a socially-environmentally adapted forestry. The fact that Aboriginal communities are expected to integrate into a forest management system that originated in an outside culture poses problems. Forest managers (whether government officials or industry) have been involved in learning about Aboriginal values, but there is still criticism of the degree to which they are willing to invest in a continual an on-going processes of social learning regarding the overall impacts of forestry on Aboriginal values instead of focusing on specific issues.

1.6.2.1 Participatory methods and their contribution to learning

McGregor (2002) demonstrated that research in Aboriginal environments that sought to include communities in all steps of the research and capitalise on the means of sharing information offered better chances of success. Although participation methods may contribute to this success they can also be viewed as a tool to engage, define, collaborate with, empower and educate communities in forest management. Community approaches to the development of C&I can offer the means for

Aboriginal expression of their knowledge, practices and belief systems. The C&I process therefore has the necessary tools to use Aboriginal knowledge and values to link forest management with culture, territorial occupation and use, community development, institutions of knowledge and knowledge transmission.

Learning as defined by social learning occurred in Aboriginal communities such as Kitcisakik and AFPP through participatory processes which accompanied, organised and elevated their knowledge such that an appropriate dialogue occurred with forest managers. In Kitcisakik, the participatory methods referred to the model of "education relative to the environment" (ERE) (Saint Arnaud *et al.* 2005). This approach allowed for the better definition of Kitcisakik's own interpretation of SFM as its primary objective. The use of ERE assisted the community to develop its own reflection of forestry and forest issues which were only then translated into C&I (Sauvé 1997; Sauvé 2003). It helped characterise the Aboriginal/forest/forestry relationship through community and intercommunity dialogue around forestry questions (Saint Arnaud *et al.* 2005). The representation of such relationships allowed for the development of C&I for SFM that reflected the priorities of Kitcisakik while maintaining community realities pertaining to their culture, values and occupation of the territory.

In AFPP, the notion of "knowledge co-production" was favoured. This included the development of a community-based environmental monitoring method that incorporates the knowledge, needs, beliefs, and concerns of the community through an integrative, flexible framework that applies both indigenous and scientific knowledge (see http://cura.unbc.ca).

Both Kitcisakik and AFPP demonstrate the benefits of participatory methods in the community. While favouring collaboration, the participatory research served as an intervention which assisted the communities in the organisation of their knowledge, critical-analysis of socio-environmental realities and their own interpretation of SFM.

The contributions of participatory efforts towards Aboriginal community learning are evident. However, in order for social learning to occur all other stakeholders and interest groups also have to show evidence that critical-analysis of their own definitions are made, and inclusion and use of other knowledge systems are allowed. Power sharing will also make participatory methods have a greater chance of success as people on both side of the table have a vested interested in learning and understanding the other's point of view.

1.6.2.2 Highlighting the necessary steps towards "true" learning

It is important to note that although community participation efforts can collectively stimulate local interest in research efforts, management and the monitoring of forest conditions, they have also caused some problems in Aboriginal environments. As mentioned by Armitage *et al.* (2008), social learning approaches may have overtones of donor driven agendas due to differences in the power structure of multilevel organisational institutions. Robottom and Sauvé (2003) particularly noted the following as key challenges:

- the sharing of power,
- the role and partnership title of the research,
- the notion of significance,
- the notion of information "dumping", and
- technocratic rationality.

Although the use of participation methods which are culturally adapted to the communities is important, it is also crucial to demonstrate that learning occurs in all participants. To date, evidence that managers are adapting and modifying their thinking, actions and behaviours via the inclusion of the Aboriginal values and objectives is lacking. It has been suggested that efforts towards the sharing of power is the only effective way to resolve these issues and promote true social learning. Armitage *et al.* (2008) for example, stress that attention must be given to learning environments that enable different segments of heterogeneous communities an

opportunity to transform traditionally disadvantageous power relations and engage in truly collaborative learning. Although there are benefits for Aboriginal communities in terms of learning, issues of power persist.

In Kitcisakik, when C&I were developed from the different representations expressed through the participatory methods, feelings about changes in the physical environment in terms of changes in elements such as forest cover (more aspen for example) and how these affect wildlife were expressed. There were individual experiences that related to concerns about changes in habitat and wildlife abundance and behaviour on family trap lines but also concerns that these changes are more global. More importantly, it was noted that foresters do not seem to consider the fact that the forest is composed of more than timber or fiber. There was also a deep sorrow and regret at the inability of community members to protect the forest. These concerns further reinforced the issues related to power relations in decision making processes. This reflection helped the community clarify their position on forestry issues and may have educated foresters on the relationship that community members have with their land and how these relationships have been affected by forestry activities. However, the situation in Kitcisakik remains one in which foresters and the government have the ultimate control over the management of traditional lands.

In order for social learning to occur, **all knowledge systems** would ideally need to be elevated to a common level of understanding, power, and respect to ensure appropriate **dialogue**. Knowledge systems need to be allowed the appropriate space in decision making so that they can each individually be influential without necessarily having to merge. This will inevitably call for interdisciplinary and multi-methodological approaches which will also serve to facilitate and promote the capacity of all partners to reach this dialogue and thus social learning. It is important to stress that to date, there seems to be a lot of effort in elevating Aboriginal knowledge systems but in many cases little is done to ensure their role. This was also

highlighted by O'Flaherty and Davidson-Hunt (2008) in planning for sustainable forest management with the Pikangikum First Nation and the Whitefeather forest initiative. In some cases a long history of abuses, broken promises and treaties may be important factors leading to a climate of mistrust that will limit the achievement of common understanding.

In the case of Kitcisakik, the interdisciplinary team of researchers and partners, and the multi-strategic participatory methods used allowed for a rich dialogue between the community and interest groups in the territory. The resulting C&I framework was discussed in workshops where key informants were present before any presentation to partners in the forest companies. Although this was important to ensure that collaboration occurred with all partners involved in SFM in the Kitcisakik territory, overtones of a donor agenda remain. Collaboration can become a fuzzy concept between consultation and consensus building. The degree of collaboration needs to be defined as it relates to power relations between parties.

The Innu/government relationship on District 19A in Labrador and the AFPP show promise in defining collaboration initiatives through participatory efforts. In the Innu case study, meetings are held in traditional settings (i.e. tents in the forest with elders at the centre and over multiple days to ensure time for reflection) and all agreements must be endorsed by both groups. In the case of AFPP, capacity building as a result of co-management efforts has been discussed by Grainger *et al.* (2006). The authors noted the efforts to further employ and strengthen local management institutions. Acknowledgement of traditional rights, and providing positions on the Board of Directors provided the opportunity for participation in land management planning as well as attempting to incorporate traditional land stewardship elements into the project. Also issues regarding funding, effective facilitation, administrative and external support are components which are considered important to promote the capacity required to support co-management efforts. The authors noted that:

"structures were in place to promote power-sharing, establish co-operation and equity, promote in-depth communication, build respect and trust among very different but legally-bound parties, and explicate the practical, everyday challenges encountered by resource users and managers" Grainger et al. (2006).

Organizing the territory and its local institutions as well as better incorporation of Aboriginal forest issues in the management of the territory should not be seen as an ultimate goal but as an important step towards true sharing of decision making and true harmonisation. Defining power relations and the role of each knowledge system in management decisions is crucial to ensure social learning away from the "donor and dumping" agenda cautioned by Robottom and Sauvé (2003). In the efforts made for capacity building, collaboration and learning all participating parties and all knowledge systems need to be involved. Each has a responsibility to teach and learn and therefore participation methods need to ensure that all parties engage in social learning.

1.7 Key issues in the implementation of Aboriginal C&I

1.7.1 The effects of understanding and methods used to access Aboriginal values and goals

This report has highlighted some of the difficulties which have been met following attempts to include Aboriginal values and objectives into the C&I process. It is important to note that C&I have been successful in providing a platform to discuss scientific and social values pertaining to sustainability issues between non-Aboriginal and Aboriginal cultures. Despite a compartmentalised approach to indicator development there is an underlying thrust to capture multiple Aboriginal factors important to forest sustainability. However, current approaches do not focus on linkages between/among different indicators or criteria, despite the fact that many

indicators could fit into multiple criteria. Instead of stressing the uniqueness of indicators, C&I processes would better represent Aboriginal values and objectives if they were to stress linkages and the fuzzy logic which best describes Aboriginal knowledge and management systems. It is thus pertinent to attempt to determine the implications of these challenges on the application of C&I frameworks.

Initially in this report, it was asked whether the persistent feeling of lack of commitment from managers was due to a lack of understanding of Aboriginal values and objectives, or the methods used to access them. In terms of the understanding of Aboriginal values and objectives as expressed by C&I frameworks, it was found that non-Aboriginal approaches to compartmentalising versus Aboriginal perspectives have more overlap in indicators than one may expect. In effect, most of the non-Aboriginal C&I frameworks could be viewed as not inconsistent with Aboriginal values and objectives. So why bother isolating and investing so much effort in Aboriginal values and objectives in SFM? One may initially think that if 75% of Aboriginal indicators are captured in C&I processes, this may be a sufficient compromise. However, if C&I are to be holistic, it could be argued that a system without 25% of its components may not be functional. The whole is more important than its component parts.

Further analysis of the differences between Aboriginal and non-Aboriginal frameworks showed a consistent oversight of culturally defined means of expressing Aboriginal knowledge and management systems. More specifically, society and nature are treated separately. It is important to recognise that forestry is occurring on lands on which Aboriginal communities live and have lived for generations. Changes caused by forestry thus have many cultural implications. Linkages have to be made with ecological indicators and their effects on, or relationship to, cultural values. Attention to such factors is critical to the application of C&I frameworks because if the system is to achieve a sense of holism and sustainability for all, it cannot

persistently ignore the cultural differences between Aboriginal and non-Aboriginal knowledge and management systems.

Within many C&I processes, the general understanding of Aboriginal needs and values exists in some form or another. However, when processes seek to be holistic they should aim for a stronger understanding of their differences. It should be remembered that values and goals, including those of Aboriginal communities, are dynamic and in constant evolution. Although many factors are changing, Aboriginal relationships to the land, their ties and traditions are an integral part of their cultures. Forest management is not the only change that these communities must contend with, even if it has immediate effects on their relationship with the land. This implies that continuous and constant revisions will always need to be made with communities to ensure that C&I are (1) consistent with their realities and (2) indeed representative of their values and needs.

A review of the methods used to access Aboriginal values and objectives has shown that although the objectives of C&I development are for the evaluation and monitoring of forests for SFM, their impacts far exceed these objectives in Aboriginal communities. The C&I process can be used to include, educate, engage, and empower Aboriginal communities in forest management. In Aboriginal communities, the C&I process can also be used to define a forestry which is more adapted to their cultural context. As such, different approaches to the development of C&I should be used depending on C&I objectives, capacity and community context.

It is mostly the participatory methods used which determine the level of inclusion, engagement, education and empowerment which is left in the communities. Until Aboriginal communities have reached an acceptable level of empowerment in forest management, much effort and time will need to be invested to assist these communities in the development of C&I and educate managers in the definition of sustainability that encompasses community values.

The significance of choosing between top-down versus bottom-up process does not seem to be the key issue to the successful inclusion of Aboriginal values and goals. A hybrid of the two processes will permit the development of C&I where national issues will merge more organically with locally important issues. However, accessing local issues will always require effective participatory methods to engage the communities in the process and ensure that all issues are appropriately addressed. It is therefore the use of effective participatory methods which ensures the accurate expression of local issues.

1.7.2 The effects of conceptual challenges between C&I and Aboriginal values and objectives

This report asked whether the process of C&I was appropriate to Aboriginal communities. For the process to be successful, managers must embrace the different sets of values and objectives, and include them in forest management. Managers must learn from and use Aboriginal realities to manage forests, but not without the meaningful participation and engagement of Aboriginal peoples. Therefore C&I objectives in Aboriginal communities extend beyond that of merely identifying C&I for SFM. This could result in a new forestry, a culturally adapted forestry, an Aboriginal forestry. This notion has many implications for the use and implementation of C&I frameworks by managers. The necessary groundwork needs to be completed to ensure capacity in communities for participation in all dialogues related to forestry. Education of community members and of forest managers can increase feelings of empowerment, hope and purpose. Increased understanding and application of Aboriginal values and objectives should be included in forest management and thus expand the pool of knowledge. These changes can create the necessary ingredients for social learning and its associated benefits.

The recognition and accommodation of different sets of values and objectives is important to ensure that SFM will achieve the goals of both managers and Aboriginal

communities. This requires collaboration and dialogue between the members holding these different forest perspectives. In order to collaborate, the role of Aboriginal communities needs to be defined, first by them, and then in collaboration. The community also needs to be engaged and involved in the process. Methods used for the development of C&I therefore need to capitalise on mutual learning, participation and education. As shown in this report, appropriate participation methods need to be determined based on a clear understanding of the community context. However, collaboration has to occur with all parties if it is to be effective. Therefore managers need to demonstrate: an honest and transparent interest in the community; an honest effort to learn from the community; willingness to participate in community education; and share power through various approaches and institutions.

An effective platform is necessary to allow for the expression of different sets of values and objectives in forest management. C&I has the potential to become this platform of discussion. However, considering the foreign concepts related to C&I methods, it is important to recognise the adaptive efforts required by Aboriginal communities interested in such approaches. After all, the C&I concepts, language and approaches were developed for managers. Aboriginal efforts to maximize the benefits of C&I processes therefore need to be matched by facilitating efforts from researchers and managers to ensure their success. Participatory methods which emphasize education and empowerment will allow community capacity development. In order for C&I to be successfully implemented in the interests of sustainability, it will require the long term investment and collaboration of both forest managers and Aboriginal communities. C&I processes also have to offer the opportunity and flexibility to learn from and adapt to Aboriginal values and objectives. Only when C&I truly meet and include the differences found in Aboriginal values and goals for their lands, will this tool be appropriate for Aboriginal communities.

CHAPITRE II

LOCAL LEVEL CRITERIA AND INDICATOR FRAMEWORKS: A TOOL USED TO ASSESS ABORIGINAL FOREST ECOSYSTEM VALUES

LES CADRES DE CRITÈRES ET INDICATEURS LOCAUX: DES OUTILS POUR ANALYSER LES VALEURS AUTOCHTONES POUR LES ÉCOSYSTÈMES FORESTIERS

M.C. ADAM AND D. KNEESHAW

FOREST ECOLOGY AND MANAGEMENT 255 (2008) 2024–2037

2.1 Abstract

Although the importance of Aboriginal knowledge, values and perspectives in sustainable development has been recognised for many decades, worldwide examples exist showing that Aboriginal involvement is less then effective. How and where to include Aboriginal needs and goals, has however been problematic. Ultimately, Aboriginal forest values need to be considered with scientific strategies and their role and compatibility with forest conditions needs to be explored. Criteria and indicator (C&I) frameworks can be used as a platform to include community needs and goals in management decisions. This review compares Aboriginal forest ecological perspectives defined by Canadian local level C&I frameworks with non-Aboriginal local level C&I frameworks to identify their differences at the indicator level. Three major themes mark the differences between Aboriginal and non-Aboriginal indicators: (1) Aboriginal frameworks introduce ecological indicators of cultural importance; (2) there is an aesthetic concern for forest operations especially if they affect cultural owners; and (3) indicators regarding the access to resources are more complex and include the sustainability of the productivity, proximity, integrity and quality of resources used in traditional activities. Results show that First Nation forest sustainability issues are in effect a combination of forest conditions and values. Inclusion of forest values in C&I frameworks is necessary because: (1) Aboriginal communities do not dissociate culture from the environment and thus forest values from forest condition, (2) they have an impact on resulting forest management strategies and decisions, and (3) they offer a holistic approach to sustainability issues and a better picture of local environmental contexts.
Keywords: Aboriginal; Forestry; Criteria and indicators; Integration; Forest values; Forest conditions

2.2 Résumé

Bien que l'importance des connaissances, des valeurs et des perspectives Autochtones soit reconnue depuis plusieurs décennies déjà, plusieurs exemples à l'échelle mondiale démontrent une participation Autochtone moins qu'efficace. La question du comment et où inclure les besoins et les buts Autochtones est problématique. Idéalement, les valeurs Autochtones en forêt doivent être considérées avec les stratégies scientifiques et leurs rôles et compatibilités avec les conditions forestières doivent être explorés. Les cadres de Critères et Indicateurs (C&I) peuvent servir comme plateforme pour inclure les besoins et objectifs communautaires pour les décisions faites en aménagement. Cette revue compare les perspectives Autochtones en écologie forestière définie par les cadres de C&I local Canadien avec des cadres de C&I locaux non-Autochtones pour identifier les différences au niveau des indicateurs. Trois thèmes ont marqués les différences entre les indicateurs Autochtones et non-Autochtones : 1) les cadres Autochtones introduisent des

indicateurs écologiques avec une importance culturelle; 2) il y a une préoccupation esthétique concernant les opérations forestières surtout quand elles affectent les occupants culturellement actifs; 3) les indicateurs se portant sur l'accès aux ressources sont plus complexes et incluent la durabilité de la productivité, la proximité, l'intégrité et la qualité des ressources utilisées pour les activités traditionnelles. Les résultats démontrent que les préoccupations Autochtones pour la durabilité de la forêt sont en fait une combinaison des conditions et des valeurs forestières. Il est important d'inclure les valeurs forestières dans les cadres de C&I car : 1) les communautés Autochtones ne dissocient pas la culture de l'environnement et non plus les valeurs forestières des conditions forestières; 2) elles ont un impact sur les stratégies et les décisions prises en aménagement forestier et 3) elles offrent une approche holistique sur la question de la durabilité ainsi qu'un meilleur portrait du contexte environnemental local.

Mots clefs : Autochtone; foresterie, critères et indicateurs, intégration, valeur forestière, conditions forestières

2.3 Introduction

Inclusion of communities in forest resource development and conservation has been touted as a central component to achieve sustainable forest resource development (Clark and Dickson 2003). For example, community forestry projects worldwide (Hartanto et al. 2002; Mendoza and Prabhu 2000; Lawrence et al. 2006; Carabelli et al. 2007) have been initiated to decrease the marginality of resource dependent communities and increase the participation of local communities which are most affected, and can benefit from forestry decisions. The participation of local communities requires the interpretation of local needs and goals which can be difficult. Compounded with local contexts, cultural and worldview differences have rendered the integration of Aboriginal communities especially problematic. Several initiatives with indigenous people's organisation have been made relating to traditional forest knowledge and development efforts (ICSU, 2002). However even today, failure to address the particular values and needs of Aboriginal cultures in sustainable forest management is noted at the global level (Ross and Smith, 2002; Natcher *et al,* 2005; NAFA, 1993; Parrotta and Agnoletti, 2007).

Specifically, Aboriginal people feel very little control or influence on forest practices and on development initiatives (Bradshaw, 2003; Côté and Bouthillier, 2002; Hawley *et al*, 2004; Hickey and Nelson, 2005; Ogima, 2004). The degree of Aboriginal influence varies worldwide. Problems range from unrecognized Aboriginal resource rights and title in New Zealand (Coombes 2007); to lack of community participation, ineffective leadership and tenural security in India (Murali et al. 2003). Research efforts have attempted to understand the convergence and divergence of traditional knowledge versus science such that Aboriginal perspectives and values can be better integrated (Hawley *et al*, 2004; Ettenger *et al*, 2002; Moller *et al,* 2004; Lévesque and Montpetit, 1997; Davidson-Hunt and Berkes, 2003). Some studies have also reviewed partnerships between industry/government and

Aboriginal/forest dependent communities in forestry to assess their involvement in management decisions (Murali et al. 2003; Bhattacharya and Basnyat 2003); Hickey and Nelson, 2005; Ross and Smith, 2002; Natcher *et al,* 2005; Sherry *et al,* 2005). However, the above research efforts have only served to justify the importance of Aboriginal perspectives and the need for ongoing efforts towards effective community management (Sheppard and Meitner, 2005; Lewis and Sheppard, 2005; Parrotta and Agnoletti, 2007). Worldwide examples indicate that present Aboriginal engagement in management is less then effective, and increased and broader Aboriginal participation is necessary.

Where and how to include Aboriginal forest values and needs has been problematic. The use and compatibility of Aboriginal forest values with scientific strategies measuring forest conditions has been difficult. More specifically, incorporation of local forest development goals implies the inclusion of local knowledge, opinions and values in management decisions along the side of science and technology regarding forest conditions (Turnhout *et al*, 2006; Clark and Dickson, 2003; Wu, 2006). Criteria and Indicators (C&I) frameworks serve as the medium within which social values merge with scientific knowledge of environmental conditions to monitor and influence trends in forest practices (Hartanto et al. 2002). In fact, development of C&I has been the most popular method to conceptualize, evaluate and implement sustainable forest management (Woodley et al, 1999; Bass, 2002) as more than 150 countries have developed their own specific sets (Castañeda 2000; Holvoet and Muys 2004). Although C&I frameworks offer a platform to include community needs and goals, to date they have been criticised for not fully identifying culturally important landscapes as central considerations for future management decisions (Parrotta and Agnoletti 2007). Efforts to include Aboriginal ecological issues and environmental values would confront the compatibility issues of Aboriginal forest values. However, studies on these issues have been limited.

The reasons for which Aboriginal ecological issues and environmental values have been overlooked in C&I are twofold. First, some research findings show that Aboriginal ecological needs and goals correspond well to non-Aboriginally developed sustainability frameworks. In Canada, Sherry *et al* (2005) found a high correspondence between Tl'azt'en (Aboriginal groups in BC, Canada) principles of ecological sustainability and the Canadian Council of Forest Ministers'(CCFM) template, Local Unit Criteria and Indicators Development (LUCID) test, and the Centre for International Forestry Research (CIFOR) generic template. Also, while studying indigenous cultural techniques to manage harvest, Moller *et al* (2004) concluded that there is a surprising level of agreement between science and traditional ecological knowledge. Second, there is concern that inclusion of Aboriginal holistic perspectives in ecological standards will lead to qualitative indicators which are viewed as difficult to measure and apply to forestry prescriptions (Rollins *et al*, 2001; McCool and Stankey, 2001). According to Kneeshaw *et al* (2000), the nature of indicators must be scientific, linked to forest management and quantifiable. To these authors, integrating the holistic Aboriginal environmental perspectives is a challenge due to difficulties in defining Aboriginal ecological frameworks for appropriate use in decision making.

However, a large pool of researchers also believe that scientific frameworks such as C&I frameworks used today, illustrate natural ecosystems as discrete and hierarchical categorizations as opposed to connections and continuous gradations (Bunnell and Huggard, 1999). They believe this to be a reductionist approach to science and framework development preventing effective information sharing and communication among Aboriginal communities and forest managers. Researchers have also found difficulties translating Aboriginal values into this hierarchical system of frameworks due to holistic patterns of Aboriginal worldviews (Parrotta and Agnoletti 2007). Some Aboriginal communities believe that there is no separation between society and individual, culture and nature, nor society and environment

(Davidson-Hunt and Berkes, 2003). There are conflicts regarding the role of Aboriginal environmental perspectives in ecological frameworks which need to be resolved to be able to contribute to Aboriginal interests for increased involvement and respect in forest management.

This study will review ecologically related C&I as an expression of Aboriginal environmental values and ecological parameters to answer the following questions:

- Do Aboriginal indicators differ from non-Aboriginal indicators in the principle of ecological sustainability? It is presumed that understanding these differences will show the importance of Aboriginal forest values and environmental perspectives, as well as the necessary changes which need to occur in forest management decisions.
- How are the Aboriginal indicators different in terms of their nature (quantifiable or qualifiable) and role in frameworks? The nature of these indicators as a function of good ecological standards of sustainable forest management indicators (Kneeshaw et al, 2000) will help determine whether they can be included in frameworks.
- Will Aboriginal indicators have an effect on forest management strategies and decisions?

Ultimately, this comparison will seek to understand differences between Aboriginal and non-Aboriginal needs and goals using indicators of ecological sustainability.

2.4 Methods

This review will compare Aboriginal versus non-Aboriginal indicators of ecological sustainability in one region (Canada) and at the local level of application of C&I frameworks. These limits have been imposed to avoid differences attributed to the global context ((Holvoet and Muys 2004).

2.4.1 The Canadian context of Aboriginal integration efforts in forest management

In Canada, 80% of Aboriginal communities are located in productive regions of the boreal and temperate forests (Hickey and Nelson, 2005) and are faced with forestry operations near or on their traditional lands. Their presence in such areas offers a social context justifying the need for their consideration in the study of sustainability. Gladu and Watkinson (2004) mention that "through their forest practices, their unique connections to the land and their local and traditional knowledge, Aboriginal people of Canada can contribute significantly to sustainable forest management." Furthermore, legislative mandates exist recognizing Aboriginal forest goals, access, and participation in forest management (Ross and Smith, 2002). "The involvement of indigenous peoples in the management process is being recognized as both an unrelinquished right (e.g., Report of the Royal Commission of Aboriginal Peoples in Canada 1997), as well as a necessary factor in achieving sustainable environments (e.g., Brundtland 1987)..."(Natcher and Hickey, 2002). In light of their vested interests and rights in forest management, the integration of Aboriginal people to forestry decisions is nationally recognised. Development of forest management based on Aboriginal ecosystem perspectives is necessary to help decision makers assume the responsibility of Canadian legislation and mandates.

2.4.2 C&I frameworks and definitions

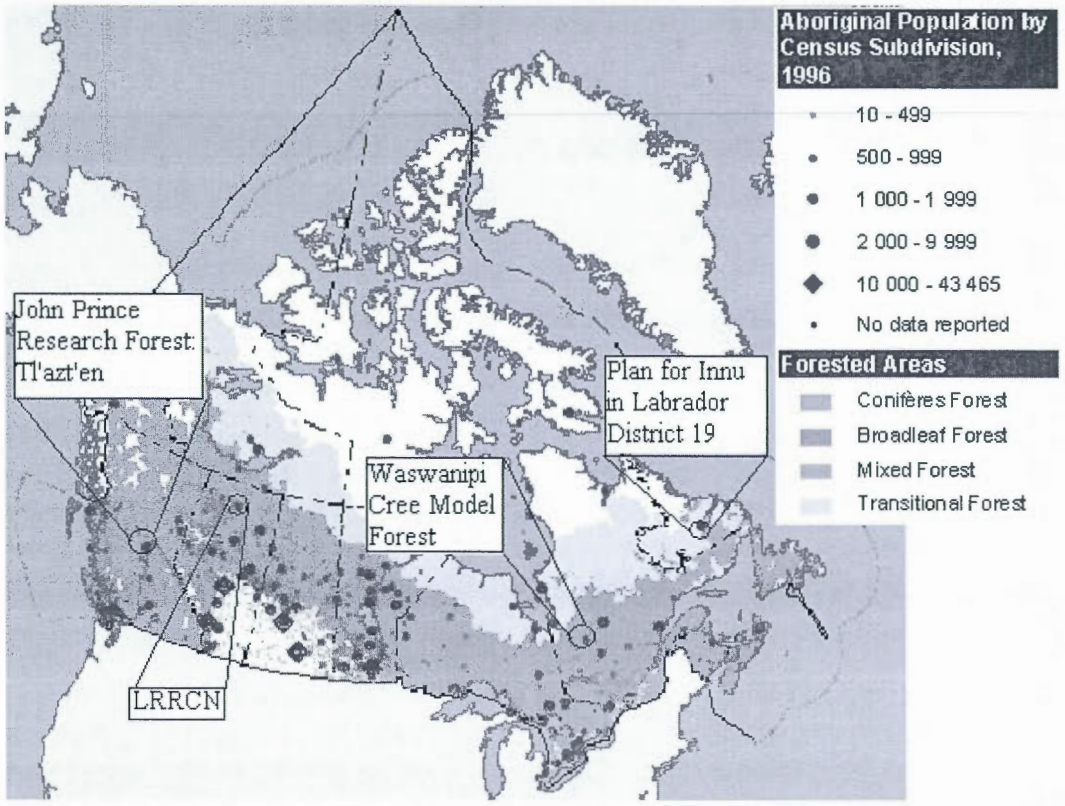
A few Aboriginal communities in Canada have begun the process of defining local level C&I frameworks.

> **Local level framework**: A set of objectives and actions defined by a community to respond to and monitor potential forest management development efforts in their land such that they will be sustainable. It serves as a platform for dialogue between the community and managers.

The following Aboriginally defined frameworks were used for this comparison: Little Red River Cree Nation (LRRCN) (Natcher and Hickey, 2002); Tl'azt'en local

level C&I of John Prince Research Forest (JPRF) (Sherry *et al*, 2005); Waswanipi Cree model forest (Canadian model forest network, 2000); OPMVPN (Objectifs de Protection et Mise en Valeur des Premières Nations) forestry toolbox (Assembly of the Aboriginals of Quebec and Labrador, 2004); and the forest ecosystem strategy plan for the Innu in Labrador district 19 (Crown 5 Year Strategy Plan, 2002)(Fig.2.1).

Figure 2.1. Aboriginal populations and forested areas (atlas.nrcan.gc.ca) and origins of the Aboriginally defined local level criteria and indicator frameworks. Note: the frameworks which were not included on this map were developed for application at the local level but without a particular community in mind (FSC, the North American Test of Criteria and Indicators of sustainable forestry framework, and OPMVPN).



These Aboriginal C&I frameworks were chosen for comparative purposes because:

- The criteria and indicators were selected by Aboriginal communities living on and from the forest.

- The frameworks demonstrated local level ecological indicators (either as indicators, critical elements, forestry objectives or local values).
- Frameworks approached the issue of ecological sustainability which encompassed the following issues within their criteria: ecosystem and species diversity and function; access to resources; and recognition and respect for Aboriginal roles in sustainable forest management.

These frameworks were compared to non-Aboriginally defined local level C&I frameworks: North American Test of Criteria and Indicators of sustainable forestry framework derived from the Canadian Council of Forest Ministers (CCFM) and Centre for International Forestry Research (CIFOR) (Woodley *et al*, 1999); and Forest Stewardship Council Canada Working Group National Boreal Standard (FSC) (Forest stewardship council Canada working group, 2004).

It should be noted that each framework operated within its own C&I hierarchy and category definition. The multiple definitions for C&I render framework comparisons difficult so the following definitions were used for this study:

Criterion: category of conditions or processes by which sustainable forest management may be assessed (Canadian Council of Forest Ministers, 1995). This study particularly looked at concerns directly or indirectly pertaining to the following criteria: ecosystem function and diversity, landscape patterns, native species diversity, incidence of disturbance and stress, genetic diversity and physical environmental factors.

Indicator: definition of quantifiable or qualifiable variables which can be measured and described.

Verifiers: Variables which, when observed periodically demonstrate trends. Verifiers vary regionally according to ecosystem and social situations.

Due to the regionality of compared C&I frameworks, objectives and desired trends are included within criterion and indicators. Table 2.1 shows the hierarchy of

each framework and how the criteria, indicator and critical local values used in this study compare.

Table 2.1Hierarchy used for comparing Aboriginal and non-Aboriginal frameworks and its equivalence to the compared C&I frameworks

Hierarchy used for comparison	Amalgamation of C&I appropriate for the North American test	Tl'azt'en C&I, AFPP	Little Red River Cree Nation (LRRCN)	OPMVPN forestry toolbox[1a]	FSC boreal standard	Waswanipi Cree Model Forest	Forest Ecosystem Strategy Plan for forest management district 19[1b]
Criterion	Criterion	Criterion	Critical element		Criterion	Criterion	Objectives
						Goal	
Indicator	Indicator	Indicator	Indicator	Objectives	Indicator	Indicator	Actions
Verifiers		Critical local value	Local value/Goal		Verifiers		Specific tables

1- The objectives (1a) and actions (1b) were considered as indicators. These were grouped by theme and a criteria and indicator were defined for each group.

2.4.3 C&I framework comparison strategy

Comparison between Aboriginal and non-Aboriginal C&I frameworks occurred in many steps. It is important to note that issues covered and methods of C&I development varied amongst frameworks. Differences in the development of frameworks may lead to variability of themes and organisation of issues covered within-and-amongst Aboriginal versus non-Aboriginal frameworks. Tables 2.2 and 2.3 describe important framework differences noted to appropriately set the context of comparison. Comparability of C&I used in this study were thus carefully evaluated. First, all C&I were translated to fit a common framework hierarchy. Second, each criterion was assessed to ensure that they could be compared across frameworks. Third, different Aboriginal ecological indicators were extracted and their nature identified.

Table 2.2 Background information on the origins of the Aboriginally defined C&I

	Waswanipi Cree Model Forest (WCMF)	Tl'azt'en C&I, AFPP	OPMVPN forestry toolbox	Little Red River Cree Nation (LRRCN)	Forest Ecosystem Strategy Plan for forest management district 19 (2003-2023)
Purpose of efforts	"Maintain and enhance the quality of the area within the boundaries of the WCMF which is known as Eeyou Istchee, to benefit Aboriginal and other users and to assure the economic, social and cultural development of the Waswanipi First Nation"	"Integrate and enhance traditional and scientific approaches to understanding human relationships with the land"	Define sustainable development strategy based on Aboriginal preoccupations	Better understand the interface between community members and their environment	"To create an ecosystem-based forest management plan for Labrador that protects ecological and cultural integrity, productive capacity, resiliency and biodiversity while advancing economic opportunities for the sustainable development of forest-based industries."
Type of management agreement (year)	Model forest Canada led by Aboriginal people (1997) but initiated by the government model forest project[1]	Co-management experiment between the University of Northern British Columbia and Tl'azt'en band members (1999)	Department of Indian Affairs and Northern development who began a national consultation process on sustainable development among First Nation and the Inuit (1996) which was taken over by the Assembly of First Nations Quebec and Labrador	Cooperative resource management with Government of Alberta (1991)	Forest process agreement between the province of Newfoundland and Labrador with the Innu Nation (2001) which led to the Forest ecosystem strategy plan and Five year operating plan
#criteria/ # indicators (incomplete/ complete[2])	4/69 (complete and inspired by CCFM)	17/52 and 143 critical local values (complete)	50/160 .(incomplete and not initially intended as C&I)	6/62 (incomplete)	21/147 (complete but not initially intended as C&I)
C&I principles	Ecological, economic, decision-making and social	Decision-making, social, economic, management and ecological	Objectives and actions required for various types of First Nation territories (ancestral, community, family, hunting and trapping territory)	Management, community access and protection of land, treaty rights, traditional practice, economic and decision-making	Ecological landscapes, cultural landscapes, economic landscapes, ecological research and monitoring, cultural research and monitoring
References	Canadian model forest network (2000); Gladu and Watkinson (2004)	Sherry et al (2005); Karjala et al(2004); Karjala and Dewhurst (2003); Grainger et al (2006)	Assembly of the First Nations of Quebec and Labrador (2004); First Nation of Québec and Labrador sustainable development institute (2006)	Hickey (2002); Hickey and Nelson (2005); Natcher and Hickey (2002); Natcher et al. (2005)	Crown Five Year Operating Plan Forest Management District 19A (2002); Crown Five Year Strategy Plan Forest Management District 19A (2002)

1- All other C&I efforts were initiated by the Aboriginal communities. 2- Complete frameworks include social, economic and ecological principles in the framework (otherwise the framework is considered incomplete)

Table 2.3 Background information on the non-Aboriginally defined C&I frameworks used in this study

	Amalgamation of C&I appropriate for the North American test	FSC boreal standard for Canada
Purpose of efforts	to test the use and relevance of criteria and indicators for the concept of sustainability at the local management unit level	to serve as a basis for certifying forests within the Canadian boreal forest. Mission: To promote environmentally appropriate, socially beneficial, and economically viable management of the forests of Canada through standards and their application."
Framework development strategy	a team of experts evaluated and reviewed the following C&I national level frameworks: 1) those that emerged from the CIFOR Phase I synthesis; 2) CIFOR's basic assessment guide for human well-being; 3) Canadian Council of Forest Ministers (CCFM) Criteria and Indicators of Sustainable Forest management in Canada (which are similar, but not the same as, the Montreal Process - see following paragraph); 4) local/regional indicators including the Idaho Forest Practices Act; and, 5) the Greater Fundy Ecosystem Guidelines developed for the Fundy Model Forest.	The framework was developed by the FSC Canada Working group composed of eight elected members representing the Aboriginal, environmental, economic and social sectors; the FSC Boreal Coordinating committee; and provincial/territorial initiatives. The framework is guided by the following: "Vision: Healthy forests providing an equitable sharing of benefits from their use while respecting natural forest processes, biodiversity and harmony amongst their inhabitants
# criteria/ # indicators (incomplete or complete framework[1])	20/57 covering ecological, economic, decision-making and social sustainability; and can be applied at the local level (complete).	102/201 covering ecological, economic, decision-making and social sustainability (complete).
References	Woodley et al, 1999; Hoekstra et al, 1998;	FSC, 2004

1- Complete frameworks include social, economic and ecological principles in the framework (otherwise the framework is considered incomplete).

Indicators were grouped and translated according to C&I defined in table 2.4. Some frameworks included criteria specific to Aboriginal issues. The following three criteria were extracted from these framework sections and included for comparison in order to consider all criteria relevant to Aboriginal issues of ecological sustainability: forest management provides ongoing access to resources; recognition and respect for Aboriginal roles in sustainable forest management (Aboriginal rights, Treaty rights and Aboriginal values); and preserving the aesthetic quality of the area (sites of particular vocation, hunting grounds) for its enjoyability, visual framework and to diminish negative visual impacts of forestry operations.

Table 2.4 Criteria and relevant themes for indicators used as a base for comparison of frameworks. The first box refers to the criteria of ecological sustainability, while the second box includes criteria which were specific to First Nation issues and/or frameworks. Extracted indicator themes are general terms used to describe the indicators found in the frameworks and allowed them to be pooled together within one criteria or another.

Criteria	Extracted indicator themes
Ecosystem function is maintained	quality (aquatic, forest etc...), river buffers, fragile and special ecosystems, regeneration, refuge habitats, structure, productivity, down and coarse woody debris, rehabilitation and restoration of damaged sites
Landscape patterns support native populations	corridors, fragmentation, protection of refuge habitats and structure and their spatial distribution, spatial distribution (habitat, residual forest, cover, cut blocks, roads ...), forest cover
Native species diversity is maintained	number of species and their habitat when a specific species is mentioned, vegetative or faunal classification, protected areas, and species interrelationships
Ecosystem diversity is maintained	age structure, ecosystem types, structural classes, forest conversion, representation of special sites, selection of protected areas
Incidence of disturbance and stress	stability, erosion, fire, noise, pollution, environmental impact assessment, damage by harvesting. Includes human and natural disturbance, stress and pollution.
Genetic diversity is maintained	exotic species, population size and connectivity, reproduction, gene frequencies
Physical environmental factors	physical integrity, microclimates, soils, ecosystem events
Forest management provides ongoing access to the resource	access, proximity (distribution), quality, ownership, fair and secure use rights, subsistence, non timber forest products, conflict resolution over use rights
Recognition and respect for Aboriginal roles in sustainable forest management (Aboriginal rights, Treaty rights and Aboriginal values)	cultural geography, socio-ecological roles, artifacts, environmental impact assessments on values, compensation over traditional ecological knowledge
Preserving the aesthetic quality of the area (sites of particular vocation, hunting grounds and landscape) for the enjoyability of the area, its visual framework and to diminish the negative visual impacts of forestry operations	trap-lines, cultural sites, managed sites

Distribution of indicators across the ecological criteria framework developed in table 2.4 was assessed to ensure their comparability. This comparison assumes that a

criterion is an issue for which the number of indicators included reflects a degree of reflexion. A lack of indicators in one criterion prevents comparisons. More specifically, few indicators may reflect gaps in the reflexion made for the criteria because a complete C&I framework (one which covers all sustainability issues from social, economic to ecological) was not developed by all groups. However, it does not necessarily mean a lack of interest in the issue. On the other hand, a high number of indicators within a criterion shows a high level of reflexion on the issue, and the criterion is viewed as a priority and can be extracted for further comparison of its indicators.

Based on the extracted criteria, all indicators were listed and compared to see whether they were covered, not covered or partially covered across C&I frameworks. Indicators which were neither covered by FSC nor the North American test of criteria and indicators of sustainable forestry framework were defined as different Aboriginal indicators. This difference is limited to the principle of ecological sustainability and the 3 criteria which were added for this study. The contrary (indicators not included in Aboriginal frameworks but included in the FSC and the North American test of C&I) was not found in this comparative study. The indicators were then evaluated as either being expressions of forest values which are influenced by concerns for community and cultural sustainability, or forest conditions influenced by ecological concerns as dictated by science.

Values are cultural ideas about desirable goals and appropriate standards for judging action (Tindall, 2001).

Forest values are expectations of what should be provided by forests (Kneeshaw et al, 2000).

Forest conditions are the results of forest management (Kneeshaw et al, 2000).

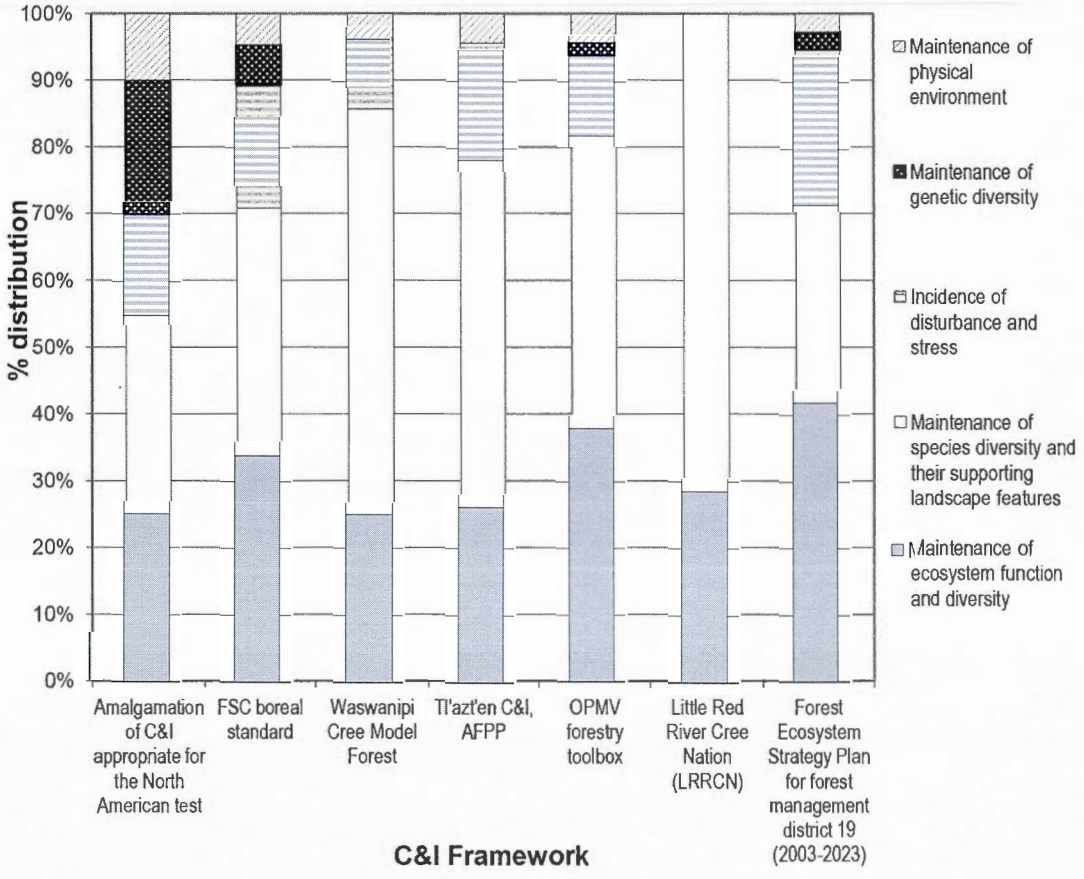
The different Aboriginal ecological indicators were then discussed based on the study objectives to determine their difference, their nature and role, and how they affect forest management decisions.

2.5 Results

2.5.1 Selection of Aboriginal priority criteria

Based on the distribution of indicators within the criteria shown in figure 2.2, the following criteria have been justified as priority for comparison in this study. The

Figure 2.2. Percent distribution of indicators by ecological criteria and framework, with the agglomeration of indicators for the ecosystem and species criteria



criterion for the maintenance of species diversity and landscape patterns consistently included more indicators in Aboriginal than in non-Aboriginal frameworks (fig. 2.2).

Although not very different than non-Aboriginal frameworks, the ecosystem function and diversity criterion had the second most indicators of any of the evaluated criteria (fig. 2.2). It is revealing that in combination, between 80 and 100% of Aboriginally defined indicators fall within these two criteria, compared to 50 and 70% for non-Aboriginal frameworks. These criteria are therefore seen as priority issues for ecological sustainability from Aboriginal perspectives. When comparing indicator distribution from the more complete frameworks (the North American test, FSC, Waswanipi and Tl'azt'en frameworks), a higher percent distribution of indicators in the criteria pertaining to resource access and Aboriginal land rights and aesthetics was found in Aboriginally defined frameworks (1 and 33% versus 1 and 6%). Complexity is shown by an increased amount of indicators per criterion thus demonstrating more issues which need to be resolved.

Some criteria level differences between Aboriginal and non-Aboriginal frameworks have been noted. Criteria such as genetic diversity, physical environmental factors, and incidence of disturbances and stress include fewer indicators in Aboriginal than non-Aboriginal frameworks (Fig. 2.2). Although many indicators do not surface within these criteria, they may still be important to Aboriginal peoples. The indicators and their associated concerns could be found in other criteria. For example, a genetic concern such as genetic variability for population viability may have been expressed by Aboriginal peoples as a concern for population distribution and availability. Aboriginal frameworks showed some concerns for species quality (in terms of resource access) and species health (found in the criterion for the maintenance of species diversity) which may in effect relate to genetic concerns. The ecological elements for concern in genetic diversity, physical environmental factors and disturbances seem to be expressed at a scale and within a perspective which is culturally defined. This exemplifies some of the challenges of

including Aboriginal worldviews into the sometimes reductionist and cartesian scientific ways. Results show some difficulty in introducing holistic Aboriginal environmental perspectives to criterial hierarchical level of framework development. Therefore, room for cultural expression and hierarchical flexibility is needed within C&I frameworks to ensure that all issues are covered explicitly.

Based on the criteria identified in the previous paragraphs, the extracted Aboriginal indicators are shown in table 2.5. Criteria of ecological sustainability are ordered by those which include the most- to- least Aboriginal indicators which are different:

- Preserving the aesthetic quality of the area (sites of particular vocation, hunting grounds) for its enjoyability, visual framework and to diminish negative visual impacts of forestry operations;
- Maintenance of species diversity and landscape patterns;
- Forest management provides ongoing access to resources;
- And maintenance of ecosystem function and diversity.

2.5.2 How are the extracted Aboriginal indicators different?

Based on the extracted Aboriginal indicators shown in table 2.5, Aboriginal indicators which differ from non-Aboriginal frameworks in this study do not reflect issues pertaining to forest conditions. More specifically, they do not seem to raise ecological issues which have been overlooked by non-Aboriginal frameworks. From this point of view, Aboriginally defined ecological frameworks compared in this study correspond well to non-Aboriginal ecological perspectives as mentioned by Sherry *et al* (2005) and Moller *et al* (2004).

Instead, the different Aboriginal indicators extracted for comparison are culturally motivated reflecting community sustainability issues pertaining to ecology. Three major themes mark the differences between Aboriginal and non-Aboriginal indicators.

Table 2.5 Aboriginal indicators extracted from the principle of ecological sustainability (n=not covered, p=partially covered, y=covered by frameworks).

Criteria	Indicator	Amalgamation of C&I appropriate for the North American test	FSC boreal standard	Waswanipi cree model forest	Tl'azt'en C&I, AFPP	OPMVPN forestry toolbox	Little Red River Cree Nation (LRRCN)	Forest Ecosystem Strategy Plan for forest management district 19 (2003-2023)
Maintenance of species diversity and their associated landscape	Use of traditional or community knowledge of species occurrence, frequency and distribution	N	p	y	n	n	n	y
	Protection of culturally important[1] species	N	n	y	y	y	y	y
	Maintaining species diversity (biodiversity - species interrelationship)	N	n	p	y	p	n	n
	Maximizing species availability	N	n	p	n	y	n	n
Ecosystem function and diversity	Conservation of specific important habitats and cultural sites	N	p	n	y	y	y	y
	Favor the diversity of species composition, and forest habitats	N	n	y	p	y	n	y
Forest management provides ongoing access to resources	Monitor new knowledge and changes in traditional use patterns[2]	N	p	y	y	n	n	y
	Protect hunting and trapping areas	N	n	y	y	y	y	p
	Ensure the quality of resources	N	n	y	n	y	p	p
	Ensure the quality of the traditional resource use activities[3]	N	n	y	p	y	y	n
	Ensure proximity of resources	N	n	y	n	y	y	n
Preserving the aesthetic quality of the area[4]	Diminish the negative visual impacts of forestry operations	N	p	n	n	y	n	y
	Consult with cultural owners to modify operations such that they are acceptable	N	n	n	n	n	n	y

1- some species are viewed as important culturally, regardless of their regional status as either endangered or at risk. 2- this can also be expressed as a means to identify the economic versus cultural potential of the land and balancing the two; 3- this could include the visual experience (expressed with the maintenance of forest cover) and remoteness.4- preserving sites of particular vocation, hunting grounds and landscape for the enjoyability of the area, its visual framework and to diminish the negative visual impacts of forestry operations.

First, Aboriginal frameworks introduce indicators relating to culturally important species, habitats and ecosystems which are found in the criteria for maintenance of species diversity and landscape patterns, and maintenance of ecosystem diversity and function. More specifically, most non-Aboriginal frameworks choose the species, their habitats and ecosystems to be maintained based on their ecological status. In the case of species diversity this could be species at risk, rare species, surrogate species, indicator species or keystone species. Aboriginal frameworks add the importance of certain forest habitats, species and cultural sites. Maintaining their availability and distribution is important to Aboriginal communities regardless of their ecological role in maintaining diversity or ecosystem function. Second, there is an expressed aesthetic concern for forest operations especially if they affect cultural owners. More specifically, there is a marked concern for the enjoyability and maintenance of remoteness of cultural activities such as hunting, trapping or camping. Third, the criterion regarding access to forest resources seems consistently more complex in Aboriginal frameworks. This criterion combines issues of resource sustainability with access sustainability to include indicators of productivity, proximity, integrity and quality for resources used in traditional activities.

2.6 Discussion

2.6.1 The role of Aboriginal forest values in the principle of ecological sustainability

This review has shown that on a superficial level Aboriginal and non-Aboriginal frameworks are equivalent in terms of issues pertaining to forest conditions. However, there is a recurrent cultural nuance found in the different Aboriginal indicators extracted in this study which is largely motivated by traditional activities such as trapping and hunting. This is consistent with other research showing that individual values are expressed through cultural and social meaning (Lawrence et al. 2006).

Predominance of this cultural motivation is evidence that Aboriginal ecological sustainability requires the increased inclusion of forest values. Inclusion of forest values with forest conditions reflects the notion that biological, cultural and historical landscapes are all associated in Aboriginal frameworks. Categorization into ecological, social, and economic principles has resulted in the isolation of each issue, and problems in including issues of interdisciplinary nature. To isolate indicators of ecological sustainability as strict forest conditions within the science of ecology would be inappropriate and overly reductionist for Aboriginal ecological perspectives.

The extracted Aboriginal indicators may be found in other non-Aboriginal principles and criteria and are therefore not unique to Aboriginal frameworks. However, their location within frameworks can lead to differences in strategies used to resolve associated issues. For example, game species are culturally important species. Consequently, their habitats are culturally important and impose resource access issues for Aboriginal peoples. Game species are thus included in three criteria of Aboriginally defined frameworks reviewed in this study: maintenance of species diversity and associated landscape patterns, maintenance of ecosystem diversity and function, and maintenance of access to resources. In non-Aboriginal frameworks, game species may be sufficiently included in the principle of sustainable economic and social benefits with subsequent indicators monitoring laws and economic benefits (CCFM, 1995). The isolation of game species indicators within this principle will not resolve Aboriginal requirements to ensure that forestry decisions do not impede on the sustainability of these species in their environment. More specifically, they do not account for game species distribution within areas of traditional practices, nor ensure habitat quality to maintain their populations, nor guarantee sustained access to areas which traditionally support these species. Contrary to framework requirements of horizontal consistency where elements of sustainable forest management should

neither overlap nor be duplicated in frameworks (Holvoet and Muys 2004) we argue that each principle and criteria reflects a motive and strategy to resolve issues. The repetition of indicators within and across principles is important to ensure a better picture of associated resource issues. Strict isolation of forest values into criteria category in C&I frameworks does not account for their link to forest conditions. It is thus important to include both forest conditions and values within certain criteria to ensure that objectives are achieved. Aboriginal cultural nuances link with forest conditions and thus offer a better picture of local goals and objectives pertaining to Aboriginal expectations when faced with forest practices.

The theory of visible stewardship (Sheppard, 2003) and the aesthetic indicators raised in this review also justify the need to include forest values. Their importance in forest management lies in their cultural-ecological correlation. Hart (2000) identified beauty and life affirming qualities of nature as a good indicator for community sustainability. Aesthetics and ecological sustainability in forested areas generally correspond positively. Sheppard *et al* (2001) mention that people appreciate a healthy sustainable landscape if it matches certain biological or culturally determined preferences. He also argues that the more extensive the departure of forest management interventions from natural processes/conditions, the uglier it is perceived by people. Furthermore, aesthetics have been shown to be a determinant expression of cultural preferences. In effect, culture filters landscape perceptions (Berninger *et al.*, in press). An aesthetic reaction can be seen as: "a set of inclinations, however intuitive or unconscious, which might influence the direction people choose not only in physical environment but also in other domains" (Nassauer, 1995). Therefore culture and aesthetics, as well as ecology and aesthetics, are correlated. Culture and ecology are also correlated. Landscapes are cultural constructions and not simply compositions of biological diversity or physical terrain (Infield, 2001;

Nassauer, 1995). Communities thus have physical expectations regarding outcomes of sustainable management. According to Sheppard (2003) and the theory of visible stewardship, forest management will not be perceived as sustainable forestry unless obvious and sustained commitment to people, their place, and the ecosystem under their control is demonstrated. Aesthetics can thus be seen as the medium by which culture and ecology interact. To communities, aesthetics is the physical manifestation of ecologically sustainable forest management. To ecology, it is the expression of cultural landscape preferences. Such links could resolve the reductionist and biocentric perceptions of C&I frameworks by creating connections between C&I hierarchical levels.

2.6.2 Integrating Aboriginal forest values in the principle of ecological sustainability

During the review, it was believed that a larger proportion of qualitative indicators would be observed due to cultural motivations found in our extracted indicators. However, inclusion of indicators pertaining to forest values does not greatly affect the nature of indicators as shown in table 2.6. On the contrary, the criterion for resource access in non-Aboriginal frameworks focussed on qualitative indicators such as maintaining fair and secure access to resources, respecting clear ownership and use rights and maintaining traditional institutions related to resources. Aboriginal frameworks on the other hand made special attention to the resources they need to access and traditional methods by which they have been used (productivity, proximity, and quality). These different Aboriginal indicators are in fact more quantifiable than non-Aboriginal counterparts. Therefore concerns for the compatibility of indicators based on forest values versus those based on forest conditions maybe unfounded if the issues translate to preferences for quantitative indicators which are more easily measured (CCFM, 1995; Kneeshaw *et al*, 2000). It should also be noted that the extracted Aboriginal indicators which are qualitative

Table 2.6 List of potential verifiers for the unique Aboriginal indicators to determine whether they are quantitative or qualitative in nature.

	Indicator	potential verifiers			
quantitative +qualitative	Use of traditional or community knowledge (TK) of species occurrence, frequency and distribution	degree of use of TK	TK of species occurrence	TK of species frequency	TK of species distribution
quantitative	Protection of culturally important species	population in protected areas	list		
quantitative	Maintaining species diversity (biodiversity - interrelationship)	species richness and diversity	movement and migration		
quantitative	Maximizing species availability	distribution of species	distribution of diversity		
quantitative +qualitative	Conservation of specific important habitats and cultural sites	habitats in conservation areas	list	cultural sites in conservation areas	
quantitative	Favor the diversity of species composition, and forest habitats	habitat diversity on landscape	species diversity on the landscape		
quantitative +qualitative	Monitor new knowledge and changes in traditional use patterns	population habits on land	percent land occupation by activities		
quantitative	Protect hunting and trapping areas	hunting and trapping sites are protected			
qualitative	Ensure the quality of resources	animal and plant health			
quantitative +qualitative	Ensure the quality of the traditional resource use activities	visual	size of land used	remoteness	
quantitative	Ensure proximity of resources	monitor species and habitat condition in traditional use lands	distance to traditional practice sites		
quantitative +qualitative	Diminish the negative visual impacts of forestry operations	buffers along protected areas, buffers along harvested areas	alternative silvicultural techniques	site restoration: greening up ...	
qualitative	Consult with cultural owners to modify operations such that they are acceptable	traditional landuse patterns	participation		

(table 2.6) are motivated by concerns over traditional practices. These are based on a history of tradition which is organized by historical local institutions ensuring fair and

secure access for all community members (Leroux *et al*, 2004). The governing traditional institutions managing the landscape for traditional activities have been organized over generations. The nature of these indicators can thus be considered observable and measurable. Therefore, inclusion of forest values should not be presumed difficult nor less effective for C&I frameworks.

2.6.3 The potential implications of integrating Aboriginal forest values into forest management strategies

The extracted Aboriginal indicators could influence the definition of conservation, maintenance and protection in forest management strategies. In some cases, although conservation of land is deemed a necessary step for maintenance of Aboriginal culture, subsistence and traditional lifestyles (Papatie, 2004), strict protection of important forest conditions may not account for other culturally motivated indicators. For example, monitoring and ensuring species diversity and ecosystem sustainability issues in protected areas alone does not accurately account for Aboriginal needs such as hunting and trapping. Trap-lines are geographically organized according to traditional systems, and will only be as good as the species and habitat diversity they hold. It is impractical to attempt to conserve all trap-lines under protected areas as their areas may be too extensive and inhibit resource development over the whole territory. Furthermore, conservation may not be compatible with traditional activities which involve the extraction of resources such as trapping and hunting. If only partly conserved, development of protected areas may require the formation of new local institutions to organize community landuse patterns, if permitted within the protected areas. Also, conservation strategies devised to maintain and protect species and ecosystem diversity may need to be revised to ensure sustainability (quantity, quality and distribution as seen in table 2.5- the criteria for resource access) of culturally important species, habitats and ecosystems used in Aboriginal traditional activities.

Perhaps these issues may be best addressed by the use of appropriate silvicultural systems and forest management units compatible with traditional activities thus ensuring a proper forest habitat for the viability of important species and activities.

The inclusion of indicators pertaining to traditional activities will affect how forest managers use indicators. More specifically, indicators of forest values cannot be viewed as variables whose trends will only be observed after management decisions have been made. Because forest values set a context and picture of community goals and objectives, they need to be accounted for throughout management processes from inventory to monitoring phases. More specifically, these indicators exhibit temporal and spatial dynamics which may not respond at the same scale as the impacts of many forest management strategies. For example, in the criterion for resource access, Aboriginal issues are dominated by the expected effects of forestry operations on species relocation. Although some resource species may benefit from forestry operations, species distribution patterns will change according to forestry operations and may not be advantageous to traditional activities. For example, Aboriginal people are concerned with moose population distribution following forestry operations (Jacqmain, 2005). To some degree, moose populations can profit from forestry operations such as clear cutting because the shrub layer diversity of recent cutovers provides a good source of food. Although a typical moose range will vary in habitat type, moose range will occupy 20-25% recent cutovers (Potvin *et al*, 1999). However, moose spatial distribution patterns may change such that family hunting grounds become less productive depending on the location of recent cutovers. It is therefore important to Aboriginal communities that traditional activities persist under changing spatial parameters such as the population distribution patterns of important species. More species, more habitats and more ecosystems need to be considered when prescribing forest harvest plans. Extracted Aboriginal

indicators therefore offer new tools to managers to organise forest practices in accordance with traditional practices.

Also, rather than focusing on each forest value as conservation issues, multiple-use forestry strategies seeking to understand and maintain the role of traditional activities under a changing landscape could be used. Conservation of Aboriginal patterns of activities may ensure the continuity of traditional activities. It may thus be worth including community landuse patterns and traditional activities in inventories to ensure that they are accurately monitored. Although historically and traditionally relevant, they are not static. The practice of traditional activities will vary amongst generations (Natcher *et al*, 2005; Nassauer, 1995). Understanding these landuse patterns over time will help determine priority areas for community needs. Therefore, forestry operations will also be affected with increased parameters to inventory in order to identify available land for harvesting such that management is more holistic.

Traditional activities are not limited by the description of their component parts and distribution across a community's territory. The sustainability of the "experience" of traditional activities also needs to be considered and maintained such as conservation of remoteness and enjoyability (as noted by the aesthetic indicators extracted in table 2.5). In this review, the criteria for preserving an area's aesthetic quality was expressed by the need for buffers, corridors, alternative silvicultural techniques, harvested site restoration and maximizing continuous forest cover in areas which are used or in close contact to communities. Some changes may be imposed on silvicultural techniques and planning of harvest sites to minimize aesthetic impacts near cultural owners and ensure that community "experience" of traditional activities is minimally affected.

2.7 Conclusion

In this review, analysis of non-Aboriginal C&I frameworks is in agreement with the general conclusions of Parrotta and Agnoletti (2007) in that they fail to address particular values and needs of Aboriginal cultures. More specifically, Aboriginal ecological indicators extracted in the Aboriginal frameworks of this study demonstrate an expressed need to incorporate Aboriginal forest values which stem from a different worldview than that which traditionally governs forestry. Aboriginal community relationship to land is closely tied to their culture, tradition and subsistence methods (Davidson-Hunt and Berkes, 2003; Karjala *et al,* 2004; Lévesque and Montpetit, 1997).

C&I frameworks prove to be a valuable medium within which social values merge with scientific knowledge of environmental conditions to monitor and influence trends in forest practices. As shown in this review, the impact these Aboriginal indicators may have on forestry strategies offers an avenue for changes in forest practices which better consider Aboriginal environmental perspectives. In the principle of ecological sustainability both forest values and conditions should be included but be explicit in their goals. The inclusion of forest values offers a holistic approach whereby conditions and values are included in C&I frameworks to resolve sustainability issues. This agrees with Yamasaki et al (2001) who argue that forest values should be included in order to create a better picture of local environmental contexts.

The inclusion of forest values with forest conditions in C&I frameworks may resolve associated criticisms of reductionism by preventing the isolation of principles into strict ecological, social and economic issues of sustainability. Comparison between Aboriginal and non-Aboriginal ecological indicators serves as a justification

for potential development and integration between ecology and culture, as well as ecology and community. The explicit inclusion of forest values with forest conditions may serve to connect what otherwise has been criticised as a long list of unconnected indicators (Kneeshaw *et al*, 1999). For example, the extracted indicators agreed with the theory of visible stewardship (Sheppard, 2003) thus showing a need to physically express sustainable forest management according to community expectations. Aboriginal forest values were also shown to be quantifiable and thus their inclusion in C&I frameworks seems justifiable from a strategic perspective.

In conclusion, C&I frameworks offer a valid platform to include Aboriginal values and needs. What remains to be answered is how these values will be translated into effective management strategies which respect and integrate Aboriginal issues.

CHAPITRE III

EXPERT OPINION ON THE CRITERIA AND INDICATOR PROCESS AND ABORIGINAL COMMUNITIES: ARE OBJECTIVES BEING MET?

OPINION D'EXPERT AU SUJET DE L'UTILISATION DES CRITÈRES ET DES INDICATEURS DANS LES COMMUNAUTÉS AUTOCHTONES: EST-CE QUE LES OBJECTIFS SONT ATTEINTS?

ADAM, M.C. AND D. KNEESHAW. 2011. 87(3) FORESTRY CHRONICLE.

3.1 Abstract

Developed in the 1990's, the process of criteria and indicators (C&I) has been used to conceptualize, evaluate and implement sustainable forest management (SFM). However, to assess their effectiveness we explore whether their use in management leads to changes especially at the local level in Aboriginal communities. More specifically, can C&I justify Aboriginal use of C&I? Since local level C&I are a recent initiative, the effectiveness of the C&I process in assessing progress towards SFM was assessed via interviews with experts associated with the development of local level Aboriginal C&I frameworks in Canada on: use, integration and needs of Aboriginal communities for C&I. Our results suggest that C&I in Aboriginal communities are considered to be "just another reference point" because: 1) Aboriginal objectives are maintained at arm's length from the forest management process; 2) the use of C&I as a negotiating tool has not been sufficient to culturally adapt forest management for Aboriginal values and objectives and 3) Aboriginal values have been restricted to the elaboration of C&I and the Aboriginal definition of SFM, but they are not part of the evaluation nor the implementation of SFM. In contrast to the forest industry, Aboriginal communities identified the following objectives as motivation for using C&I: Aboriginal representation, Aboriginal engagement, capacity building and empowerment. Without explicitly acknowledging these Aboriginal community objectives, C&I becomes a tool restricted primarily to forest managers and thus sustainable forest management becomes unattainable. In effect the underlying issue is not C&I in themselves but the limited role Aboriginal communities have been allowed to have in the SFM process.

Keywords: Aboriginal forestry, criteria and indicator, sustainable forest management, engagement, empowerment, capacity building, representation, participation, integration, values and objectives.

3.2 Résumé

Élaboré au cours des années 1990, le processus des critères et des indicateurs (C&I) a été utilisé pour conceptualiser, évaluer et implanter l'aménagement forestier durable (AFD). Cependant, afin d'évaluer son efficacité, nous avons cherché à savoir si son utilisation en aménagement apporte des changements, notamment au niveau local des communautés autochtones. De façon plus spécifique, est-ce que les C&I justifient une utilisation autochtone des C&I? Compte tenu que les C&I de niveau local constituent une initiative récente, l'efficacité du processus C&I pour l'évaluation des progrès vers l'AFD a été évalué au moyen d'entrevues, en collaboration avec des experts associés au développement de cadre de travail de C&I

autochtones de niveau local au Canada, sur l'utilisation, l'intégration et les besoins des communautés autochtones en matière de C&I. Nos résultats indiquent que les C&I dans les communautés autochtones sont considérés être « seulement un autre point de référence » parce que 1) les objectifs autochtones sont maintenus à distance lors des processus d'aménagement forestier; 2) l'utilisation des C&I en tant qu'outil de négociation n'a pas été assez fréquente pour pouvoir adapter d'un point de vue culturel l'aménagement forestier aux valeurs et aux objectifs autochtones et 3) les valeurs autochtones ont été restreintes à l'élaboration des C&I et à la définition de l'AFD, mais elles ne font pas partie de l'évaluation ni de l'implantation de l'AFD. Contrairement à l'industrie forestière, les communautés autochtones ont identifié les objectifs ci-après comme étant la raison de l'utilisation des C&I : représentation autochtone, engagement autochtone, capacité de développement et responsabilisation. Sans la reconnaissance explicite de ces objectifs des communautés autochtones, les C&I deviennent un outil principalement restreint aux gestionnaires et en conséquence l'aménagement forestier durable devient inaccessible. En effet, l'enjeu sous-jacent ne porte pas sur les C&I en eux-mêmes mais au rôle limité des communautés autochtones accordé au cours du processus des C&I.

Mots clefs : foresterie autochtone, critères et indicateurs, aménagement durable de la forêt, engagement, autonomisation, développement des capacités, représentation, participation, intégration, valeurs et objectif.

3.3 Introduction

Sustainable forest management (SFM) is the continual process of improvement of forest management which takes into consideration social, economic, environmental, cultural and spiritual needs of the full range of stakeholders and is ensured by planning and monitoring (Kneeshaw et al, 2000; Smith, 2004). Criteria and indicators (C&I) have been devised as a tool to conceptualize, evaluate and implement SFM (Woodley et al. 1999). C&I were initiated through the Statement of Forest Principles signed at the 1992 UN Conference on the Environment and Development. Various countries followed by developing their own C&I at the national level. Today, more than 150 countries have developed their own set (Castañeda 2000; Holvoet and Muys 2004). C&I frameworks were initially developed at national and regional scales based on local level data. As such standardised approaches and generic indicators were chosen that are often inadequate at a local scale. For example, Woodley et al. (1999) tested CCFM and CIFOR national level C&I frameworks at the forest management unit scale in North America. They found that the tested indicators did not translate well from one scale to the next and thus rejected 65 out of 207 C&I. They suggested that should the selection of C&I have started from scratch, results would have been different. Also, according to Karjala et al. (2003) and Natcher and Hickey (2002), generic sets of C&I are often inappropriate for engaging Aboriginal involvement and result in the removal of indigenous peoples from decision and policy making processes. Recently, local level initiatives are occurring to increase the relevance of C&I as well as to empower local communities (Fraser et al., 2006; Pokharel and Larsen, 2007).

The inclusion of Aboriginal interests in C&I is an important step in the Aboriginal struggle for: 1) recognition and rights in forest management, and 2) increased consideration for their cultural and spiritual needs in SFM (Smith, 2004;

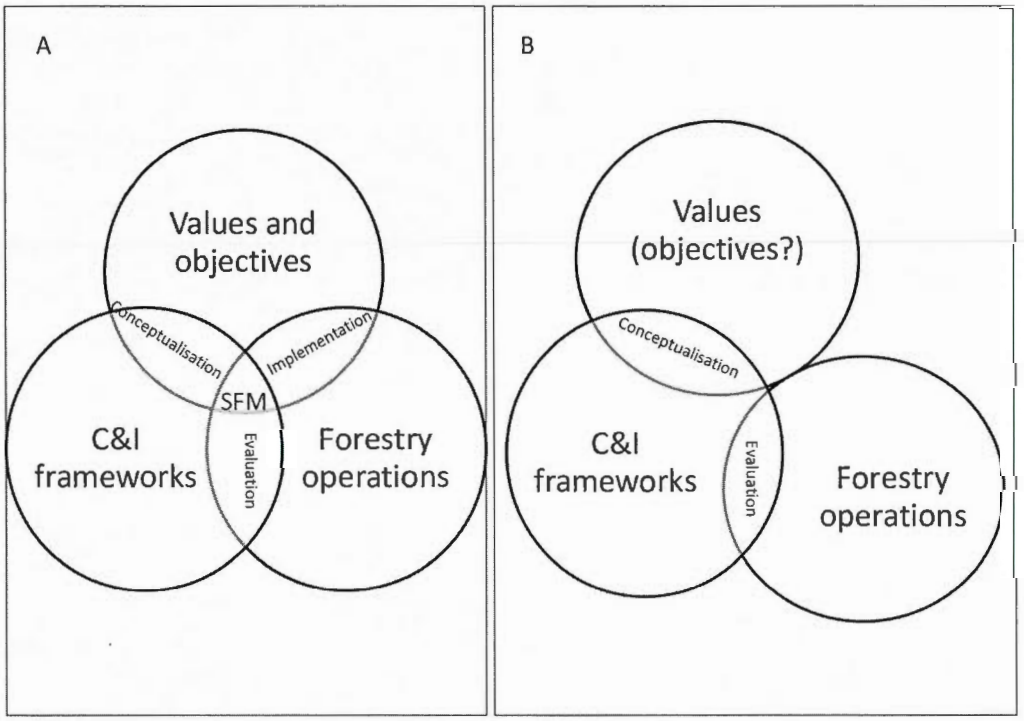
Natcher and Hickey, 2002; National forest strategy coalition, 2003). NAFA's (National Aboriginal Forest Association) position paper in 1995 highlighted the importance of respecting and providing for Aboriginal and treaty rights to ensure sustainability. Smith (2000) added that in order for SFM C&I measurement processes to be fair, effective and efficient the inclusion of Aboriginal people in the process was necessary. Smith (2000) mentions that the unique context of Aboriginal peoples to obtain recognition for their resource related rights, knowledge and values needs to be addressed.

The elaboration of local level C&I by and for Aboriginal communities recently began and is rife with expectations from both managers and Aboriginal communities. More specifically, local level C&I initiatives are viewed as an interesting platform for collaboration between Aboriginal communities and forest managers. The primary objectives of C&I in forest management are to (FAO 2005):

- assess progress towards SFM;
- promote improved forest management practices over time and;
- further the development of a healthier and more productive forest estate.

From an Aboriginal perspective, completing these objectives in Aboriginal communities should theoretically lead to improved forest management practices adapted to Aboriginal values. Through the use of C&I which theoretically translate values and objectives to C&I, SFM should be evaluated, conceptualized and implemented with Aboriginal values in order to attain a healthy and productive forest as defined by Aboriginal communities (figure 3.1A).

Figure 3.1.Theoretical (A) framework depicting the role of Aboriginal values and objectives in criteria and indicators (C&I) for sustainable forest management (SFM). Based on expert discussion of Aboriginal objectives and use of C&I (B) represents the present role of values and minimal consideration for Aboriginal objectives in the conceptualization, implementation and evaluation of SFM.



To date, C&I are considered in general well developed and a good tool for guiding forestry efforts towards SFM (Innes et al. 2004; Holvoet and Muys 2004; McDonald and Lane 2004). They are also a useful tool to include Aboriginal values with scientific knowledge of environmental conditions (Adam and Kneeshaw 2008; Fraser et al. 2006). The development of Aboriginal C&I frameworks has shown some success in influencing the conceptualisation of SFM by including Aboriginal values. Local level Aboriginal frameworks have allowed increased incorporation of

Aboriginal values as well as an expression of Aboriginal worldviews in terms which can be used by science and managers (Adam and Kneeshaw, 2009).

However, although the elaboration of local level C&I has resulted in compilations of First Nation values on forest lands, have they been used to change management? Some argue that Aboriginal interests are still viewed by forest managers as those from yet another stakeholder (Stevenson and Webb, 2003). In a recent publication by Wyatt (2008) there is still question as to how Aboriginal values will be used in management: "Will Aboriginal forestry lead to a new form of forestry that improves sustainable forest management with the incorporation of Aboriginal values and knowledge or will First Nations be obliged to trade their values and knowledge for access to the forest resource and a share in economic benefits?"

Furthermore, consolidating Aboriginal values with Aboriginal forest management objectives has been problematic. A review of local level Aboriginal C&I frameworks suggests that translation of Aboriginal values into management requires the elaboration of community feedback mechanisms (Adam and Kneeshaw, 2009) and thus a link to community reality, context and objectives. According to Shields and Mitchell's (1997) hierarchical systems model, "people's objectives are a reflection of a contextual application of their held value sets and management goals make sense only within the context of the human social system." While Aboriginal values represent a form of local ecological knowledge, their effect has been variously described by authors as a complement, supplement, enhancement or expansion of conventional science (Berkes, 1999; Colding and Folke, 2001; Gadgil et al., 1993). Based on Ostrom's (1990) description of institutions for the governance of resources, in order to properly utilize these values and objectives to support decision making, SFM must be appropriately "embedded" in the social and cultural milieu of Aboriginal communities. Indeed objectives which will be referred to in this paper as

Aboriginal community objectives have been identified to allow a link between Aboriginal social and cultural milieus and SFM. These include: representation of Aboriginal interests; ongoing Aboriginal engagement in decision making processes, Aboriginal decisional empowerment and capacity building from both managers and Aboriginal sides to ensure effective dialogue and collaboration (Hernes and Sanderson 1998; NRCAN, 2002; Natcher and Hickey, 2002; Karjala and Dewhurst, 2003; Stevenson and Webb, 2003; Stevenson and Perreault, 2008; Wyatt, 2008; Adam and Kneeshaw, 2009). When Wyatt (2008) assessed the Aboriginal role in Canadian forestry from exclusion to co-management and beyond, these were in effect identified as the ongoing Aboriginal objectives to attain in decision making processes where Aboriginal interest are dominant. However, although many authors have identified their importance, the role of Aboriginal community objectives in C&I frameworks has never been investigated although it is widely accepted that Aboriginal community objectives are an integral part of SFM and need to be accounted for to ensure that social sustainability issues are represented. Are these objectives accounted for when C&I are used for SFM? Are Aboriginal community objectives and forest management objectives finding common grounds to attain SFM objectives with C&I?

Fraser et al. (2006) highlighted a gap between those involved in indicator selection and those involved in decision-making. Indeed the role of C&I in SFM (figure 3.1A) should theoretically show a connection not only between C&I frameworks and forestry operations but also between community values and forestry operations. According to Fraser et al. (2006), this gap has led to the dominance of top-down processes in policy development thus undermining the influence of locally defined values. Shields et al. (2002) also highlight inadequate communication: "we are developing indicators that are meaningful to scientists but not necessarily to policy makers and the general public." So are Aboriginal community objectives

(representation, engagement, capacity building and empowerment) able to influence decision making processes in forestry?

More research is therefore required to determine the efficiency of translating Aboriginal values into management strategies through C&I. This article acts as an exploratory study on the use of local Aboriginal C&I by: 1) exploring the incorporation of Aboriginal objectives in SFM and 2) the intended use of local level C&I for Aboriginal communities. More specifically, we ask what are the Aboriginal objectives justifying Aboriginal collaboration in C&I? How do they compare with the Aboriginal community objectives identified in the literature? And are they consistent with SFM? It is our goal that the ideas emerging from this study will facilitate and identify research needs to fill the gaps identified between the selection of C&I and their use in decisions made for forest management.

3.4 Methods

Although C&I have been a popular tool used to assess SFM, it is important to note that they have only evolved since the 1990s. Local level C&I are a much more recent initiative and few have been developed and put in use, especially where Aboriginal peoples are the local communities. Due to their recent development and application, the actual changes local level Aboriginal C&I have caused in forest management and how they are applied cannot yet be effectively measured in the field. Instead, we sought the opinion and perception of experts to clarify how these C&I are presently used in Aboriginal communities.

For this study the experts interviewed were selected: from Canadian research teams involved with the elaboration of Aboriginal local level C&I; and with the advice of organisations such as NAFA and the SFMN (Sustainable Forest Management Network). Six Canadian experts from across the country were

interviewed in the summer of 2008 representing expertise in New Brunswick, Ontario, Québec, Labrador, Northwest Territories, Saskatchewan and Alberta. All experts have considerable experience in developing local level C&I for First Nations communities and in working on Aboriginal forestry issues. Although the sample size is small, the experts chosen for this study provide a diversity of Aboriginal experience with C&I frameworks in Canada through: field experience and publications. The experts also have direct involvement in the development of local level C&I in Aboriginal communities (including among others: Little Moose Cree, Little Red River Cree, Kitcisakik, Pikangikum, White feather forest initiative, Waswanipi cree, Plan for Innu Labrador District 19, Heart Lake First Nations, and Treaty 8 First Nations Alberta). Our sample included experts who'd worked with National level C&I, published on forestry and First Nations communities and/or were part of First Nations communities. By combining their expertise and opinion, we believe that a cross-section of the diversity of Canadian Aboriginal experience in the elaboration and evaluation of local level C&I frameworks is attained and that the results from their interviews will provide a portrait of important issues and concerns.

The interviews took on average 40 minutes to complete. The interview was constructed such that by discussing the present Aboriginal use of-, needs with-, and gaps in C&I we could extract Aboriginal expectations for C&I and as such their underlying objective for collaborating in C&I The interviews therefore included the following 4 groups of open ended questions to seek Aboriginal objectives through:

1. Aboriginal use and ownership of C&I: Considering the C&I efforts for and by First Nations: how are these frameworks being used today and have these communities developed a sense of ownership towards these frameworks?

2. Integration of Aboriginal values in C&I: Do you see the development of C&I as a means of Aboriginal integration in management and development?
3. Isolation of Aboriginal values in C&I: Current approaches have isolated Aboriginal goals and issues in C&I, do you see a possibility of having C&I frameworks without this isolation?
4. Future needs of C&I: Where are C&I frameworks going, what are their future as a tool and how will they be used from now on?

These questions sought to explore issues in: the present use of local level C&I by Aboriginal communities; their use in the context of integration needs and existing efforts for better integration of their values in management; and future needs and improvements to C&I respectively. The constructivist version of Glaser and Strauss's (1967) grounded theory method was used (Charmaz, 2000). To explore the results, response to each of the series of questions were coded so that Aboriginal objectives could be understood as a function of the present use (question 1), needs and identified solutions to improve integration of Aboriginal interests (question 2 and 3) and future expectations (question 4) of C&I. They were subsequently developed into concepts of higher order categories which represent Aboriginal objectives as determined by the experts. The Aboriginal objectives identified in the interviews were then compared with the Aboriginal community objectives found in the literature: representation, engagement, empowerment and capacity building. Extracts from the interviews are referred to in this article as expert opinion.

3.5 Results

In determining the use of C&I, all experts interviewed agreed that depending on the community context, C&I have become a useful tool: to protect Aboriginal values,

as leverage, for empowerment and as a support tool. Indeed the objectives highlighted by the experts compare well with the Aboriginal community objectives we find in the literature. Power (as a means) and control (as the end result) refer to the Aboriginal community objective of empowerment. Representation and protection of values compare to the Aboriginal community objective for representation. Engagement and capacity building were both objectives which were also raised in the interviews. In general, experts seem to agree that in theory the tool is a useful one. However the following paragraphs provide further detail on these objectives, how they were raised in the interviews and whether C&I have been effective in addressing them.

3.5.1 Aboriginal empowerment

Empowerment designating an enabling power or 'the power to': a state of personal development and increased critical awareness (increase their self esteem and confidence and are better able to use their own resources), as well as a state of the mind through which people engage in a learning process (Chambers, 1997).

According to the informants, empowerment has emerged as an Aboriginal objective for using C&I. The emergence of concepts such as representation, engagement, power and control from the interviews also support this idea. To attain empowerment you need power which relates to the means. Control is the end result of having more power such as the ultimate decisional right. It should be noted that regardless of the level of empowerment attained, the means to achieve that level needs to be maintained. The following sections will discuss the importance of empowerment for Aboriginal community involvement in C&I.

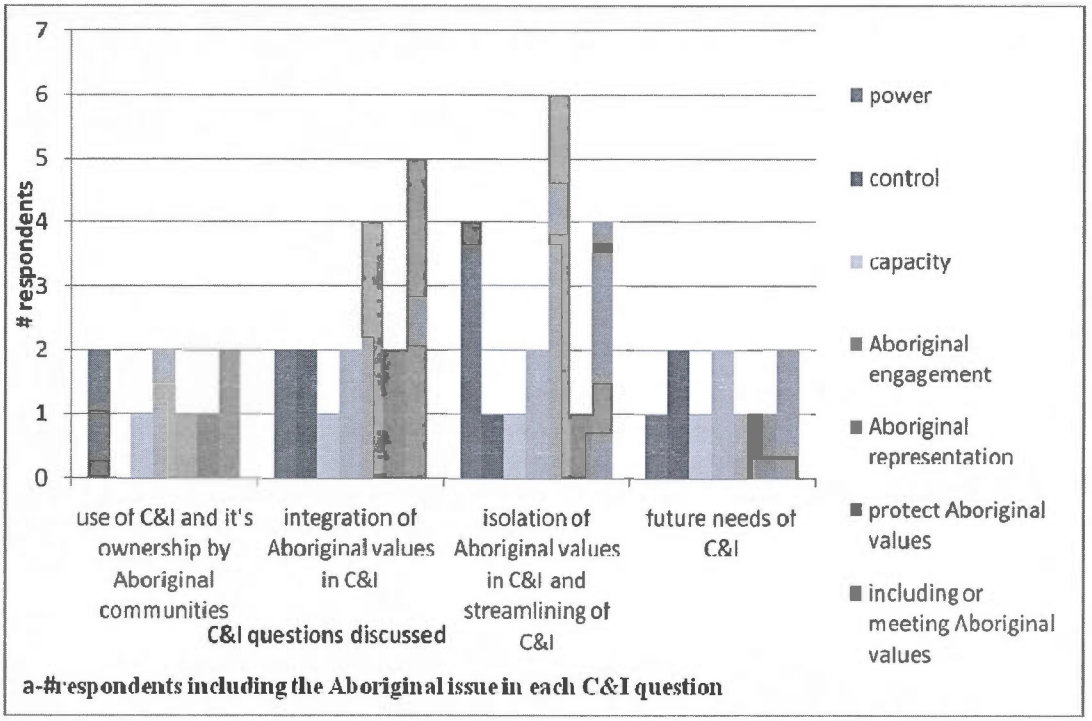
3.5.1.1 Aboriginal power

Power as the currency in decision making processes -"the nature and the levels of participation in a policy or a development process are often measured in terms of

power and roles that the different stakeholders have in the decision-making process." (Buchy and Hoverman 2000: pg 16)

In the interviews some of the means to attain power such as representation and engagement were specifically mentioned. Others were not and were simply referred to as a request for power. Power was one of the most important concepts raised especially when the integration of Aboriginal values in C&I was discussed (figure 3.2). According to respondents, C&I can provide an increase in power for Aboriginal

Figure 3.2. Relative importance of Aboriginal objectives: power, control, capacity building, representation, engagement and values raised by respondents when discussing Criteria and Indicator (C&I) by interview questions.



communities because the integration of Aboriginal values in C&I raises the importance of their needs, consolidates their needs, and increases attention towards their issues. A respondent specifically mentioned that C&I provide the means by

which Aboriginals can bring their issues to the table and thus gives them the power to discuss with managers. Therefore respondents believe having their own Aboriginal C&I will award them the necessary space in the process to influence management and thus increase their influential power in management.

The concept of power also emerged when rights issues were discussed. More specifically increased power dominated as a key solution to Aboriginal rights for territorial occupation, economic opportunity and the maintenance of a sense of place. "C&I are political and strategic..." C&I have been used by "political leadership to say to industry that they (Aboriginal communities) are doing something different and need to work with them". Power also emerged when discussing the Aboriginal need to isolate their issues into their own C&I. "They wanted isolation because rights are different and they do not want to be reduced to another stakeholder".

3.5.1.2 Aboriginal control

Control- designating empowerment as 'power over' (Buchy and Hoverman, 2000).

The difference between Aboriginal request for increased power (the means) versus control (an end) was evident throughout the interviews. Respondents highlight that although C&I provide good information and a good leverage, "in effect (they are) just another reference point". Although increased power was requested as a key solution to Aboriginal rights, territorial occupation, economic opportunity and the maintenance of a sense of place; control emerged as the objective in these categories. This was especially evident when discussing future needs for C&I where control emerged as the most important issue (fig 3.2). Here, the issue of Aboriginal governance was discussed and the need for control, negotiation power, articulating trade-offs, and informed decision making was raised. It is clear from the interviews

that Aboriginal objectives for empowerment fall beyond increased negotiation and collaboration. C&I only get them "closer to the driver's seat".

3.5.2 Aboriginal representation

Representation as the devolution of powers to the local level- Ackowledging Aboriginal interests and values to allow these communities to make decisions about affairs of consequence to them such that they have the opportunity to exercise their inherent right and obligations to protect their interests and values (Buchy and Hoverman 2000).

Respondents highlighted that the development of Aboriginal C&I frameworks has provided a vehicle to articulate and translate Aboriginal concepts and ideas thus bridging understanding between Aboriginal peoples and managers. According to experts C&I have "articulated a diversity of interests at the local level" and C&I "is a required exercise to translate Aboriginal values to the other side". The representation of Aboriginal values has thus become one of the objectives for using C&I. It was a key issue discussed in the questions regarding the integration and isolation of Aboriginal values as well as in streamlining C&I (figure 3.2).

Experts believed that Aboriginal representation would be at risk through streamlining efforts. Streamlining seeks to improve the efficiency and effectiveness of collecting and managing C&I information towards convergence and avoiding duplication, and sharing responsibilities in an effective and equitable manner (Niemann and Innes, 2004). Although all experts agree that there are positive reasons for streamlining C&I especially for methodological, budgetary and decision making reasons they generally disagree with this move. They mention that streamlining C&I inevitably results in "tossing out the more difficult C&I" as well as watering down and reducing the diversity of issues present in the frameworks. An expert suggested that a template could be developed by Aboriginals to serve as a common starting

point for all Aboriginal communities and as a defence against outside attempts towards streamlining.

3.5.3 Aboriginal engagement

Engagement- ensuring the continual access and participation of Aboriginal peoples in intended collaborative initiatives.

Aboriginal engagement was especially important in the interviews when discussing the future needs for C&I (Fig 3.2). In terms of the present use of C&I in Aboriginal communities, all experts agreed that C&I are a tool used for and by sources other than the community itself: "(C&I are) not coming out from Aboriginal groups themselves", "we (non-Aboriginals) develop things we think they (Aboriginals) should think are important... it (C&I as an Aboriginally initiated tool) isn't really happening, it is a luxury issue ". All experts also agreed that there really isn't much of a sense of Aboriginal ownership for the C&I frameworks developed in their community. As mentioned by an expert for example: "(C&I frameworks are of) value to those who are asked to manage".

Aboriginal engagement in management processes was raised as an ongoing objective. It is ongoing because of the potentially static nature of C&I. This issue was raised as a problem when integration as a means of protecting Aboriginal values was discussed in the interviews. Although experts agree that "The goal (of C&I) is more to protect Aboriginal values in the face of development ... more so than SFM", C&I "(do) not consider tradeoffs, direction nor interconnectedness", and "they can thus become static and need to be revisited ... this is the biggest limitation because people have to be revisited not just the matrix (or the series of criteria and indicators)". C&I need to evolve WITH First Nations and their engagement in C&I should be

maintained to provide continuous improvement of management objectives. Experts mentioned the need to continually meet Aboriginal values by:

- creating new potential for selecting and incorporating new C&I,
- ensuring that C&I evolve with Aboriginal peoples,
- investing more community time on visioning and consensus building, and
- acknowledging the community context (social, economic and environmental) within which local level C&I are to be developed and implemented: "need to take a step back and understand community needs and effects of timing".

3.5.4 Capacity building

Capacity building- developing sustainable economic and ecological relationships with forested lands and resources by designing and implementing institutions that recognize and accommodate the needs, rights and interests, and create space for knowledge, value and management systems of Aboriginal peoples, non-Aboriginal governments and industries (Stevenson and Perrault 2008).

According to the interviews, incorporating capacity building as an objective in C&I has become important in Aboriginal communities. A strong foundation and investment at the community level is required to ensure that a community can support C&I when timing, development needs, and ability have been considered. Indeed, C&I have been made for industries and not for, nor by Aboriginal communities. As expressed by an expert, capacity building is needed because C&I "should benefit them (Aboriginals) and be applied but this takes a lot of preparation and many C&I have not been developed with that sense". The industry and managers also need to be aware of the community context and reference points with which a dialogue can be established. Therefore capacity building needs to be incorporated in the process to

promote participation and understanding of SFM for *both* the community and the industry.

3.6 Discussion

3.6.1 The other C&I objectives: Aboriginal community objectives

A review of the methods used to access Aboriginal values by Adam and Kneeshaw (2009) showed that the effects of elaborating C&I in Aboriginal communities extend beyond the evaluation and monitoring of forests for SFM. C&I have become a learning vehicle which can stimulate the capacities of First Nation peoples and forest managers. Stakeholder processes have many and varied purposes beyond making decisions: capacity building, social learning, conflict resolution, and networking are among them (Beierle, 2002). Expectations in the outcome and uses of C&I should therefore account for the community context within which it is to be applied. Indeed discussions about the present use of C&I for Aboriginal communities indicate that there is Aboriginal motivation to use C&I as a tool to translate and thus represent Aboriginal interests. The present use of C&I is also motivated by the beneficial effects of engagement in the elaboration of C&I. Motivation to use C&I as an integration mechanism for Aboriginal values in management was highlighted by experts in that C&I had secondary effects such as capacity building which could serve to develop the community as well as benefit a dialogue with managers. Discussions of the future needs in C&I highlight the importance of accessing greater control over decisions on their territory. Discussion of the existing efforts to better include Aboriginal values in C&I demonstrated that the continued efforts for Aboriginal engagement in all aspects of SFM were expected. There was also as a fear of simplifying and diminishing Aboriginal values with other stakeholder interests as well as through the use of methods which seek to simplify the C&I process. In this

study, the Aboriginal objectives mentioned by experts when local Aboriginal C&I are discussed concord with the Aboriginal community objectives for SFM raised in the literature: Aboriginal representation, Aboriginal engagement, capacity building and empowerment. These have therefore emerged as objectives for the use of C&I by Aboriginal communities that are beyond those of forest managers objectives for simply evaluating the process.

If the social, economic and environmental requirements for sustainability are to be considered, then the emergence of Aboriginal community objectives should be encouraged. More specifically, it is widely understood that the challenge of sustainable development is the reconciliation of society's development goals with the planet's environmental limits over the long term. This can only be met by focussing on the dynamic interactions between nature and society, with equal attention to how social change shapes the environment and how environmental change shapes society (Clark and Dickson 2003). Unless Aboriginal community objectives are explicitly recognised and understood, the effective application and use of C&I towards SFM will be delayed. However, as mentioned in the interviews: "It (C&I) may not be working fully but it is a good tool and a good idea for development ... it is worthwhile".

3.6.2 C&I frameworks: just another reference point?

In theory and from a manager's perspective, Aboriginal C&I are a reference for Aboriginal values. But to what extent are they included with C&I for the evaluation, implementation and conceptualization of SFM? By exploring the use of Aboriginal local level C&I, this study highlights that although Aboriginal values may be translated to C&I they may not fully represent Aboriginal objectives for using C&I because these objectives are in effect maintained at arm's length from forest management. Experts agree that C&I is successful in translating Aboriginal values to

be used by managers, however doubts arise when discussing the use of C&I as a tool for leverage and providing the necessary means for Aboriginal influence in management decisions. Translating Aboriginal values is a necessary step in the elaboration of SFM with C&I through Aboriginal values. However, leverage and influence relate to the use of C&I for the conceptualization and implementation of SFM. Aboriginal goals for empowerment, engagement, capacity, and representation allude to needs for increased Aboriginal roles in negotiation and decision making in management. Experts allude to these goals and agree that C&I could help Aboriginal communities attain these goals. However, experts refer to the static nature of the tool, lack of feedback mechanisms between communities and managers. The importance of citizen influence was also highlighted by Rollins et al. (2001). According to these authors, forest management conflicts require more than a scientific solution but one which addresses fundamental questions about the values that societies seek to satisfy and thus their social values. Figure 1B illustrates where the use of Aboriginal community values lies with C&I for the evaluation, implementation and conceptualization of SFM. In effect the role of values has been limited to the conceptualisation of SFM via the elaboration of C&I (fig 3.1B). Although C&I have been used by the industry to consult with Aboriginal communities, to date the interviews show that unless their objectives are also incorporated and Aboriginal communities are allowed more power, decisions remain out of their hands and the process becomes static and superficial. Although, Aboriginal values for the right to use and occupy their territory are expressed in C&I, to date their use in negotiating with industry and government has not been sufficient to culturally adapt forest management for Aboriginal objectives.

In effect the use of C&I in SFM does not fully incorporate Aboriginal community objectives and as such it seems that forestry management objectives dominate and drive SFM efforts. It should thus be reiterated that SFM should also incorporate the

social, economic, environmental, cultural and spiritual needs of the full range of stakeholders and their respective objectives. SFM can not be achieved if Aboriginal community needs are excluded.

More specifically, in the use of C&I for the evaluation of SFM (fig 3.1A), it was suggested in the interviews that reference should be made to the community (thus values and objectives) as well as C&I when evaluating SFM. Mechanisms need to be put in place to ensure feedback between the actors and their role in SFM (fig 3.1A). This supports Berkes and Turner (2006) who mention that institutional arrangements and ecological knowledge need to be tested and revised in an ongoing process of trial and error. It is also consistent with the findings of Beckley et al. (2002) and Sherry et al. (2005) who looked at indicators of community well being to find that there should be increased focus on the community dimension as a whole rather than isolating a series of Aboriginal issues. As mentioned by Hickey (2008) the meaning of SFM will vary depending on people, scale of management and time period. There needs to be a mechanism in place to identify and enable changes to be made or as was mentioned in this study, "create new potential". Such a connection would validate the use of C&I in making decisions which are adapted to Aboriginal values and objectives, as well as providing the means to account for the dynamic nature of values and how they form objectives.

According to our results, there are Aboriginal expectations for more power in the decision making process even to the extent of control. Power differentials have also been raised in many and various contexts. For example, Agrawal (1995) noted that:

"preserving the diversity of different knowledge systems might then lie in attempting to reorient and reverse state policies and market forces to permit members of threatened populations to determine their own future, and attempt, thus, to facilitate in situ preservation of indigenous knowledge. In situ preservation cannot succeed without indigenous populations gaining control over the use of lands in which they dwell and the resources on which they rely."

Ballard et al. (2008) also noted that the informal ways of gathering data and the differences in decision making made Aboriginal involvement and incorporation of their knowledge difficult. However, they highlight "the fact that collaboration cannot and should not replace government to government consultation with tribes." Studies promoting social learning and collaborative learning have also emphasized the effects that various levels of power sharing can have on resolving issues. Armitage et al. (2008) identified power differentials as a central concern in many rural, resource-dependent regions. These authors are careful to differentiate between collaboration and consensus building or consultation and mention that unless power differentials are addressed collaborative learning cannot occur. Lane (2006) also refers to the importance of empowerment as a common theme in the literature when discussing the role of planning and capacity development in Aboriginal communities. Although C&I can help in recognising the rights and different values of Aboriginals, recognition is not sufficient. Aboriginal people are trying to find the ways to have their role valued in forest management and thus to balance existing power differences between managers and the community.

3.7 Conclusion

The use of C&I for SFM to date has not fully incorporated Aboriginal community objectives and as such seems to focus on forestry management objectives. As mentioned by Kant and Brubacher (2008) "Aboriginal people generally perceive that forest management is meeting their expectations related to environmental values and SFM better than it is meeting their expectations related to Aboriginal and treaty rights, participatory decision making and economic opportunities and development". Although our work is based on a small sample, it suggests that explicitly incorporating Aboriginal community objectives highlighted in this study in C&I are

required in order to meet sustainability objectives. Indeed sustainability is a boundary term where science, society and politics can meet. If C&I are to serve as a tool for sustainability they have to explicitly and honestly meet all aspects of sustainability. More specifically, Aboriginal representation, engagement, empowerment and capacity building are community elements which need to be developed in order to effectively identify, implement and evaluate Aboriginal values and objectives for SFM. Even though considerable efforts are made to gather and understand Aboriginal needs in forest management, this study showed that the use of that information is limited to the elaboration of C&I for SFM. Translating Aboriginal values into Aboriginal objectives which can be used in the evaluation and implementation of SFM needs further consideration. Therefore the underlying issue does not lie in C&I itself, but in the limited role of Aboriginal communities in the process. Aboriginal values and objectives should be an integral part of all levels of SFM; from decision making to the design of decision making processes. Only then would C&I advance from being a reference point and instead become an active element for achieving SFM. Increased research efforts should therefore be invested in using Aboriginal values and objectives in the implementation and evaluation of SFM strategies as well as in decision making processes.

SECTION II ELABORATING ON ABORIGINAL ENVIRONMENTAL VALUES USING A CASE STUDY APPROACH

We know that including Aboriginal environmental values and objectives into C&I requires further work (Natcher et al. 2005; Parrotta and Agnoletti 2007; Smith 2004). Indeed, there is a persisting feeling of lack of commitment towards Aboriginal issues. Also, the first section demonstrated some of the weaknesses and strengths of C&I as a tool to integrate Aboriginal values. McCool and Stankey (2004) also cautioned that constraining the definition of indicator selection to a technical/scientific problem ultimately carries significant penalties for the effectiveness of C&I towards SFM. More specifically the selection of indicators should not be based on what can be measured but what should be measured. This is especially pertinent when social values and objectives need to be incorporated as they are often difficult to measure. The authors mention that efforts should be made to portray and understand the system to be sustained.

Furthermore, many C&I frameworks have been criticized for their top-down methods of development which in reality, may not be specific enough to address local forest management issues (Karjala *et al.*, 2003). Through their research at the local level, Natcher *et al.* (2002) expressed the importance of "articulat(ing) value diversity, (such that it is) transparent to both community members and resource managers and would follow for ongoing learning, adjustment and improvement in the management process".

Some authors also argue that there is a tendency for spirituality to be marginalized from the centers to the periphery of power and decision making (Atleo, 2001). Considering the holistic perspectives of First Nations, this does not exclude

the potential marginalization of spiritual and cultural values in C&I. Indeed, C&I are described as a typical scientific framework as defined by Bunnell and Huggard (1999): one where natural ecosystems are illustrated using discrete and hierarchical categorizations, rather than connections and continuous gradations. The socio (spriritual)-environmental nature of some Aboriginal ecological perspectives may therefore be difficult to attain using C&I.

It is therefore imperative to include a case study approach to this dissertation to: 1) ensure a bottom-up approach, 2) allow for cultural and spiritual values associated with environmental values to surface, 3) articulate value diversity and 4) begin a portrait of the Aboriginal environmental system we seek to better characterise. This section is based on case studies of one community which seeks to elaborate on the Aboriginal environmental values which may need further consideration in forest management. The case studies occurred in Kitcisakik which is an Algonquin community (population= 385) located in the Réserve faunique La Vérendrye in Quebec, Canada.

We chose to sample a portion of the Kitcisakik population believed to be aware and active in forest related issues in the community. The forestry committee was the community institution used to approach these individuals. The forestry committee is the Aboriginal institution which was specifically developed by Kitcisakik to: ensure the community's participation in forest management; protect Aboriginal values and objectives; discuss measures in which management of some of the territory can be shared in the short term; and discuss measures towards self-governance and management (Papatie 2004).

The members voluntarily choose to work with or for the committee and range in age from young (early 20s) to elders (when issues related to traditional activities need to be discussed). Because of the voluntary nature of membership in the forestry

committee, members vary in numbers and people from year to year and season to season depending on competing community job opportunities and issues of concern in the community. There is only one permanent member of the forestry committee. Members receive training and work in forest related activities in the territory. These activities range from conducting forest inventories for forestry companies, devising fuelwood exchange programs, to creating trails for educational purposes which expose aboriginally important flora. The forestry committee members can therefore easily and effectively participate in forest related issues.

The premise of this section is that by discussing specific ecological changes which occurred in an Aboriginal territory, and elaborating on their importance, we expected to get a portrait of Aboriginal perspectives and local values related to forest management. The ecological changes presented were based on a study by Grondin et al (2003a,b,c) which identified changes in the forest ecosystem since preindustrial times and included: changes in species composition (more shade-intolerant deciduous trees in the forests), decrease in abundance of given species (eastern white pine), changes in age class distribution (tendency towards a young forest, reduction of oldest age classes). Although all indicators presented were deemed important, it was roads (proposed by the respondents) which promoted discussion on Aboriginal perspectives and local values.

In the first part of this section we investigate roads and explore access issues to help characterise an Aboriginal environmental value. We focus on the local level to understand what roads mean to the community in terms of their effects on the forest, the community and how they are being associated with the forestry industry. We pay particular attention to Aboriginal culture and socio-environmental dynamics at the indicator level.

In the second part of this section we elaborate on Aboriginal means of expressing environmental values related to forest management. The objective is to explore different means of accessing and understanding Aboriginal information. The ultimate purpose of this section is to elaborate on the necessary attributes to allow a cross-cultural dialogue.

CHAPTER IV: FORESTRY AND ROAD DEVELOPMENT: DIRECT AND INDIRECT IMPACTS FROM AN ABORIGINAL PERSPECTIVE

LA FORESTERIE ET LE DÉVELOPPEMENT DES ROUTES: IMPACTS DIRECTS ET INDIRECTS D'UNE PERSPECTIVE AUTOCHTONE

ADAM, M.C. AND D. KNEESHAW, T. BECKLEY

ACCEPTÉ DANS LA REVUE ECOLOGY AND SOCIETY

4.1 Abstract

The forest industry is a significant contributor to the development of roads and most are constructed on Aboriginal territories. Many Aboriginal communities are isolated both socially and economically and Aboriginal cultures are often described as having inherent socio-environmental relationships. Aboriginal communities, therefore, may be the most likely to benefit and be most vulnerable to the impacts of road development. This article uses a case study approach to explore how an Aboriginal community interprets and responds to the increasing development of roads in its territory. The results are interpreted using the theory of access so that both structural and relational issues brought about by the development of road networks can be explored. The dominant themes discussed as being affected by the influence of roads on access included issues of the following nature: Aboriginal, hunting, foreign, territorial and environmental. Issues pertaining to Aboriginal actors as opposed to foreign actors such as the industry or non-Aboriginal hunters and fishers dominated discussions. Although the positive effects provided by roads were alluded to, focus tended towards the affected relationships and ties between the territory, the environment and Aboriginal members. Roads are associated with changes in traditional roles and practices which benefit individualistic behaviors. The access mechanisms mediating and controlling the use of resources through traditional norms and roles such as sharing, asking permission and helping in the practice of traditional activities no longer apply effectively. Changes in the traditional spatial organization of the territory have minimized the influence of knowledge, identity, and negotiation in mediating access among communities. Results highlight that conflicts have thus resulted between and among Aboriginal communities. Also, perception of the role of the environment and ways in which traditional practices occur has altered important socio-environmental dynamics which are part of Aboriginal culture.

Keywords: forest roads, Aboriginal access theory, traditional occupation, socio-environmental, integration.

4.2 Résumé

L'industrie forestière contribue de façon significative au développement des routes dont la plupart est située en territoire Autochtone. Plusieurs communautés autochtones sont isolées socialement et économiquement et leurs cultures sont souvent décrites comme ayant d'importantes relations socio-environnementales. Les communautés autochtones sont ainsi les plus sujettes à profiter et être affectées par les impacts du développement des routes. Cet article utilise une approche par étude de cas pour explorer comment une communauté autochtone interprète et réagit au

développement croissant des routes sur son territoire. Les résultats sont interprétés en utilisant la théorie de l'accès pour que les problématiques structurelles et relationnelles dues au développement des routes puissent être explorées. Les thèmes dominants des discussions, considérés comme étant affectés par l'influence des routes sur l'accès, incluaient les problèmes de nature suivante : Autochtone, la chasse, exocommunautaire, territoriale et environnementale. Les acteurs autochtones plutôt que les acteurs exocommunautaire comme l'industrie ou les chasseurs non-autochtones dominaient dans les problématiques discutées. Malgré le fait que les effets positifs permis par les routes faisaient surface, c'était surtout les liens et les relations affectés entre le territoire, l'environnement et les autochtones qui était discutés.

Mots clefs : routes forestières, Autochtone, théorie de l'accès, occupation traditionel, socio-environnemental, intégration.

4.3 Introduction

The forest industry is a significant contributor to the development and maintenance of road networks. However, roads pose a challenging forest management problem. First of all, the forest industry constructs a large number and a large distance of roads in forested areas. In Canada, there are 68 437 km of permanent primary roads and 15 401 km are permanent forest roads (Bourgeois et al. 2005). If secondary and tertiary forest roads were included the number would increase. For example, in BC alone the total number of forest roads is estimated to be between 400 000 and 550 000 km (Daigle 2010). Second, the majority of road development by forest companies occurs in territories often occupied by Aboriginal peoples. In Canada for example, 80% of First Nation communities are located in the productive regions of boreal and temperate forests and are thus very close to forestry activities (Smith 2004).

Roads are traditionally associated in the literature with a limited set of environmental and social benefits and impacts. On one hand, roads are associated with economic growth and national wealth (Wilkie et al. 2000). In Nelson et al. (2006) roads are viewed as a solution to the "poverty trap". Better rural transportation is a principal factor for improving livelihoods especially in developing countries through: better access to markets, increased social mobility, migration, and greater economic opportunities. The development of roads is also viewed as a means to expand into a territory, tap into otherwise inaccessible resources and provide new opportunities.

On the other hand, there is a growing body of literature highlighting the negative aspects associated with the development of roads. Roads are associated with ecological disturbances and landscape degradation. In conservation biology for example, many researchers agree that road density is a good indicator of intensive use and the human footprint on the landscape. Some, like Crist et al. (2005) therefore

advocate a high value for roadless areas as an integral part of conservation strategies. Reviews by ecologists such as Trombulak and Frissel (2000) and Formann (2000) evaluated the ecological effects of roads and include: 1- habitat destruction; 2- species mortality due to collision; 3- altered animal behaviours; 4- changes to physical and chemical environments; 5- introduction of exotic species and; 6- increased anthropogenic use of the territory. Increased poaching, illegal logging, and squatting have also been identified as a result of road development on societies.

Aboriginal communities could benefit from aspects of road development initiated by forestry companies since many in Canada are isolated both socially and economically. Benefits could include: the increased mobility generated from road development to access forest resources and; the economic and employment opportunities associated with the forestry industry. Most aboriginal communities in Canada are located in the forest regions which are generally the more northern and isolated areas of Canada (NRCan 2009). In Quebec, the unemployment rate, education and average earnings of Aboriginal people are significantly lower (a gap of approximately 20%) than that of non Aboriginal people (O'Donnell and Ballardin 2006). For these reasons, they may be the most likely to benefit *and* be most vulnerable to the impacts of road development. Vulnerability may be due to the changes to land use brought about by road networks. Several land use and occupancy studies testify that indigenous people had high use of the land before the presence of roads (Tobias 2010). Aboriginal cultures are also described with inherent socio-environmental relationships (Davidson-Hunt and Berkes 2003, Stevenson 2006, Berkes 2008). Maintaining these relationships is a concern for Aboriginal communities facing rapid and significant environmental changes caused by forestry activities.

In Canada for example, the 1970s were characterized by large scale forestry operations. These resource development efforts were accompanied by significant road development efforts. Forestry operations occurring on Aboriginal lands caused significant changes in the age and structural compositions of forests and developed many roads to extract timber. In some communities such as Kitcisakik (Québec), more than 60% of their territory has been logged since the beginning of large scale industrial forestry 40 yrs ago (Papatie 2004). In the Nitassinan (Innu Nation forest) of district 19 in Labrador, a 50 % reduction in the landbase available for forestry operations was negotiated to incorporate Innu values and concerns (Forsyth et al. 2003). The nature and the rate of environmental changes have had an impact on Aboriginal socio-environmental dynamics at rates which are difficult for the community to integrate (Merkel 2007). Road development is occurring in Aboriginal community contexts complicated by a series of pressures whose impacts are difficult to isolate as they interplay with one another.

Elements other than the traditional benefits and costs of roads previously mentioned should be considered. For example, although initially roads facilitate and physically increase the ability to use resources, other changes may occur with increasing road densities (Trombulak and Frissel 2000, Bourgeois et al 2005). The perception of the benefits from roads in the short versus long term is at least in part a function of how much road development is occurring (Kneeshaw et al. 2010). Are the initial benefits provided by roads maintained with increasing road networks and road densities? As roads enable resources to be used, they also provide opportunities for resource development efforts as well as changes in community access dynamics. Roads increase resource use by non-aboriginal hunters, recreationists, and for non-aboriginal resource development. According to Sikor and Lund (2009), access to resources is often contested and rife with conflict especially in societies where normative and legal claims to resources are competitive. Many Aboriginal

communities are asserting their rights to land and resources and from their perspective, there is a climate of uncertainty when rights and claims to resources are considered.

There is a tendency to view roads and access in tandem. Access is usually defined as the ability to benefit from things. The effects of roads are often limited to their impacts *on* a resource and as affecting access *to* the resource. In this sense, roads are assessed by the physical nature by which they provide access to a territory and the movement they permit within their networks. The interaction between roads and access is often perceived as being limited and dictated through property rights and laws. In effect, roads, rights and laws are some of the structural components of access. However, access is a complex issue which involves the promotion of other social, cultural and environmental values (Ribot and Peluso's 2003). Property and access are a personal issue which falls beyond the realm of laws (Krueckeberg 1995). As mentioned in Ribot and Peluso's (2003) theory of access, access is actually the ability to benefit from things including material objects as well as persons, institutions and symbols. According to the theory of access, there are many actors that seek to benefit from access. These actors interplay via social relations that are influenced by access mechanisms such as knowledge, technology, social identity, capital, labor, authority and markets. The social relations between actors influence how access to resources is gained, controlled and maintained. Social relations dictate access through a variety of means including interplaying norms, power, authority, property, and control over territorial occupational patterns and resource use. There are therefore complex and overlapping webs of relations and mechanisms which organize actors and their access to resources. Roads are only one of the many mechanisms involved in access. Roads are one of the technological mechanisms of access which will have multiple levels of impact because they are involved in a web of social relations that shapes benefit

flows. The changes in access brought about by the development of road networks need to be assessed through both structural and relational issues.

Community responses to roads are an important factor to consider in development efforts. According to Shindler et al. (2002), forestry professionals need to understand how natural systems function and are sustained *as well as* how people interpret and respond to changes in forest settings, policy decisions, and management institutions. Community responses to roads may also help identify relational and structural issues especially those related to resource development, access, socio-environmental dynamics and territorial competition for claims to the land. Some of the relational changes associated with road development may be classified by Turner et al. (2008) as invisible losses: impacts which are not widely recognized in decisions about resource planning and decision making because they are an indirect or cumulative result of management decisions or policies. The invisible losses include: cultural/lifestyle losses, loss of identity, loss of self-determination and influence, emotional and psychological losses, loss of order in the world, knowledge losses, and indirect economic losses and lost opportunities (Turner et al. 2008).

In this paper, we use a case study approach to explore how a Canadian Aboriginal community with an already high density of roads on its territory interpreted and responded to development of road networks created for forestry purposes. We use Ribot and Peluso's (2003) access theory to determine how important factors emerging from respondent interpretation of road development are associated with road influence in benefitting or losing from forest resource access: 1) Who is most affected by the influence of roads on access, 2) how are roads changing the way that the resource is being used, and 3) what access mechanisms are changing in association with road development. Although the theory of access approaches a highly comprehensive notion of access issues, we only looked at how the theory

applies to roads. We are specifically interested in the theory's definition of access which goes beyond the structural components of access to incorporate social and environmental relations and thus the various community levels affected by road development in this case. By looking at roads through the lens of access theory we hoped to develop an understanding of the socio-environmental and the social relations that they affect.

4.4 Study area

4.4.1 Kitcisakik

Kitcisakik is an Algonquin community (population= 385) located in the Réserve faunique La Vérendrye in Quebec, Canada. The environment is a key component of Kitcisakik culture. According to Papatie (2004) the community members are the guardians of this territory and have the responsibility of ensuring its "harmonious" use to preserve its heritage for future generations. The territory (5227 km^2) is composed of mixedwood forest at the limit of the yellow birch – balsam fir and white birch-balsam fir bioclimatic zones of the boreal forest. It is on this territory that the community members live, occupy and practice traditional activities such as trapping, hunting, camping and canoe. A small portion of the community still practices semi-nomadic living arrangements between a summer and a winter settlement.

In general Aboriginal territorial organization has gone through many changes since European contact. For example European colonialism and efforts towards sedentary patterns have had significant impacts. The Kitcisakik territory has traditionally been divided into family territories which organized resource use. Physically, there was little access between and within family territories and rights were held by trapline holders. What could be referred to today as trespassing was physically difficult making it beneficial for community members to hunt in their own

family territory. Otherwise when resources were scarce, it was necessary to ask permission to hunt in another family's territory because access points and knowledge of the forest were limited to the family holding the trapping rights. Although physical access to resources within the territory may have been difficult there was a high need to use and occupy the land. Activities such as hunting, trapping, portaging, camping are among those that were traditionally practiced on the land. A traditional regime of mutual dependency and community property norms were held in place by both the family territorial organization system and cultural principles which are described in Kitcisakik as the four community principles (sharing, honesty, mutual aid and respect). To date, occupancy and territorial organization has been affected by a multitude of factors including, among others, road development, intensive resource extraction from industries, improved means of transportation and increased access into the territory by other communities and non-aboriginals.

Kitcisakik is a community who has shown an increasing interest in the activities of the forest industry since 1998 (Papatie 2004). Today 43 km^2 per year are logged on the territory (Papatie 2004) and more than 60% of its territory has been logged since the beginning of large scale industrial forestry 40 yrs ago. Harvesting was largely composed of extensive clear-cuts although some selective logging also occurred. Road development is not a novel infrastructure for the community as roads have generally been developed in proportion to timber extraction efforts. There are now 4834 km of roads (all road types included) in Kitcisakik most constructed for forest timber extraction purposes.

The community is isolated from major centers and markets. The education level is low where 82.3% do not have high school, diploma, college certificate nor university degree. It is poor with few employment opportunities (35.3% employment rate) and lower revenues than the rest of Québec (54% difference in the median

income for people 15yrs and over) (StatCan 2006). In the community there is neither permanent water, nor sewers, nor electricity.

4.4.2 Description of the population sampled

This project is one among many projects originating from a partnership between the community of Kitcisakik and the University of Québec in Montreal. The partnership was initiated because of the community's growing interest in vocalizing their issues, values and goals regarding the growing changes occurring in their forest environment. The ultimate goal of the partnership was therefore to better understand the community's relation to the forest and forestry activities as well as devising tools to better integrate their values and adapt forestry activities. All studies generated from this partnership were approved by the Ethics Review Boards of the University of Quebec in Montreal. All participants signed an informed consent form, which was read to them. There was no remuneration for study participation.

The results presented here were obtained to accumulate information such that appropriate tools to integrate Aboriginal values into forestry activities could be devised. The individuals interviewed in this study are believed to be those most aware and active in forest related issues in the community. The forestry committee was the community institution used to approach these individuals. The forestry committee is the Aboriginal institution which was specifically developed by Kitcisakik to: ensure the community's participation in forest management; protect Aboriginal values and objectives; discuss measures in which management of some of the territory can be shared in the short term; and discuss measures towards self-governance and management (Papatie 2004). The members voluntarily choose to work with or for the committee and range in age from young (early 20s) to elders (when issues related to traditional activities need to be discussed). Because of the voluntary nature of membership in the forestry committee, members vary in numbers and people from

year to year and season to season depending on competing community job opportunities and issues of concern in the community. There is only one permanent member of the forestry committee. Members receive training and work in forest related activities in the territory. These activities range from doing forest inventories for forestry companies, devising fuelwood exchange programs, to creating trails for educational purposes which expose aboriginally important flora. The forestry committee members can therefore easily and effectively participate in forest related issues.

4.5 Methods

We used questionnaires with both open and closed ended questions to lead into semi-structured interviews which were completed by 10 members of the forestry committee in 5 interview sessions (2 individual interviews, one group of 2 and two groups of three). Two women (W1 and W2: 38-50 years old)(fewer women often participate in forestry committees (Richardson et al 2011)) , 4 young men (Y1-4: 20-35 years old), and 4 men (M1-4: 38-50 years old) participated in the interviews (one of the older members is considered an elder).

Interviews began by introducing the project and showing the members a map of the road network in the territory. Interviews lasted between 1 and 2 hours. To explore the physical, environmental and social realms of forest committee responses to road development, the interviews were divided into three sections discussed in random order. One section pertained to the effects of roads on culture (Do roads affect the 4 principles of the Kitcisakik community: respect, mutual aid, honesty and sharing?). The second section explored the effect of roads on the environment (forest, health, trees, fauna, etc.). The third section explored forest committee responses to the physical nature of road development: 1) road use (by hunters, aboriginals, community

members, and industry); 2) road type (primary, secondary, tertiary, paved, and size); 3) road condition (use by ATV, cars, maintenance); 4) road location (are roads in sacred areas, or important community areas); and 5) amount of roads on the territory (too many or not enough roads). Questions began as true or false but were then discussed as open ended questions where comments were noted and discussion encouraged.

The results were interpreted using Ribot and Peluso's (2003) theory of access. As respondents reacted to roads in the context of their environmental, cultural and physical nature they were in fact responding to some of the key elements of access theory such as: actors (those people, families, community, and institutions which will either benefit or lose from access created by roads); resources (access to which actors seek to benefit from with roads); and mechanisms (rights based, illicit, structural and relational means used to include, reinforce or gain access). According to the theory it is the actors, their values and their social relations which form the access issues influenced by roads. Therefore interview responses were coded to identify dominant themes regarding the effects of road development as either benefiting or costing residents of Kitcisakik. We then categorized the themes according to the key elements of access theory (actors, part of the resource being accessed or an access mechanism). Interview responses were also interpreted according to the relations between actors, resources and for emerging access issues. Although the results are associated with roads, roads serve as an indicator and platform where community, environmental and development issues can emerge. Roads may not be the unique direct causal factor but more likely, according to respondents, a proxy for their effects.

An informal validation exercise was also performed (appendix 1). We presented the results to the forestry committee to determine if there were gaps in our understanding of the interviews, and whether the committee was in concordance with

our interpretations. We also interviewed an aboriginal member from the Maiyoo Keyoh, (interviewed 11/01/2010). The Maiyoo Keyoh (Keyoh is a family territory) of British Columbia (Canada) developed forestry scenarios to assist the members in participating in future development and establishment of management decisions in their forest (17013 Ha) which has undergone increasing forestry operations over the past 40 years. When defining scenario preferences, roads emerged as a determining parameter against many scenarios (Morben et al. 2009). Furthermore, the Maiyoo Keyoh are presently concerned with the resulting roads planned as a consequence of the increasing forestry activities in their territory (Morben et al. 2009). The level of disturbance as a result of forest operations is projected to increase from 17% to 84% of the territory. In this validation exercise we asked how roads affected the Maiyoo Keyoh territory. The purpose was to determine whether similar issues would be observed in a different community at a different geographic site. All comments and ideas extracted from the interview were used to check and corroborate the results from the Québec study (results are presented in the appendix 1). The results discussed hereafter summarize the Kitcisakik forestry committee interpretations of developing road networks on their territory validated by the community members themselves.

4.6 Results and discussion

4.6.1 What are the access themes influenced by roads?

Before applying the theory of access, the following dominant themes discussed in the interviews were identified as being affected by increasing road networks. These themes are not mutually exclusive and represent the Kitcisakik forestry committee perspective:

1. Aboriginal: These can be divided into intra-, inter-Aboriginal community dynamics and general Aboriginal values (those which are not specific to the case study but which are Aboriginal issues in nature) effects.
2. Hunters in general (sports, poaching and aboriginal hunters): Road development has facilitated hunting activities by rendering the territory more accessible. This is true for community members, other Aboriginal communities as well as non-Aboriginal hunters.
3. Foreign: The forest industry and non-Aboriginal hunters were specifically identified as new groups with stakes in the development of roads on the territory. They are viewed as foreign by the forestry committee because they have not historically occupied or used their territory nor collaborated with the community for territorial use.
4. Territorial: Road development has affected local territorial dynamics by opening the region to use by everyone and changing the way it is viewed and perceived by users in general (Aboriginal and non-Aboriginal peoples).
5. Environment: The ecological impacts of roads were noted by the members interviewed including effects on: edges (forest composition, structure and health in edges), forest tree composition (more young trees, more deciduous trees), dust, lakes (water composition), fish, and fauna ("the animals look for shelter"). Changes in Aboriginal community relationship to the environment were also noted by respondents.

Based on Ribot and Peluso's (2003) access theory, the themes identified were categorized as follows: the environmental theme is defined as a resource; the aboriginal, hunters and foreign themes are defined as the actors; and the territorial theme is an access mechanism.

4.6.2 Actors, resources and access mechanisms

The respondents refer to the environment as the resource that is affected by roads. The environment as a resource (as providing material goods which can technically be controlled by property rights) is an access issue where actors feel they are both benefiting and losing from road development. In the interviews, the environment was referred to: 1) for trapping and hunting; 2) as habitat for fauna and flora; and 3) as a food source. However, we also see issues identified as socio-environmental dynamics and described by access theory to involve mechanisms of knowledge, norms and beliefs which cannot be limited or controlled by property. In the interviews access to the environment was referred to as: 1) part of their culture; 2) part of their home and their identity; 3) a source of knowledge either spiritually, traditionally, historically or practically; and 4) an important resource for their way of life.

In the interviews, issues pertaining to Aboriginal actors as opposed to foreign actors such as the industry and hunting dominated discussions around road development. This may come as a surprise because increased access can often lead to what may be perceived as the intrusion by new and foreign actors to a territory (e.g. the forest industry and hunting activities). On one hand, respondents highlighted the implicit role of the forest industry in developing road networks. They mention that roads allow the forest industry to use the territory "without permission" (all respondents) and "dishonestly" (respondents W1, M3, M4 and Y2), thus disrespecting community cultural principles. The structure of the interview allowed such comments to emerge throughout; however, they were few in number per respondent and rarely expanded upon.

Hunting, on the other hand, was presented by respondents as two different categories of actors. In the first category, hunters are characterised as foreign actors i.e. the sports non-Aboriginal hunter. Although this actor intrudes on community

rights, they are in many ways tolerated as their presence is both spatially and temporally predictable in Kitcisakik. Community members are aware of the territory and time available to these hunters because hunting is controlled by seasons and granted through licenses. The second category is of more concern and describes illegitimate hunting activities by non-Aboriginals (poaching) and Aboriginals (those hunting to sell or that don't follow cultural and community norms). In this category, importance was attributed to the fact that some hunting activities occur without consideration of local norms. According to the theory of access, these actors use illicit access mechanisms to benefit from resources. Although the issue of hunting needs to be clarified, this study shows that there was a direct and obvious connection made between foreign actors, access and road development by the forestry committee. However, the main respondent concern was based on the access mechanism which differentiated between actors which is in this case illicit access mechanisms.

The territory is also a theme raised by respondents, which is an access mechanism according to Ribot and Peluso (2003). More specifically respondents refer to the importance of family territories, community territories, and the associated knowledge, ancestral rights and control rights they feel they should exert. Respect and permission to use were the key issues which consistently emerged. These issues reflect changes occurring in Kitcisakik regarding the people's perception of territorial rights. These are important because according to Fernandez-Gimenez et al. (2008:pg147), "the erosion of respect- self-respect, respect for elders, for community, for tradition, and for the land and animals- is the perceived cause underlying the failure of individuals to abide by customary norms." Although increased ability to use a territory may initially be viewed as a positive contribution, changes in the right to use the territory and the introduction of new open access mechanisms as described by Ostrom (1990) were shown to be problematic. Essentially open access occurs when access is available to all and when norms and the position of actors within social and

socio-environmental relations are challenged thus preventing access mechanisms to function effectively. More specifically, the following changes in influences to territorial rights have occurred: cultural frames in resource access priority; access to technology as facilitating or preventing resource access; physical access to resources in determining who benefits; and access through authority and social identity in determining who benefits from the resources. Examples are discussed in the following sections.

4.6.3 Global Aboriginal perception of benefits or losses due to roads

In the interviews, positive effects provided by roads were not contested by respondents. Indeed, the benefits of roads remain at the surface of this entire study as respondents alluded to the increased ability to hunt, increased facility to perform traditional practices, and increased means to occupy the territory. Some specific examples of the physical access benefits roads could provide were mentioned such as: the facilitating effects of roads in providing communication and transportation of important resources and aid to elders (ex. the fuelwood program); filling up freezers with more easily accessed game; decreased dependence on the environment; and decreased community dependency. Indeed these are benefits associated with roads as the structural components of access. However, respondents tended to focus on the affected relationships and ties between the previously mentioned factors rather than restricting discussions to the physical access benefits roads could provide. "Roads are useful but there is a limit" (respondent Y2). The theory of access stipulates that "access relations are always changing, depending on an individual's or group's position and power within various social relationships" (Ribot and Peluso 2003:pg158). It is these changing relations that are a preoccupation as they affect important cultural norms and principles in Kitcisakik including: a) Aboriginal rights, knowledge and identity, b) role and definition of the environment, c) community

relations and experience with the environment, d) territorial organization, use and rights and e) respect and collaboration. In effect, respondents believe roads disturb relationships, values and communication between factors rather than promote them. Indeed, as predicted, access is a personal issue.

4.6.4 Relational issues between actors

Ultimately, Aboriginal actors were presented as the dominant concern regarding access issues for the Kitcisakik forestry committee. Other studies have also shown that roads surface as an issue for communities (see appendix). For example, Peluso (1992) looked at the processes of social change as timber operations entered a west Kalimantan village with new roads, new physical access, and development of forest products. The author showed that although roads brought trucks, traders and collectors from elsewhere, increased villager access to outside markets and facilitated outsider's access to this remote area; enforcement of village claims and the capacity to maintain the traditional ethic of access were highlighted as complications. Indeed interview responses in this study also highlighted changes mostly associated with Aboriginal values, Aboriginal way of life, Aboriginal knowledge of the territory, Aboriginal perception of ancestral rights and Aboriginal territorial organization. The changing Aboriginal relations which emerged in the interviews we conducted can be categorized as inter-Aboriginal, intra-Aboriginal and general Aboriginal values. These changes are discussed in further detail in the following paragraphs.

4.6.5 Intra-Aboriginal relationships

Rapid and accessible communication measures can have positive effects on a community such as reducing risk (pressures to hunt for subsistence are diminished) and are sought by community members through technological advances (vehicles and ATVs for transportation). In the interviews, however, changes in the ability to use

and the right to use have affected Aboriginal values and Aboriginal way of life in Kitcisakik. Respondents now feel that roads are associated with changes in traditional roles and practices which benefit individualistic behaviors. For example, respondents mention that although available to all, changes in the rights to hunt and trap are problematic. Unlike the past, community members no longer ask permission to hunt, need help in the hunt, nor share the kill: "it has become easy to hunt ... now everybody can and fast" (respondent Y1). In effect, if everyone can do it alone and easily, the traditional norms and roles dictating who and with what rights they use resources no longer apply effectively. In Kitcisakik, these traditional roles were in fact access mechanisms mediating and controlling the use of resources through sharing, asking permission and helping in the practice of traditional activities. According to Agrawal (1995:pg418) and Banuri and Apfell-Marglin (1993:pg10-18) such individualistic tendencies are a significant departure from the distinguishing characteristics of indigenous knowledge including among other characteristics: "not believing in individualist values" and "requiring a commitment to the local context unlike western knowledge which values mobility and weakens local roots."

The affected access mechanisms and the changes toward individualistic tendencies create conflict in Kitcisakik at many levels. The role of traditional "experts" (practitioners and protectors) in hunting has been minimized. The traditional collaboration needed in the past for hunting activities (sharing, asking permission, help in the kill, help returning the kill to the village) has been minimized. "Before, he had to think of the difficulties of others and the possibility of his own difficulties" (respondent W2). As well, conflict with the old norms dictating use rights exists between the younger users, the older generations and the territory leaders or protectors. "you can hunt from four wheels or cars" .... "the young don't even ask to go on the territory, they steal from our food storage (environment)" ..... "there is no more transmission" (respondents W2, M3, Y1 respectively). Miller et al. (2000)

identified the importance of extending traditional teaching and values to younger generations as one of six recommendations for planning. Although respondents focus on the advantages of the "old ways" which may be perceived as a romanticised notion of the past and a fear for the contemporary lifestyles, the issue lies in the loss of Aboriginal access mechanisms mediating resource use. By interpreting the interviews with the theory of access, we note that there is a loss of formal and informal rights, local institutional organisation, and intra community relations to manage the changes in Kitcisakik's territory. According to Dietz et al. (2003) these rules need to evolve to ensure successful commons governance. As a consequence, intra-community collaboration is minimized and intra-Aboriginal relationships are disturbed.

4.6.5.1 Inter-Aboriginal relationships

The same changes that affect intra-Aboriginal relationships are also affecting inter-Aboriginal relationships. Respondents expressed that not only are traditional roles and practices changing at the individual level but they are also occurring with the new spatial organization of family territories. According to respondents, roads dissect the territory, they cut through family territories, and they go through trails and hunting grounds. "It is a labyrinth of roads" (respondent M4). Not only do roads change the movement patterns and means of moving through a territory but they render family territories easily accessible to all and disturb the traditional spatial organization of the territory. Unlike non-Aboriginal mechanisms where land is marked with boundaries and driven by rights based mechanisms (property), the Aboriginal mechanisms which define a territory are driven by structural and relational mechanisms and defined by three criteria: knowledge, permission to use and use/occupation. The family territory of this community plays an important role in access mechanisms because traditionally, it was the members which occupied, used and knew their respective territories that controlled and mediated access. To use

another family's territory one had to ask permission as well as access family knowledge of that territory and its resources. These mechanisms have been affected in association with roads and changes have been especially problematic among Aboriginal communities. "People just occupy the land and don't ask permission. Sometimes the traps are stolen, sometimes we are surprised to see others (other communities) hunting in our territory..... there is no communication and no transmission" (respondent M1). Roads have affected the role of family territory as a source of knowledge, social identity, and in negotiating access.

Knowledge of the territory at the landscape scale has increased among the members of Kitcisakik and between the surrounding Aboriginal communities. It is no longer specialized nor divided among family territories. "There are no more hunting guardians" (respondent M2). Knowledge and availability of the land created by road developments is causing power shifts which are affecting the distribution of rights and control over the land and affecting community ties. "He forgets the other and affects the life of the other. The other's life is affected on top and has to find another spot to trap" (respondent W2).Knowledge of environmental cues determining the presence and potential of specific resources becomes superfluous and the little that is needed is easily available to the surrounding Aboriginal communities. The limits of knowledge as a mechanism influencing access have thus been extended to neighboring communities thus creating tension.

It has been suggested that social identity can mediate access (thus the need to ask permission) through membership in a group or community (age, gender, ethnicity, religion, status, profession, place of birth, common education or other attributes that constitute social identity) (Ribot and Peluso 2003). In the interviews, the role of the family territory as a social identity which can mediate access to resources is minimized. There is no longer a perceived need to ask for permission (and enforcing

rights) to enter a territory. Respondents highlighted an increasing tension which is especially problematic among neighboring Aboriginal communities where members of other communities are both using and hunting in Kitcisakik without permission. Roads are thus associated with heightened competitive claims for resources between communities.

Negotiation is a mechanism influencing how certain groups interact with others to allow a distribution of benefits (Ribot and Peluso 2003). Because of the previously mentioned change in the role of the family territory, negotiation mechanisms are also diminished. It is not just the road in itself which affects access mechanisms but the density of roads as well. There are so many roads that the role of the family territory as a social identity which can mediate, control or negotiate access is difficult.

Fernadez-Gimenez et al. (2008) highlighted that the creation of clearer boundaries does not help emphasize the positive, cooperative attributes of social exchanges between communities. This is pertinent to roads because on one hand, roads create clear physical marks on the landscape which could be viewed as boundaries. On the other hand, the purpose of roads as facilitators of mobility and communication should emphasize these attributes and exchanges. However, roads seem to be viewed by respondents as artificial physical boundaries in conflict with traditional boundaries. In effect, the changes associated with road development have altered how privilege, reciprocity and respect of one territory relative to another are assessed.

4.6.5.2 General Aboriginal values

From an Aboriginal perspective, it is an inherent Aboriginal right to practice and have access to traditional activities on the land and benefit from the resources. Although there are Aboriginal rights to use the land attributed by non –indigenous people, these rights are not meant to be used in the absence of traditional Aboriginal

systems or laws. The changes in territorial perspectives, family territories and inter-intra- Aboriginal relations associated with roads are also changing the role of Aboriginal rights and relationships with tradition and culture. More specifically, the role of Aboriginal rights is changing from one which binds Aboriginal peoples, to one which allows individual members to perform specific activities: "people (aboriginal people in the community) will do things because of ancestral rights but do not try to ensure the sustainability of the resources" (respondent M1). Also the new ways to use and justify use of the land which are emerging in Kitcisakik require a redefinition of the Aboriginally defined rights which should dictate access to resources. Indeed, respondents mentioned that maintaining and respecting the relationship with the land is as important as maintaining Aboriginal rights to the land. "People (Aboriginal in the community) don't practice traditions" (M4). "They (community members) think they can do anything and have the right to do it but they forget their values" (M1).In this context it becomes important for Kitcisakik to manage the effects of road/resource development so that they can reasonably continue to exercise their tradition and culture within their territory under agreed understanding of Aboriginal rights.

4.6.6 Relational issues with the resource: socio-environmental relations

The results show that roads have changed environmental relations at many levels. More specifically perception of the role of the environment and ways in which traditional practices occur has altered important socio-environmental dynamics which are part of Kitcisakik's culture. For example, the environment was traditionally viewed among other things as food storage belonging to the community whose use was dictated by the cultural principles (sharing, respect, mutual aid and honesty). However, the technological advances associated with roads and access (prominent use vehicles) and the increased ability to use resources (use of freezers) has changed

this definition. According to respondents, people not only hunt for their subsistence but to also fill *many* freezers. "They no longer share the catch.... Now it is solitary, the whole moose goes into a freezer"(M1). "No one shares anymore, it is all easy ... many people even have 3 freezers" (M4). In effect the environment is becoming an easy pool of resources for the individual (rather than the community) and storage has been moved to the home (rather than the environment).

The effects of roads on the landscape landmarks used and the methods employed to practice traditional activities have diminished the connection between the people and the environment of Kitcisakik. More specifically, access mechanisms which were traditionally based on portage routes and environmentally based landmarks (example- large white pine trees served to orient hunters towards productive lands) have changed to using roads as landmarks. The elder interviewed believes that there is a sense of laziness in the community now. "The people do not walk like they used to. The people no longer have legs, and no longer have arms" (W1). This laziness, although associated with people hunting from the road side also reflects that the people no longer take the time to know their territory. Respondents mention that the "space" in the woods has changed and "now people can no longer find themselves" in the environment (respondent W2, M4). Furthermore, the connection between people and fauna was noted (respondent W1): "They (animals) see everything and will no longer resist"; "the people no longer hear nor see songs."

The environmental experiences derived from traditional practices have also been affected by the rate and density of developing road networks in Kitcisakik. New environmental experiences are clashing with the old ways resulting in differing perceptions between generations regarding the role and importance of traditional and ancestral rights practiced in the environment. To the older generations, the increased accessibility and availability of environmental experiences has resulted in a decrease

in the perceived value of traditional practices by younger generations. Although roads do not directly interfere with the pursuit of traditional practices, they have affected the means by which these practices occur. In concordance with Merkel (2007) skills are being lost as people are spending less time in the environment. Roads are thus not the only cause but they are an important contributing factor to the erosion of traditional relationships with the environment.

4.7 Conclusion

Roads benefit many Aboriginal communities by increasing community access to market centers and intra community communication. However, as with many aspects of development, roads provide some benefits but they come with costs in terms of traditionally important Aboriginal relations. The role of respect, collaboration, reciprocity, and identity in organising the relations of one territory with another has been disturbed in this case study and implies important cultural changes in terms of beliefs and norms as well as spatial territorial organisation. In this study, the ability to use resources has evolved disproportionately compared to the rights and norms dictating the use of resources. The repercussions associated with road development therefore need to be appropriately considered. Although it is clear that some benefits can be attained, the influence of roads needs to be thought of as having both structural and relational components.

The structural components are related to the physical influence of roads in a landscape and the associated benefits of movement through that landscape superficially influenced by property rights. Although increased mobility and access to resources were alluded to and therefore a benefit in themselves, it was the negative changes they had on relational components of access which dominated impressions.

The relational issues raised were not necessarily limited to roads as their direct causal factor. For example the changes that are raised here in terms of Aboriginal identity involve more than the effects of roads. Aboriginal identity is by no means defined by roads. Indeed the issues highlighted can be characterised as invisible losses (Turner et al. 2008) which can occur in many Aboriginal communities facing development pressures.

Based on this case study, road development needs to be managed to ensure the persistence of Aboriginal culture and their rights. Responses to road development have also served as a good indicator of important cultural and Aboriginal relational issues. Indeed, it is by appropriately considering all aspects of access as described by Ribot and Peluso's (2003) theory of access that we can begin to account for the trade-offs between access to resources and the changing dynamics it imposes.

Using access theory was an effective tool to understand the important relations and personal Aboriginal dynamics which need to be considered in access issues. Changes in inter and intra Aboriginal community issues, cultural implications, the use and role of Aboriginal rights and the role of important Aboriginal territorial organisation issues were raised as a result of roads.

As is expected from exploratory research, a series of questions have emerged from this case study. This case study indentified the need for further research which uses access theory where resource development efforts need to be integrated with many resource users. Comparing responses in many Aboriginal communities is also necessary to identify trends. Furthermore, identifying responses as a function of varying road densities, and responses to new roads versus old roads would also help differentiate between short-term and long-term impacts of road development. We hope that the ideas emerging from this study will facilitate and identify research

needs such that the positive contributions versus losses due to road development can be appropriately weighed and accounted for.

CHAPTER V: METHODS TO ACCESS ABORIGINAL KNOWLEDGE AND MODES OF EXPRESSION FOR FOREST MANAGEMENT: A CASE STUDY SHOWING THE BENEFITS OF INFORMAL INSTITUTIONS AND CULTURAL REFERENCES.

BY: ADAM, M.C., T. BECKLEY, AND D. KNEESHAW

5.1 Abstract

A central issue in forest management strategies is the identification of methods to integrate Aboriginal interests that are well adapted to indigenous people's values, objectives and social realities. There have been various approaches and although integration of community and local dimensions to forest management is viewed as improving management strategies, integration has also come with many pitfalls. In effect forest management has not come to terms with the richness of Aboriginal methods of expressing and managing their resources. This study sought different types of Aboriginal modes of expression to describe: 1) the differences in the methods used to access different types of knowledge and, 2) the differences in emerging results. The results showed that using methods which account for informal institutions and cultural references has been successful in: 1) garnering respondent participation, 2) exposing the various levels of impacts, 3) surfacing information which is socially, culturally and contextually bound, and 4) tuned to community realities and issues which are temporally bound. Aboriginal ways of knowing and relating to the natural world can serve as their own tool to help management strategies. Approaching the integration of Aboriginal values and objectives with greater acknowledgement of the varying Aboriginal institutions and modes of expression will get managers closer to re-thinking forest management and defining Aboriginal forestry.

Keywords: Sustainable forest management, TEK, Fuzzy logic, Aboriginal forestry, Aboriginal worldviews, integration, ecological knowledge, road.

5.2 Résumé

L'identification des méthodes utilisées afin d'intégrer les intérêts autochtones dans l'aménagement forestier de façon à ce qu'il soit bien adapté aux valeurs, aux objectifs et aux réalités sociales des peuples autochtones est une problématique centrale dans les stratégies d'aménagement forestier. Il existe plusieurs approches et même si l'intégration des dimensions communautaires et locales est perçue comme améliorant les stratégies d'aménagement, l'intégration aussi est pleine d'embuches. En fait, l'aménagement forestier ne tient pas compte de la richesse des méthodes autochtones pour exprimer et gérer leurs ressources. Cette étude utilise différents types de modes d'expression autochtone pour décrire : 1) les différences entre les méthodes utilisées pour accéder à différents types de connaissances; 2) les différences qui émergent dans les résultats. Les résultats démontrent que l'utilisation de méthodes qui prennent en compte les institutions informelles et les références culturelles ont du succès pour: 1) générer la participation des répondants; 2) exposer différents niveaux

d'impact; 3) la mise en relief d'une l'information socialement, culturellement et contextuellement liée; et 4) être synchronisé temporellement avec les réalités et les problématiques communautaires. La connaissance et la proximité autochtone avec le monde naturel peut servir comme outil pour aider les stratégies d'aménagement. L'intégration des valeurs et objectifs autochtones, avec une plus grande reconnaissance de leurs institutions et de leurs modes d'expression, permettront aux aménagistes de repenser l'aménagement forestier et de se rapprocher d'une définition pour la foresterie autochtone.

Mots clefs : Aménagement forestier durable, Connaissance écologique traditionnelle, fuzzy logic, foresterie autochtone, intégration, connaissance écologique, routes.

5.3 Introduction

A large body of literature is developing to demonstrate the importance of Aboriginal interests in forest resource development (Coates, 1992; Smith, 1998; Gladu and Watkinson, 2004). However as highlighted by Lane (2004), the real question is no longer why, but how in a practical sense, productive resources and lands such as forests might be shared where there are Aboriginal interests. Identifying methods to integrate Aboriginal interests to develop forest management strategies that are well adapted to indigenous people's values, objectives and social realities has therefore become a central issue.

There have been various approaches to the integration of Aboriginal interests: integration of Aboriginal knowledge (TEK, LEK), integration through co-management, and integration of Aboriginal values and goals in management tools (such as Criteria and Indicators (C&I)). Recent advancements in forest management to understand the cultural divergence between Aboriginal and non-Aboriginal forest visions have shown some promise regarding the notion of integration. Studies by Jacqmain et al (2007 and 2008) have confirmed that regardless of diverging forest vision, integration of Aboriginal knowledge can improve understanding of species in ecosystems, as well as lead to an appreciation of Aboriginal preoccupations for the negative impacts of certain forestry operations. For example, Jacqmain et al (2008) demonstrated that while moose are believed by managers to have low fidelity to sites and may even respond positively to forestry activities, local Cree native knowledge demonstrated that moose were indeed being affected by forestry activities. Cree knowledge highlighted the need to change clear-cutting practices occurring in mature mixedwood forests to minimize moose impacts.

Although integration of community and local dimensions to forest management is viewed as improving management strategies (Berkes 1994, Sheppard and Meitner,

2005), integration has also come with many pitfalls. More specifically, what Aboriginal concerns and values of interest are chosen for integration and how they are integrated remains problematic. For example, the dominance of scientific worldviews is still apparent. Spak (2005) cautions that "state resource managers who are willing to take TEK seriously focus their efforts on attempting to research and package TEK in a manner in which it can fit into, strengthen, and support the goals, problems and objectives that state management agencies have identified as important." As such, TEK is often used as a supplementary body of information rather than integrated to re-think the basis of scientific management itself. According to Nadasdy (2005), integration where co-management processes are introduced to existing community institutional structures has treated and excluded Aboriginal political and ethical considerations as externalities. This has thus led to the bureaucratization of resource management institutions and communities. This has prevented empowerment and instead extended state power further into Aboriginal communities. Integration of Aboriginal values and objectives in management tools have also generally required and led to the reduction of Aboriginal language and modes of expression into scientific frameworks which in the end, have rendered Aboriginal ways invisible (Stevenson, 2006).

In effect forest management has not come to terms with the richness of Aboriginal methods of expressing and managing their resources. As pointed out by Houde (2007) there are many faces to ecological knowledge. According to the author, those considered in management processes tend to be in the form of: factual observation, classification and system dynamics; management systems; and factual knowledge regarding past and current uses of the environment. However, ecological knowledge can also take the form of ethics and values, traditional ecological knowledge as a vector for cultural identity and cosmology (Houde, 2007). Approaching integration with this type of knowledge has not been commonly used in

forest management. On one hand, according to Houde (2007), this type of information is considered by managers as abstract and holding "fundamental differences from the mainstream values encoded in Canadian institutions". On the other hand, Colding and Folke (2001) used social taboos as examples of informal institutions to show that they could offer several advantages in designing strategies for the sustainable use of resources. These authors argue that these institutions are significant because they serve as a means of understanding ecological adaptations within communities; and because they are based on local knowledge systems embedded in a larger social context. Devising the means to access the richness of Aboriginal knowledge and to use this knowledge to re-think forest management remains a central issue for the integration of Aboriginal values and objectives in forest management.

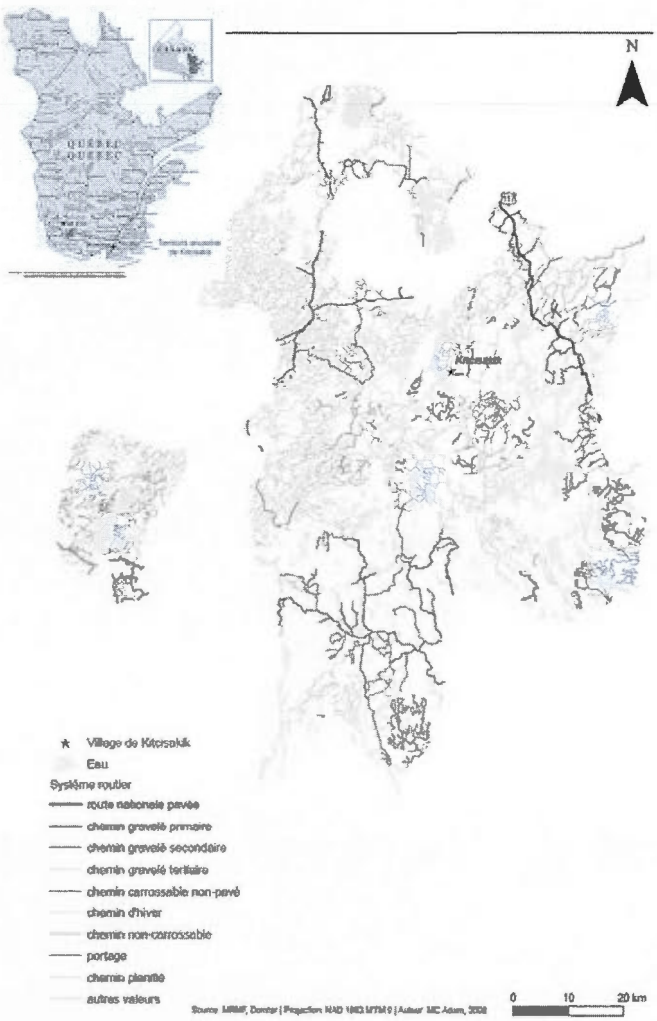
How to access the different faces of knowledge, what kind of information will emerge from this knowledge and how useful it can be to forest management, needs to be investigated. This article offers a case study approach to these questions. More specifically, to integrate Aboriginal values and objectives in management, this study sought both the common type of knowledge (factual and observational) used in forest management as well as Aboriginal modes of expression to further understand the impacts of forestry practices on an Aboriginal community territory. To assess its usefulness for forest management, this article can describe: 1) the differences in the methods used to access different types of knowledge and, 2) the differences in emerging results.

5.4 Case study- Kitcisakik

Kitcisakik is an Algonquin community (population 385) located in the Réserve faunique La Vérendrye in Quebec (Canada). The territory (5227 km2) is composed of

mixedwood forest within the yellow birch bioclimatic zone of the boreal forest. The environment is a key component of the Kitcisakik culture. According to Papatie (2004) the community members are the guardians of this territory and have the responsibility of ensuring its "harmonious" use to preserve its heritage for future generations. However there are 15 beneficiaries active and annually logging a total of

Figure 5.1 Kitcisakik territory showing roads



43 km^2 per year (Papatie, 2004). There are 4834km of roads in Kitcisakik (figure 5.1) most if not all were built for forestry purposes. The territory is therefore marked by the effects of logging activities as well as intensive road networks. Since 1998, the Kitcisakik community developed the forestry committee in order to get involved in forest management and ensure that forestry activities are adapted to their goals and values (Papatie, 2004). The Kitcisakik community proves to be an appropriate candidate for integration efforts in forest management.

5.4.1 The differing methods and emergence of roads as way to frame the problem of forestry activities in Kitcisakik

We approached the Kitcisakik forestry committee to identify priority issues concerning changes in the forest on their territory. The ultimate goal was to improve understanding of Aboriginal forestry issues such that Aboriginal values could be better integrated in management decision. We specifically targeted individuals who had worked for or in association with the Kitcisakik forestry committee such that they held a high level of interest and knowledge of forestry issues in the territory. Half of the individuals were between the ages of 18 and 35 and the other half between the ages 36-50 (only one member is considered an elder in the community). This study occurred in two phases and accessed two types of knowledge. Eleven (9-males, 2-females) and ten individuals (8-males, 2- females) participated in the first and second phase of the research respectively (3 members participated in both phases (1 young, 1 elder, 1 older)).

The first phase explored the faces of ecological knowledge which have been more acceptable to managers as mentioned by Houde (2007). In other words, Aboriginal contribution was viewed as a body of factual and specific observations that could be used to better monitor ecosystem health and better measure ecological changes. More specifically, we wanted to get an Aboriginal perspective on the

impacts (those documented by forest inventories and scientific studies) of forestry operations on forest ecology in Kitcisakik's territory (changes in species composition, changes in forest structure and the declining abundance of certain species). By exposing, validating and discussing known changes in the forest (those identified by Grondin et al, 2003, a,b,c) we expected to attain a deeper understanding of Aboriginal forest ecological values as affected by forestry practices and use it to improve management decisions. However, instead of discussing at length how the documented changes in the forest affected the community to get an idea of *what* should be integrated (our questions), we were diverted by our research respondents to the issue of roads which according to this community served as a better platform to discuss the impact of forestry activities in their territory. Although identified forest changes such as an increased presence of deciduous species on the territory, the increased presence of balsam fir, the decreasing presence of old forests, the reduced abundance of specific species such as white pine and eastern red cedar emerged as important issues (Grondin et al, 2003, a,b,c); the most important issue to the committee members interviewed emerged independently and related to the amount of roads in the territory. The issue of roads emerged: in a survey; as the focus of conversation during a field visit of what the respondents identified as forestry activities of concern; and in a focus group discussion. Evidently when it came to identifying important forestry impacts, the Kitcisakik forestry committee wanted to discuss roads.

The second phase of the research therefore aimed at understanding the issue of roads and how it pertained to forestry activities. On one hand, we aimed at breaking down the issue of roads with the hope of finding a link between forestry activities, roads and the Kitcisakik forestry committee perception. This approach to accessing Aboriginal information is similar to that found in the previous phase (seeking observational and factual type of knowledge) where we sought specific information within a highly categorised form of the problem. We used true or false questions to

help lead into open ended questions on the effects of roads as environmental, access and use, or road type and condition issues:

Effects of roads on the forest (for example health, trees, fauna)

Road use by hunters, Aboriginal peoples, community members, and industry

Road type (primary, secondary, tertiary, paved, and size)

Road condition (use by ATV, cars, maintenance)

Road location (are roads in sacred areas, or important community areas)

Amount of road on the territory (too many or not enough roads)

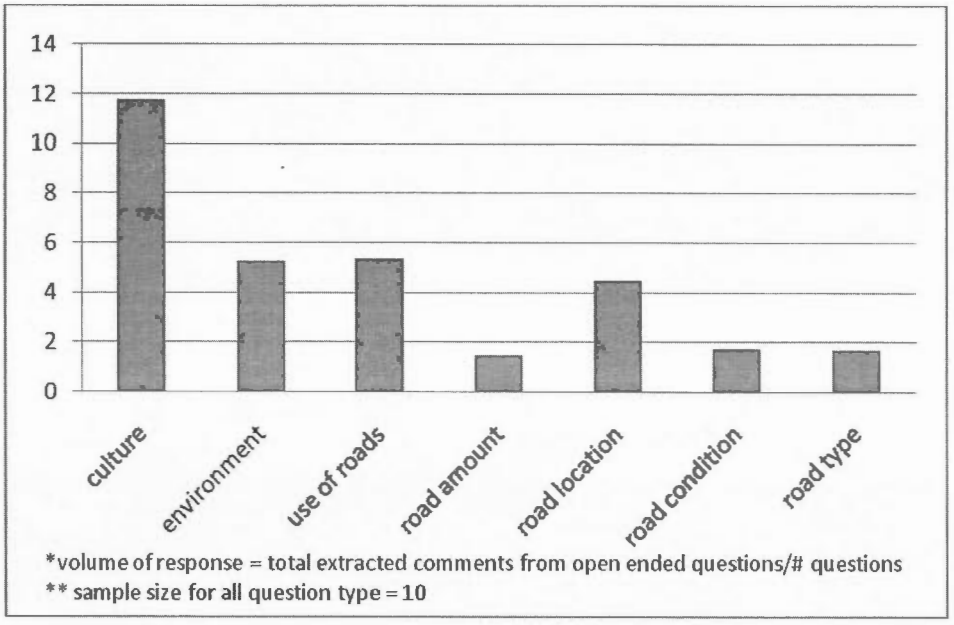
Alongside this method however, we also sought the more abstract forms of ecological knowledge by using community cultural references. We used the underlying principles by which the community identifies itself: honesty, respect, mutual aid and sharing. We asked if roads affected these principles (found in *AKI* - a Kitcisakik community guide to relating with the environment and people, and were known by all community members interviewed). They can be defined as an informal institution as described by Colding and Folke (2001) where: a) institutions are defined as the rules and norms that structure human interaction, including their enforcement characteristics and sanctioning mechanisms; and b) institutions are informal because they portray norms of behaviour, conventions, self-imposed codes of conduct, and their enforcement characteristics. In terms of Houde's (2007) classification, exploring knowledge from such a perspective could draw out the ethics and values dimensions of ecological knowledge: "the expression of values concerning correct attitudes, often identified as values of respect, to adopt toward nonhuman animals, the environment in general, and between humans". In this phase all questions were asked in random order and interviews lasted between one and two hours.

5.4.2 Different methods, different response

From a methodological perspective, this research demonstrates the value of using Aboriginal knowledge beyond that of factual observation, classification, and systems. In phase one for example, had we insisted on limiting Aboriginal contribution to a complementary form of the scientifically documented impacts of forestry activities on the territory, we would have missed the important effects of roads. Roads would remain an asymptomatic issue related to strategic and operational forestry strategies.

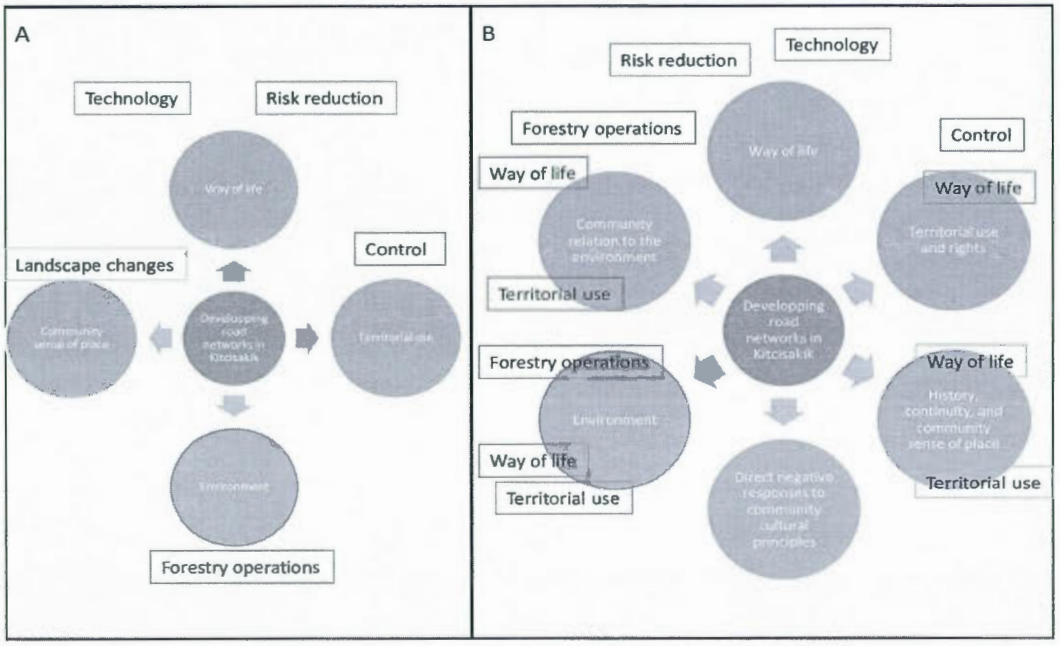
Furthermore, the volume of responses differed between the factual and more abstract types of Aboriginal knowledge sought in phase two. Respondents seem to have more facility to participate in the interviews when questions are framed with cultural references rather than when specific information is sought (figure 5.2). In this phase,

Figure 5.2 Volume of response* according to question type**



the richness of the information gathered was also greater when the issue was culturally framed (figure 5.3). The themes extracted from the interviews and the portrait of interactions between roads, forestry, environment and community were greater when the cultural element was present (figure 5.3). Therefore, although seeking information from this type of knowledge may seem abstract, it was a better platform for participants to express their views. In effect it allowed the Aboriginal respondents to frame the issue themselves based on their social and cultural context. This research therefore demonstrated that using an informal institution was a good method to gather information and garner participant response.

Figure 5.3.Portrait of the impacts of roads for the Kitcisakik forestry committee, derived from questions pertaining to the effects of roads on the environment, road use and road location issues (A); and questions pertaining to the effects of roads on culture (Kitcisakik community principle) (B).



5.4.3 Different methods, differences in the Aboriginal portrait

Although framing the issue with cultural references to access ecological knowledge may be abstract from a scientific perspective, in combination with the factual body of information proved useful to improve manager appreciation for Aboriginal issues. The following paragraphs will highlight the differences in the results emerging from the use of informal institutions and cultural references.

5.4.3.1 Difference #1:

An important general problem in forest management was raised: roads. Although forestry is a significant contributor to expanding road networks their impacts are often limited to minimizing costs and access to resources (Baskent and Keles, 2005). Although it would be expected that facilitation and access derived from roads could be viewed as a positive change to the community, in effect it also has some significant negative effects. As mentioned by Merkel (2007), while some changes may be seen as a positive force, change is generally a painful process in Aboriginal communities. This research demonstrates that roads have produced rapid development pressures for the community and contributed to changes which have affected culture, community and the forest environment (figure 5.3).

5.4.3.2 Difference #2

Going beyond the use of Aboriginal factual knowledge improved the quality and relevance of information for Aboriginal peoples. More specifically, the portrait created out of knowledge derived from Aboriginal institutions better represent Aboriginal cultural, social and environmental realities.

An accurate Aboriginal portrait is important to understand the issues the community faces with forestry activities. It is through this portrait that managers will know what values need and can be integrated to better adapt forest management

strategies. This study showed that associating forestry impacts to culture and Aboriginal informal institutions as well as using roads as a platform of discussion allowed respondents to express the many levels of impacts (figure 5.3). More specifically, the interviews showed that because forestry roads are everywhere and provide easy and fast access to the territory the following community values have been affected: a) way of life, b) environment, c) community relation with the environment, d) territorial use and rights, e) history, continuity and sense of place, f) cultural principles (Figure 5.3, table 5.1).

Furthermore, the use of informal institutions and cultural references effectively portray the socio-environmental realities the Kitcisakik community face with forestry activities. Indeed analysis of affected community values reflects issues which are culturally, socially and contextually bound. More specifically these results highlight issues which are bound to a community where tradition is important but contemporary life styles are emerging (Table 5.1). In the interviews for example, changes in hunting and trapping due to forest roads emerged as issues affecting the community, the individual, relations with the environment, and inter-community relations. The contemporary hunting strategies introduced with forestry roads include: 1) ease and speed of access to hunting grounds, 2) hunting and trapping becoming a skill which is increasingly available to all. However, the cultural norms which have traditionally dictated how hunting and trapping should be practiced have been affected.

At the community level, the following changes were noted in the interviews (table 5.1): the role and traditional knowledge of hunters has changed now that hunting skills are believed to be accessible to all, permission to hunt is no longer requested, and sharing of the products is no longer practiced.

Table 5.1. A Kitcisakik perspective of the effects of roads as organised by themes (translated from french).

Theme	Keywords	Examples of interview extracts
Way of life	ease, everyone can	"It has become easy to hunt ... Now everybody can and fast"
	trapper, garde chasse	"The kill can be taken and cleaned by one person and they can do it quickly."
	solitary, individual, alone	"Now roads are there, he is capable on his own"
	Freezer	"Respect is lost... People now hunt to fill their 3 freezers"
	food storage	"People permit themselves to come in (my territory)... They are stealing from my food storage.'
	way of life	"People no longer walk like they used to. According to elders, there is an effect of laziness."
Territorial use and rights	permission, asking, permit, being there (without permission)	"The young will hunt and use ancestral rights as a justification.... They no longer care about the future of the resources."
	ancestral rights	"Everyone has access, anyone can permit themselves to come in (the territory)"
	Access	"The occupation/use of the territory has changed, there is no longer a garde chasse"
	Occupy	
History, continuity, and sense of place	transmission, communication	"People no longer respect each other, they don't ask anymore, they just occupy, transmission is not occurring."
	respect of life	"The notion of values have exploded, the values of life, the notion of guardianship, the traditions of hunting are no longer practiced."
	Life	
	value of life	
Environment		"The animals are looking for shelter"
		"The health of the forest has changed, the forest is too young, medicinal plants, birds, lakes and fish have changed"
		"The forest is ugly because of roads, it is not the same view (landscape) as before"
Community relations with the environment		"Moose see everything going on with and within families, they will not resist"
		"The people no longer hear nor see songs"
Cultural principles	antonyms to the 4 principles (honesty, respect, mutual aid, sharing)	"People help each other less and less ... Actually there is help but it isn't mutual help"
		"Weariness has replaced trust"
		"People used to share but now they just fill their freezers"

At the individual level, people hunt because they can, quickly and as much as they can. This is in contrast to the role of Aboriginal rights and Aboriginal respect for nature in dictating hunting practices.

At the environmental level, changes have been noted in the experience people will attain from hunting practices now that access has increased. Hunting strategies have been made so easy that knowledge and environmental experience is only minimally required thus affecting people's relation and respect for nature (table 5.1).

Inter-community relations have also been affected. Respondents noted some concerns over the hunting and trapping practiced by neighbouring Aboriginal communities. In the community, the principle of respect has been replaced by a sense of weariness due to the increased use of the territory.

These changes exemplify how community and environmental bonds have decreased to benefit individualistic tendencies. It is in these relationships and the multi-level associations emerging when informal institutions and cultural references are used, that a rich portrait of community issues can surface. Furthermore, this portrait is up to date in terms of the community pressures including in this example: pressures to fight for Aboriginal rights, pressures to maintain traditional ways, pressures for respect, pressures to occupy and use the territory and pressures to maintain their relationship and knowledge of their environment.

5.4.3.3 Difference #3

The use of informal institutions and cultural references has also allowed Aboriginal modes of expression to permeate. More specifically, the results resemble fuzzy logic in that, relationships rather than listing forestry impacts were important. Roads were chosen by the participants as a platform to discuss these relationships. Fuzzy logic has been associated to Aboriginal modes of expressions by Berkes (2008)

and is described as: "a *mathematical approach for dealing with complex systems where only approximate information on components and connections are available. It is a way to deal with uncertainty and uses rules of thumb. It is suitable for concepts and systems that do not have sharply defined boundaries, or where the information is incomplete or unreliable.*" Although a portrait of the effects of roads on culture, environment and community dynamics was established, we cannot conclude that the links and associations which emerged in the interviews are a direct result of roads alone (see boxes in figure 5.3).

For example, in this study the concerns over the effects of forest roads on community way of life are not unique to roads. More specifically, the interview supports Merkel's (2007) argument that "increased exposure to alternative lifestyles has generally decreased the Aboriginal community dependence on the land for sustenance, particularly among younger population. It means that skills are being lost as people are spending less time in these traditional pursuits". In the interviews, respondents highlighted that the community historically viewed the environment as, among other things, a community source of food. Its use was dictated by the cultural principles (sharing, respect, entre aide and honesty). However, the prominent use of freezers, the ease and rapid access to resources have confounded the definition of food storage:

The road network is so widespread that hunting can be done from the road side. "People no longer walk like they used to. According to elders this produces an effect of laziness."

The people now hunt to fill their freezers. The relationship to the environment is changing where the environment is becoming an easy pool of resources for the individual and storage has been moved to the home.

These are significant cultural changes affecting Aboriginal perspectives for the environment and the community. However, ease and rapid communication measures also have positive effects on the community such as reducing risk (pressures to hunt for subsistence are diminished) and are sought by community members through technological advances (vehicles and ATVs for transportation and freezers for storage). Therefore it may be questioned whether roads alone are the cause of changes in community way of life.

Also, the loss in the value of family territory was raised in the interviews as an effect of forest roads on territorial use and rights. More specifically, the most prominent word extracted from the interviews pertained to the lack of permission in territorial use by all users whether Aboriginal or non-Aboriginal. A sense of powerlessness and lack of control over territorial use emerges from the responses. People just occupy the territory, they just use it as they see fit and the family territory has lost its values. Community members feel they are being robbed by all. This however is not only an issue of developing road networks or forestry activities. It is also an issue of property rights, their enforcement and their evolution.

The fact that a direct link between roads and these impacts was not obtained is not a problem but an expression of Aboriginal modes of framing and expressing issues. This is consistent with Stevenson's (2006) description of Aboriginal worldviews in management. Managers tend to create units while Aboriginal managers will not necessarily manage specific resources but the relationships to their lands and resources and to each other. Using informal institutions and cultural references have indeed focussed on the relationships affected, and the important community values.

5.5 Conclusion

This article demonstrates that using informal institutions and cultural references has been successful in accessing some of the different faces of Aboriginal knowledge. It supports previous studies which highlighted the importance of culture when Aboriginal relationships with the land are explored (Davidson-Hunt and Berkes, 2003; Karjala et al., 2004; Lévesque and Montpetit, 1997). Adam and Kneeshaw (2009) mention a consistent oversight of culturally defined means of expressing Aboriginal knowledge and management systems. More specifically, in terms of forest sustainability, Aboriginal communities do not dissociate culture from the environment and thus forest values from forest condition (Adam and Kneeshaw, 2008). Papaik et al (2008) also mentioned the importance of understanding differences in culture and scales of perception to improve local stakeholder participation and thus sustainability. The portrait which emerged from this study successfully incorporates this cultural dimension.

The results gathered from such methods have been useful in: 1) garnering respondent participation, 2) exposing the various levels of impacts, 3) surfacing information which is socially, culturally and contextually bound, and 4) tuned to community realities and issues which are temporally bound. This is important because as mentioned by O'Flaherty (2008) there is a need to go beyond documenting and sharing information but mobilizing and ensuring continuity. Accessing knowledge alone does not engage indigenous people and their role as the carriers of this knowledge. Indeed knowledge is entwined with power and institutional interests (Foucault, 1980), and without its social and cultural context it cannot adapt to ever changing social realities. According to Agrawal (1995) all knowledge systems are subject to constant advances in methodologies. We need to use Aboriginal institutions of knowledge to ensure that frameworks are embedded in a social context which

although based on tradition, they are also adapted to community contemporary realities.

Investigating the means of accessing the richness of Aboriginal knowledge and modes of expression is important because it can depict Aboriginal forestry perspectives which can help managers better appreciate community socio-environmental dynamics. Although recent efforts such as Jacqmain (2007 and 2008) have been successful in incorporating Aboriginal values, objectives and knowledge to change forestry activities it cannot be said that there is integration to the extent of creating an Aboriginal forestry. Although Conklin (1997) mentions "all politics are conducted by adjusting one's discourse to the language and goals of others, selectively deploying ideas and symbolic resources to create bases for alliance"; we however cannot limit Aboriginal contribution to being a complementary source of information. Leach (2008) also highlighted that resource development needs to go beyond the western frame to better include "human /ecological dynamics, history, path dependency, and the ways in which different people frame or construct problems". As mentioned by Berkes and Berkes (2008) "the challenge is to find appropriate ways of bridging Western science and indigenous knowledge without absorbing the diversity of knowledge traditions into one dominant science". Aboriginal ways of knowing and relating to the natural world can serve as their own tool to help management strategies. Approaching the integration of Aboriginal values and objectives with greater acknowledgement of the varying Aboriginal institutions and modes of expression will get managers closer to re-thinking forest management and defining Aboriginal forestry.

CONCLUSION

There are high expectations from both forest managers and Aboriginal communities that developing and using C&I towards SFM will lead to Aboriginally adapted forestry strategies. Indeed, C&I is a recognized tool also used to advance SFM with the translation of Aboriginal values to evaluate, implement and conceptualize SFM. However, we initially asked if C&I as a tool can be effective in addressing the persisting feelings from Aboriginal communities that their interests are minimized, and their environmental values poorly incorporated. What and why are some of the environmental values so difficult to incorporate? And, are some of these persisting issues inherent in the tool itself or in its use? In this dissertation we have been able to elucidate the strength and weaknesses of this tool.

Weaknesses in C&I

Key concern and some elements have been identified to ensure the effective integration of Aboriginal environmental values. Conceptual challenges have been identified associated with the elaboration and application of C&I in an Aboriginal context. When we reviewed the literature about the methods used to elaborate C&I, we noted for example, that C&I are a modern means of expressing sustainability and by their compartmentalized structure are foreign to Aboriginal peoples. At times they may require the translation of Aboriginal values which may lead to some loss of Aboriginal information and knowledge. C&I's compartmentalized and hierarchal

format does not provide space for the Aboriginal importance attributed to relationships (Natcher et al. 2002; Berkes 2008; Stevenson 2006; Cheveau et al. 2008).

A review of the methods used to elaborate C&I and expert opinion on the use of C&I showed that in order for C&I to generate change and not become "just another reference point", C&I need to include feedback mechanisms with the communities (Colfer et al. 2001; McCool and Stankey 2004). When using C&I, a complementary process acknowledging that Aboriginal communities have a dynamic and changing relation to the environment is required. More specifically, once C&I have been elaborated, they need to be interpreted within the appropriate context. As mentioned by Senge et al. (2004), humans are not tape-recorders just recording their environment. They actually participate with the environment. As a consequence, that relation needs to be characterized over time and the different Aboriginal repercussions due to environmental changes need to be accounted for. C&I need to be interpreted within a system where ecology, community, economy and culture are recognized as dynamic interrelating components.

Furthermore, according to the experts interviewed, although Aboriginal values are used to elaborate C&I to help conceptualize, implement and evaluate SFM; values are not involved in the process of implementation or evaluation. This has repercussions on the intended cross-cultural dialogue. C&I can initiate a cross cultural dialogue by incorporating Aboriginal values. However, using C&I to agree on outcomes does not ensure that a cross-cultural dialogue is maintained. C&I need to also account for Aboriginal objectives in order to effectively influence decisions. Like Beierle (2002) who studied stakeholder processes, C&I have many and varied purposes for Aboriginal communities beyond making decisions including: control, power, engagement, representation and capacity building. They represent the community context within which C&I need to function in order to be effective. They

also represent Aboriginal community objectives which need to emerge in C&I. Integration of Aboriginal values in C&I requires a respectful interaction between Aboriginal peoples and forest managers (Parson and Prest, 2003). This interaction also needs to be established with a long term perspective. Like Natcher et al. (2002) ongoing learning on both parts needs to be promoted.

Strengths in C&I

The results demonstrate that Aboriginal environmental values can be represented in C&I. This was highlighted by the experts interviewed who deemed C&I to be a good tool to translate Aboriginal interests for use by managers. The review of the methods used to elaborate C&I also showed that C&I are an effective platform to discuss and put forth Aboriginal interests (Fraser et al. 2006; Hartanto et al. 2002). Aboriginal environmental values were specifically extracted when we compared the ecological indicators of Aboriginal and non-Aboriginal local level C&I frameworks. The nature of the difference between Aboriginal and non-Aboriginal C&I was in the cultural nuance expressed with the ecological indicators. There is therefore sufficient evidence showing that specific Aboriginal environmental values are associated with C&I. In this study, they have taken the form of an Aboriginal cultural expression and representation of Aboriginal community context.

Compounding the weaknesses and the strengths of C&I for Aboriginal environmental values, the results suggest that the issue lies more in the interpretation of C&I and Aboriginal environmental values than on C&I as a tool. The results did show that although more work is required to include Aboriginal environmental values, the potential for them to be present in C&I is there. Indeed local level aboriginal C&I frameworks included 13 different indicators for the environment than non-Aboriginal frameworks. However interpretation problems occur when elaborating and using C&I which do not render Aboriginal ways visible, do not articulate value diversity, nor portray Aboriginal holistic patterns. The notion of integration is cautioned because

once Aboriginal values are translated for management, the essence of Aboriginal values and objectives are at risk of being lost through translation and adaptation efforts. Also, C&I as a tool focus on measurements. However, the idea that arriving at some form of measurable parameter which would help differentiate Aboriginal perceptions from non-Aboriginal perception, subscribes itself to the assembly line framework (Senge et al. 2004). At this point management becomes an issue of measurement in which case it dissociates itself from the reality it seeks to manage, its dynamic nature, and the broad application to society. Integrating an Aboriginal reality in forest management requires more than just finding means to measure environmental values. It also requires those measures to be interpreted according to an Aboriginal community context.

Aboriginal environmental values

By compounding what Aboriginal environmental values emerged in this dissertation, we have succeeded in beginning to characterize them. The importance of access to resources surfaced as an important Aboriginal environmental value in this dissertation. Access surfaced as one of the indicators which differed in Aboriginal C&I frameworks, and as the issue of choice to discuss the importance of environmental changes caused by forestry activities in Kitcisakik. Access to forest resources was consistently more complex in Aboriginal C&I frameworks where issues of resource sustainability were combined with access sustainability to include indicators of productivity, proximity, integrity and quality for resources used in traditional activities. This complexity was also emphasized when respondents discussed the effects of road development. Access issues included concerns over the effects on inter/intra Aboriginal, and socio-environmental dynamics. More importantly access was portrayed as a personal issue integrating many relationships. When the use of C&I was explored, access issues also indirectly surfaced as an

Aboriginal community objective for control over the territory to occupy and use the territory.

The relationship between Aboriginal culture, community and ecology was an important concept in Aboriginal environmental values emerging throughout. Through C&I and when discussing roads, it was constantly necessary to refer to Aboriginal culture along with environmental and ecological factors. Culture was the nuance which differentiated Aboriginal and non-Aboriginal C&I frameworks. The Aboriginal community objectives extracted when investigating the use of C&I reflect those of a culturally distinct population which emphasize that better representation and protection of their values is needed as well as continuing to occupy their territory according to their cultural ways. In characterising Aboriginal environmental values this dissertation shows that it is important to pay attention to culture and the relations between ecology, community, culture and environment. Culture is therefore an undissociable component of Aboriginal environmental values.

In the case study, when the effects of roads were discussed, the environment was: associated with trapping and hunting, a habitat for fauna and flora, a source of food, a source for and important for culture, a component of Aboriginal identity and a home, knowledge (spiritual, traditional, historical and for activities), a component of the the art of living. In C&I a cultural nuance was extracted from Aboriginal environmental values. Through C&I as a tool, Aboriginal indicators for the environment added a cultural nuance to the non-Aboriginal ecological indicators of SFM. Differences in Aboriginal C&I frameworks show an important Aboriginal cultural imprint on ecological factors and that sustainability issues are in effect a combination of forest conditions and values. Essentially the environment was referred to in terms of productivity, function and diversity as well as for aesthetic and traditional practices. In the case study this nuance was further characterised and also included socio-environmental dynamics.

Suggested further research

By compounding the methods used to extract these Aboriginal environmental values, we can begin to suggest methods to ensure that they are made visible and incorporate holistic patterns for use by managers.

The results obtained by characterising Aboriginal environmental values can be applied beyond just an Aboriginal context. For example, the results suggest that C&I, and their measures for access overly reduce access issues. Access is generally interpreted by the impact on resources and access to resources. Roads are often the indicators chosen to monitor and evaluate access. They are also generally reduced to their beneficial effects in promoting physical access to resources and markets, and their negative effects on the environment. However, when C&I are explored with Aboriginal perceptions, associations made at multiple levels. For example relationships between roads, forests, community, territorial occupation, forestry, and cultural principles were made. Forest management strategies to date tend to have difficulty incorporating the growing evidence of the negative impacts of roads in management. Although the removal, management, and monitoring of roads is a recognized issue for foresters, discussion is often limited to minimizing the total long-term costs of road construction, maintenance, and timber transportation (Anderson et al., 2006). Forestry industries have yet to consider a long-term vision of the spatial considerations associated with road development. According to Baskent and Keles (2005) and Bourgeois et al. (2005) roads are among the "variables" for which spatial considerations are often opted out by forest managers except to consider road configurations and layout options in the tactical and operational side of planning. As such road impacts at the landscape scale (environmental or social) cannot truly be accounted for, as they are primarily being developed to attain forest resources during forestry operations. This research emphasizes the need to consider the impacts of roads in management more explicitly and more widely. Using

Aboriginal preoccupations about roads and access could help further define sustainable forestry strategies and help re-think management such that forestry is better adapted to Aboriginal values and other stakeholder values.

Like Stevenson (2006) and Natcher et al. (2002), we sought to characterize Aboriginal values using various methods including C&I, access theory, simulations and interviews. Methods which expose the integrative Aboriginal perception where relationships and culture are important need to be incorporated when C&I are to be interpreted. It was by using access theory that the relationships, cultural implications and the multiple levels of impacts were made visible. Unlike C&I which reduces systems to component parts, access theory describes systems with actors and various mechanisms. Access theory is based on the premise that issues are personal and changing in accordance with the mechanisms that drive them. Looking at methods such as access theory to help define and integrate Aboriginal values may be worth considering.

We only used the theory of access to explore the effects of roads, but the theory could be more widely used to explore the effects of forestry operations. The benefit would not be limited to characterizing Aboriginal values but could also benefit forest management in general. For example, although we don't explore the theory of access as a means to define Aboriginal values for forest management it emerges as an interesting option. The benefits this theory have evoked for Aboriginal purposes warrants further exploration.

We focused on Aboriginal values however, we also need to acknowledge the importance of the varying Aboriginal institutions and modes of expression in order to help re-thinking forest management and define Aboriginal forestry. There are many faces to ecological knowledge. According to Houde (2007), those considered in management processes tend to be in the form of: factual observation, classification

and system dynamics; management systems; and factual knowledge regarding past and current uses of the environment. However, ecological knowledge can also take the form of ethics and values, traditional ecological knowledge as a vector for cultural identity and cosmology (Houde, 2007). These are also difficult to incorporate in C&I and play an important role in making Aboriginal ways visible. Studies by Jacqmain et al (2007 and 2008) have confirmed that regardless of diverging forest vision, integration of Aboriginal knowledge can improve understanding of species in ecosystems, as well as lead to an appreciation of Aboriginal preoccupations for the negative impacts of certain forestry operations. The use of Aboriginal informal institutions and their knowledge was noted as an important variable in the second section of this study. In effect Aboriginal ways of knowing and relating to the natural world can and should serve as their own tool to help management strategies.

Conclusion

In order to effectively be used to influence decision making, Aboriginal values need to be integrated AND characterised. This research has demonstrated that C&I can integrate Aboriginal environmental values. C&I are a tool capable of translating and packaging Aboriginal values for use by managers. Their effectiveness is however dependent on their use, the presence of feedback mechanisms, efforts to portray holistic patterns of Aboriginal ways, explicitly incorporating Aboriginal community objectives and continually maintaining a cross-cultural dialogue. In effect, C&I will only be an effective tool if they are explicitly connected to community reality and interpreted for their effect on socio-environmental relations. This research suggests that in order for this to occur, C&I need to be supplemented by other tools because in this study, C&I on their own were not sufficient to characterise Aboriginal environmental values.

Methods such as the theory of access, need to be used to better acknowledge and account for the dynamic nature, the importance of the community and cultural context

and the central role of relationships. This was demonstrated when the theory of access was used to characterize access issues related to road development. In effect, access emerged throughout this study as an important Aboriginal value. From an Aboriginal perspective, access is a complex and dynamic issue incorporating many actors both foreign and Aboriginal, as well as affecting relations with the environment and the territory through various mechanisms. The use of access theory effectively portrayed Aboriginal ways and the importance of relationships which need to be accounted for if changes will occur on their territory.

The conclusions of this study are therefore threefold: 1) although C&I can integrate Aboriginal environmental values they are missing the long-term, dynamic and holistic perspectives characteristic of Aboriginal ways; 2) Access emerges as an important Aboriginal environmental value which is complex and needs to be better accounted for in forest management; 3) Access theory highlights Aboriginal values that C&I do not: systems, relations, and culture.

REFERENCES

Adam, M.C., and D. Kneeshaw. 2008. Local level criteria and indicator frameworks: A tool used to assess Aboriginal forest ecosystem values. *Forest Ecology and Management* 255: 2024-2037.

Adam, M.C. and D. Kneeshaw. 2009. Formulating Aboriginal criteria and indicators: a synthesis. SFMN.

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26: 413-439.

Argyris, C. and Schon, D. 1978. Organizational learning: A theory of action perspective. Addison-Wesley, Reading, MA.

Armitage, D., M. Marschke, and R. Plummer. 2008. Adaptive co-management and the paradox of learning. *Global environmental Change* 18: 86-98.

Assembly of the First Nations of Quebec and Labrador (FNQLSD). 2004. OPMVPN Forestry Tool Box (Steve Morel). URL: http://www.iddpnql.ca.

Ballard, H.L., M.E., Fernandez-Gimenez, and V.E. Sturtevant. 2008. Integration of local ecological knowledge and conventional science: a study of seven community based forestry organizations in the USA. *Ecology and Society* 13(2): 37.

Baskent, E.Z. and S. Keles. 2005. Spatial forest planning: A review. Ecological modelling 188 : 145-173.

Bass, S. 2002. Application of criteria and indicators to support sustainable forest management: some key issues. In: Raison, R.J., Brown, A.G., Flinn, D.W. (Eds.), Criteria and Indicators for Sustainable Forest Management. IUFRO Research Series 7. CABI Publishing, Oxford, pp. 19–37.

Banuri, T. and F. Apffel-Marglin (eds).1993. Who Will Save the Forests? Knowledge. Power and Environmental Destruction. London: Zed.

Beckley, T.M. 2000. Sustainability for whom: Social indicators for forest-dependent communities in Canada. Sustainable Forest Management Network project report 2000-34.

Beckley, T.M., J. Parkins, and R. Stedman. 2002. Indicators of forest-dependent community sustainability: The evolution of research. *Forestry Chronicle* 78(5): 626-636.

Beierle, T.C. 2002. The quality of stakeholder-based decisions. *Risk analysis* 22(4): 739-748.

Bell, S. 2001. Landscape pattern, perception and visualisation in the visual management of forests. *Landscape and urban planning* 54: 201-211.

Berkes, F. 1994. Co-management: Bridging the two solitudes. Northern Perspectives 22(2-3): 18-20.

Berkes, F. 2008. Sacred Ecology. second ed. Routledge, New York.

Berkes, F. 1999. Sacred ecology; traditional ecological knowledge and resource management. Taylor and Francis, Philadelphia, Pennsylvania, USA.

Berkes, F. and Berkes, M.K. 2008. Ecological complexity, fuzzy logic, and holism in indigenous knowledge. Futures 41:6-12.

Berkes, F. and N.J. Turner. 2006. Knowledge, learning and the evolution of conservation practice for socio-ecological system resilience. *Human ecology* 34(4): 479-494.

Berninger, K., D. Kneeshaw, and C., Messier. The role of cultural models in local perceptions of SFM—differences and similarities of interest groups from three boreal regions. J. Environ. Manage., in press.

Bhattacharya, A.K. and B. Basnyat. 2003. Empowering people through Joint Forest Management: a study from Madhya Pradesh (India). *Int. Forestry Rev.* 5 (4), 370–378.

Bourgeois, L., D. Kneeshaw, and G. Boisseau. 2005. Les routes forestières au Québec: les impacts environnementaux, sociaux et économiques. *VertigO* 6(2): 2-9.

Bradshaw, B. 2003. Questioning the credibility and capacity of community based resource management. *Can. Geogr.* 47 (2), 137–150.

Buchy, M. and S. Hoverman. 2000. Understanding public participation in forest planning: a review. *Forest Policy and Economics* 1: 15-25.

Bunnell, F.L., and D.J. Huggard. 1999. Biodiversity across spatial and temporal scales: problems and opportunities. *Forest Ecol. Manage.* 115, 113–126.

Burchfield, J.A. and J.M. Miller, S. Allen, R.F. Schroeder, T.Miller. 2003. Social implications of alternatives to clearcutting on the Tongass National Forest: an exploratory study of residents' responses to alternative silvicultural treatments in Hanus Bay, Alaska. Gen. Tech. Rep. PNW-GTR-575. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28p.

Canadian Council of Forest Ministers (CCFM). 1995. Defining sustainable forest management: a Canadian approach to criteria and indicators. Canadian Council of Forest Ministers, Ottawa, Canada. URL: http:// www.ccfm.org/ci/framain_e.html.

Canadian model forest network. 2000. A user's Guide to Local Level Indicators of Sustainable Forest Management: Experiences from the Canadian Model Forest Network. NRCAN, Ottawa.

Carabelli, E., and H. Bigsby, R. Cullen, P.L. Peri. 2007. Measuring sustainable forest management in Tierra del Fuego, Argentina. *J. Sust. Forestry* 24 (1), 85–108.

Castañeda, F. 2000. Criteria and indicators for sustainable forest management: International processes, current status and the way ahead. *Unasylva* 51(203): 34-40.

Chambers, R. 1997. Whose Reality Counts? Putting the Last First. Intermediate Technology, London.

Charmaz, K. 2000. Grounded theory: Objectivist and constructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of qualitative research (2nd ed., pp. 509-535). Thousand Oaks: Sage.

Cheveau, M., Imbeau, L., Drapeau, P., and Bélanger, L. 2008. Current status and future directions of traditional ecological knowledge in forest management: a review. Forestry Chronicle 84(2): 231-243.

Clark, W.C., and N.M. Dickson. 2003. Sustainability science: The emerging research program. *Proceedings of the National Academy of Sciences of the United States of America* 100(14): 8059-8061.

Coates, K., editor. 1992. Aboriginal land claims in Canada: a regional perspective. Copp Clark Pitman, Toronto, Canada.

Colding, J. and C. Folke. 2001 Social taboos: "invisible" systems of local resource management and biological conservation. *Ecological applications* 11: 584-600.

Colfer, C.J.P., Salim, A., Tiani, A.M., Tchikangwa, B., Sardjono, M.A., and Prabhu, R. 2001.Whose forest is this, anyway? *Criteria and Indicators of Sustainable Forest Management.* Raison R.J., Brown A.G., and Flinn D.W. (Eds), CAB International in Association with the International Union of Forestry Research Organizations (IUFRO), New York.

Conklin, B.A. 1997. Body paint, feathers, and VCRs: aesthetics and authenticity in Amazonian activism. American ethnologist 24(4): 711-737.

Coombes, B. 2007. Defending community? Indigeneity, self-determination and institutional ambivalence in the restoration of Lake Whakaki. *Geoforum* 38 (1), 60–72.

Côté, M.-A. and L. Bouthillier. 2002. Assessing the effect of public involvement processes in forest management in Quebec. *Forest Pol. Econ.* 4, 213–225.

Crist, M. R., B. O. Wilmer, and G. H. Aplet. 2005. Assessing the value of roadless areas in a conservation reserve strategy: Biodiversity and landscape connectivity in the Northern Rockies. *Journal of Applied Ecology* 42(1): 181-191.

Crown Five Year Operating Plan Forest Management District 19A (2003– 2008). 2002. Appendix C: Environmental Protection Guidelines for Ecologically& Culturally Based Forest Management in District 19: Stand Level Operation. URL: http://www.env.gov.nl.ca/env/Env/EA%202001/Project% 20Info/1062.htm.

Crown Five Year Strategy Plan Forest Management District 19A (2003–2008). 2002. Appendix C: Environmental Protection Guidelines for Ecologically&

Culturally Based Forest Management in District 19: Stand Level Operation. URL: http://www.env.gov.nl.ca/env/Env/EA%202001/Project%20Info/ 1062.htm.

Daigle, P. 2010. A summary of the environmental impacts of roads, management responses, and research gaps: A literature review. *BC Journal of Ecosystems and Management* 10(3):65–89.

Daniel, T.C. 2001. Whither scenic beauty? Visual landscape quality assessment in the 21st century. *Landscape and urban planning* 54: 267-281.

Davidson-Hunt, I.J. 2006. Adaptive learning networks: Developing resource management knowledge through social learning forums. Human Ecology 34 (4): 593-614.

Davidson-Hunt, I. and F. Berkes. 2003. Learning as you journey: Anishnaabe perception of social-ecological environments and adaptive learning. *Conservation ecology* 8(1): 5.

Dietz, T., E. Ostrom, and P. C. Stern. 2003. The struggle to govern the Commons. *Science* (302): 1907-1912.

Elseroad, A. C., P. Z. Fulé and W. W. Covington. 2003. Forest Road Revegetation: Effects of Seeding and Soil Amendments. *Ecological restoration* 21(3): 180-185.

Ettenger, K. and local elders, hunters and tallymen. 2002. Muskuuchii: Protecting a Traditional Iyiyuuch Wildlife Preserve and Sacred Site. URL: http:// www.gcc.ca/pdf/ENV000000006.pdf.

Fall, A. and J.A. Fall. 2001. Domain-specific language for models of landscape dynamics. *Ecological Modelling* 141: 1-18.

FAO. 1997. Forest Dependent Survival Strategies of Tribal women: Implications for Joint Forest Management in Andhra Pradesh, India. RAP Publication: 1997/24. Food and Agriculture Organization of the United Nations, Bangkok.

Fernandez-Gimenez, M.E., J. U. Hays, H. P. Huntington, R. Andrew, and W. Goodwin. 2008. Ambivalence toward formalizing customary resource management norms among Alaska native beluga whale hunters and Tohono O'odham livestock owners. *Human Organization* 67(2): 137-150.

First Nation of Québec and Labrador sustainable development institute, 2006. First Nation of Québec and Labrador Sustainable Development Strategy. URL: http://www.iddpnql.ca/fichiers/strategy_2006.pdf.

Folke, C., Carpenter, S., and Elmqvist, T. 2002. Resilience for sustainable development: building adaptive capacity in a world of transformations. International council for scientific unions (ICSU). Rainbow Series No. 3, Paris. (http://www.sou.gov.se/mvb/pdf/resiliens.pdf).

Ford, R.M., K.J.H. Williams, I.D. Bishop, and T. Webb. 2009a. The value basis for the social acceptability of clearfelling in Tasmania, Australia. *Landscape and urban planning* 90: 109-206.

Ford, R.M., K.J.H. Williams, I.D. Bishop, and J.E. Hickey. 2009b. Effects of information on the social acceptability of alternatives to clearfelling in Australian wet eucalypt forests. *Environmental management* 44: 1149-1162.

Forest stewardship council (FSC) Canada Working group. 2004. National Boreal Standard. Forest Stewardship Council Toronto, Canada. URL: http://www.fsccanada.org/pdf_document/BorealStandard_Aug04.pdf.

Forman, R. T. T. 2000. Estimate of the area affected ecologically by the road system in the United States. *Conservation biology* 14(1): 31-35.

Forest Stewardship Council (FSC) Canada Working Group. 2004. National Boreal Standard. Forest Stewardship Council, Toronto, Canada. (http://www.fsccanada.org/pdf_document/BorealStandard_Aug04.pdf).

Foucault, M. 1980. Power/Knowledge: Selected interviews and other writings 1972-1977 (Pantheon Books, New York).

Fraser, E.D.G., A.J. Dougill, W.E. Mabee, M. Reed, and P. McAlpine. 2006. Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. *Journal of Environmental Management* 78(2): 114-127.

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

Gladu, J.P. and C. Watkinson. 2004. Measuring sustainable forest management: a compilation of Aboriginal indicators. (DRAFT) A Report for the Canadian Model Forest Network-Aboriginal Strategic Initiative.

Glaser, B. G., and A.L. Strauss. 1967. The discovery of grounded theory: Strategies for qualitative research. New York: De Gruyter.

Grainger, S., E. Sherry, and G. Fondahl. 2006. The John Prince Research forest: evolution of a co-management partnership in northern British Columbia. *Forestry Chronicle* 82 (4), 484–495.

Grondin, P, L. Bélanger, V. Roy, J. Noël and D. Hotte. 2003a. «Envahissement des parterres de coupe par les feuillus de lumière (enfeuillement)». In Les enjeux de

biodiversité relatifs à la composition forestière, P Grondin et A. Cimon, p. 131-174: Ministère des ressource naturelles, de la faune et des parcs.

Grondin, P, J. Noël and D. Hotte. 2003b. «Raréfaction de l'épinette blanche dans les sapinières de la fôret boréale». In Les enjeux de biodiversité relatifs à la composition forestière, P Grondin et A. Cimon, p. 67-92: Ministère des Ressources naturelles, de la Faune et des Parcs.

Grondin, P., J. Noël and D. Hotte. 2003c. «Envahissement des parterres de coupe par le sapin en forët boréal». In Les enjeux de biodiversité relatifs à la composition forestière, P Grondin et A. Cimon, p. 15-44: Ministère des ressources naturelles, de la faune et des parcs.

Hart, 2000. Hart Environmental Data. URL: http://www.sustainablemeasures.com/ North Andover, MA.

Hartanto, H., M.C.B. Lorenzo, and A.L. Frio. 2002. Collective action and learning in developing a local monitoring system. *Int. Forestry Rev.* 4 (3), 184–195.

Hawley, A.W.L., E.E. Sherry , and C.J. Johnson. 2004. A biologists perspective on amalgamating traditional environmental knowledge and resource management. *BC J. Ecosyst. Manage.* 5 (1), 36–50.

Hernes, H.-K. and H.T. Sanderson. 1998. Institutional Design of Fisheries Co-Management: The Problem of Democracy and Representation. Paper Presented at "Crossing Boundaries," the Seventh Annual Conference of the International Association for the Study of Common Property, Vancouver, British Columbia, Canada, June 10-14.

Hickey, G.M. 2008. Evaluating sustainable forest management. *Ecological indicators* 8: 109-114.

Hickey, C.G. and M. Nelson. 2005. Partenariat entre les premières nations et le secteur forestier: une enquête national. Réseau de gestion durable des forêts, Edmonton (Alberta), 34 pp.

Hoekstra, T.W., T.F.H. Allen, J. Kay, and J.A. Tainter. 1998. Criteria and indicators for ecological and social system sustainability; with system management objectives. In: North America test of criteria and indicators of sustainable forestry. USDA Forest service: Inventory and Monitoring institute.

Holvoet, B. and B. Muys. 2004. Sustainable forest management worldwide: A comparative assessment of standards. *International Forestry Review* 6(2): 99-122.

Houde, N. 2007. The six faces of traditional ecological knowledge: challenges and opportunities for Canadian co-management arrangements. Ecology and society 12(2): 34.

Infield, M. 2001. Cultural values: a forgotten strategy for building community support for protected areas in Africa. *Conserv. Biol.* 15 (3), 800–802.

Innes, J.L., B. Wilson, and G.M. Hickey. 2004. Streamlining planning and reporting for sustainable forest management. International Perspectives on Streamlining Local-level Information for Sustainable Forest Management: 105-109.

International Council for Science (ICSU). 2002. Report of the Scientific and Technological Community to the World Summit on Sustainable Development. URL: www.icsu.org/Library/WSSD-Rep/Vol1.pdf.

Jacqmain, H. 2005. The Moose Habitat Project: Midterm Report 2004–2005 Presented to the Waswanapi Cree Model Forest and Ministry of Natural Resources, Wildlife and Parks.

Jacqmain, H. and L. Bélanger, S. Hilton, L. Bouthillier. 2007. Bridging native and scientific observations of snowshoe hare habitat restoration after clear cutting to set wildfire habitat management guidelines on Waswanipi Cree land. Canadian Journal of Forest Research 37: 530-539.

Jacqmain, h. And C. Dussault, R. Courtois, L. Bélanger. 2008. Moose-habitat relationships : integrating local Cree native knowledge and scientific findings in northern Québec. Canadian journal of forest research 38: 3120-3132.

Kant, S. and D. Brubacher. 2008. Aboriginal expectations and perceived effectiveness of forest management practices and forest certification in Ontario. *Forestry chronicle* 84(3): 378-391.

Karjala, M.K. and S.M. Dewhurst. 2003. Including Aboriginal issues in forest planning: a case study in central interior British Columbia, Canada. *Landscape Urban Plann.* 64, 1–17.

Karjala, M.K., E.E. Sherry, and S.M. Dewhurst. 2004. Criteria and indicators for sustainable forest planning: a framework for recording Aboriginal resource and social values. *Forest Pol. Econ.* 6, 95–110.

Kearney, A.R. 2001. Effects of an informational intervention on public reactions to clear cutting. *Society and natural resources* 14: 777-790.

Kimmins, JP. 2001. Visible and non-visible indicators of forest sustainability: beauty, beholders and belief systems. In: Sheppard, SRJ, Harshaw, HW (eds) Forests and landscapes linking ecology, sustainability and aesthetics, IUFRO Research Series #6. CABI Publishing in Association with IUFRO, Wallingford, Oxon, pp43-56.

Kneeshaw, D.D., A. Leduc, P. Drapeau, S. Gauthier, D. Paré, R. Doucet, R. Carignan, L. Bouthillier, and C. Messier. 1999. Development of integrated ecological

standards of sustainable forest management at an operational scale. Working Paper 1999–21 for Sustainable Forest Management Network.

Kneeshaw, D.D., A. Leduc, C. Messier, P. Drapeau, D. Paré, S. Gauthier, R. Carignan, R. Doucet, and L. Bouthillier. 2000. Developing biophysical indicators of sustainable forest management at an operational scale. *Forestry chronicle* 76: 482-493.

Krueckeberg, D. A. 1995. The difficult character of property. *Journal of the American planning association*. Summer 61(3):301.

Lane, M.B. 2006. The role of planning in achieving indigenous land justice and community goals. *Land use policy* 23: 385-394.

Larouche, M. 2007. La modélisation de scénarios d'aménagement forestier à l'échelle du paysage: un outil d'aide à la décision en foresterie autochtone. Mémoire de Maîtrise, Département des Sciences Biologiques, Université du Québec à Montréal.

Lawrence, A., K. Paudel, R. Barnes, and Y. Malla. 2006. Adaptive value of participatory biodiversity monitoring in community forestry. *Environ. Conserv.* 33 (4), 325–334.

Leach, M. 2008. Pathways to Sustainability in the forest? Misunderstood dynamics and the negotiation of knowledge, power, and policy. Environment and Planning A 40: 1783- 1795.

Leroux, J., Chamberland, R., Brazeau, E. et Dubé, C. 2004. Au pays des peaux de chagrin: Occupation et exploitation territoriale à Kitcisakik (Grand lac Victoria) au XX' siècle. Québec: Les Presses de l'Université Laval et le Musée canadien des civilisations.

Lévesque, C. and C. Montpetit. 1997. Toward the integrated and sustainable management of forestry activities in Eeyou Astchee: the development of a body of cultural, social and economic criteria and indicators. James Bay Advisory Committee on the environment, INRS Québec.

Lewis, J.L. and S.R.J. Sheppard. 2006. Culture and communication: can landscape visualization improve forest management consultation with indigenous communities? *Landscape Urban Plann.* 77 (3), 291–313.

McCool, S.F. and G.H. Stankey. 2004. Indicators of sustainability: challenges and opportunities at the interface of science and policy. *Environmental management* 33(3): 294-305.

McCool, S.F. and G. Stankey. 2001. Representing the future: a framework for evaluating the utility of indicators in the search for sustainable forest management. In: Brown, A.G., Flinn, D.W. (Eds.), Criteria and Indicators for Sustainable Forest Management. IUFRO Research Series No. 7. CABI Publishing, Oxford.

McDonald, G.T. and M.B. Lane. 2004. Converging global indicators for sustainable forest management. *Forest Policy and Economics* 6(1): 63-70.

McGregor, D. 2002. Indigenous knowledge in sustainable forest management: Community-based approaches achieve greater success. Forestry Chronicle 78 (6) : 833-836.

Meitner, M.J. 2004. Perceptions of forest landscapes. *Landscape and planning*: 435-440.

Mendoza, G.A. and R. Prabhu. 2000. Multiple criteria decision making approaches to assessing forest sustainability using criteria and indicators: a case study. *Forest Ecol. Manage.* 131 (1–3), 107–126.

Merkel, G. 2007. We are all connected: Globalization and community sustainability in the boreal forest, an Aboriginal perspective. *Forestry Chronicle* 83(3): 362-366.

Miller, A.M., I.J. Davidson-Hunt and P. Peters. 2010. Talking about fire: Pikangikum First Nation elders guiding fire management. *Can. J. For. Res.* 40(12): 2290–2301

Moller, H., F. Berkes, P. O'Brian Lyver, and M. Kislalioglu. 2004. Combining science and traditional ecological knowledge: monitoring populations for co-management. *Ecol. Soc.* 9 (3), 2.

Murali, K.S., R. Jagannatha Rao, P. Sudha, G. Sangeetha, I.K. Murthy, and N.H. Ravindranath. 2003. Evaluation studies of Joint Forest Management in India: social and institutional implications. *Int. J. Environ. Sust. Dev.* 2 (1), 19–35.

NAFA. 1995. An Aboriginal criterion for sustainable forest management. Position paper. http://nafaforestry.org/criterion/nafa_Aboriginal_criterion.pdf.

Nadasdy, P. 2005. The anti-politics of TEK: the institutionalization of co-management discourse and practice. Anthropologica: 47(2): 215-232.

Nassauer, J.I. 1995. Culture and changing landscape structure. *Landscape Ecol.* 10 (4), 229–237.

Natcher, D.C. 2001. Land use research and the duty to consult: A misrepresentation of the Aboriginal landscape. Land Use Policy 18(2): 113-122.

Natcher, D.C. and C.G. Hickey. 2002. A criteria and indicators approach to community development. Sustainable forest management network. Working Paper 2002–2.

Natcher, D.C. and C.G. Hickey. 2002. Putting the community back into community-based resource management: A criteria and indicators approach to sustainability. *Human Organization* 61(4): 350-363.

Natcher, D.C., S. Davis, and C.G. Hickey. 2005. Co-management: managing relationships, not resources. *Hum. Organ.* 64 (3), 240–250.

National Aboriginal Forestry association (NAFA), 1993. Strategy: Forest Land and Resources for Aboriginal Peoples. An intervention Submitted to the Royal Commission on Aboriginal Peoples. Ottawa, Ontario. URL: http// www.nafaforestry.org/publications.

National Forest Strategy Coalition (NFTC). 2003. National Forest Strategy (2003- 2008). A Sustainable Forest: The Canadian Commitment. (http://www.nafaforestry.org/docs/strategy2003.pdf)

Niemann,T. and J.L. Innes. 2004. Streamlining local-level information for sustainable forest management. In International perspectives on streamlining local-level information for sustainable forest management: A selection of papers from a conference held in Vancouver, Canada, August 28 – 29, 2004. Innes, J.L., Hickey, G.M., and Wilson, B., eds. 2004. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC.

Nelson, A., A. de Sherbinin, and F. Pozzi. 2006. Towards development of a high quality public domain global roads database. *Data Science Journal* 5: 223-265.

NRCAN. 2002. Waswanipi Cree Model forest- phase II: evaluation report. www2.nrcan.gc.ca/dmo/aeb/

O'Flaherty, R.M., I.J. Davidson-Hunt, and M. Manseau. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather forest initiative. *Ecology and Society* 13(1): 6.

Ostrom, E. 1990. Governing the commons: the evolution of the institutions for collective action. Cambridge: Cambridge university press.

Panagopoulos, T. 2009. Linking forestry, sustainability and aesthetics. *Ecological economics* 68: 2485-2489.

Papaik, M.J. and B. Sturtevant, C. Messier. 2008. Crossing scales and disciplines to achieve forest sustainability. Ecology and Society 13(1): 30.

Papatie, J. 2004.Vécu et réflexion de la communauté Anicinapek de Kitcisakik avec le régime forestier Québécois. Commission d'étude sur la gestion de la forêt publique Québécoise.

Pâquet, J. 2001. Public preferences of forest management practices in Québec. In Looking beyond the trees: Visual stewardship of the working forest. Visual resource management conference compendium. Kamloops, BC apr 17-19 2001. Http://www.for.gov.bc.ca/HFD/Pubs/Docs/MR/Rec034.htm.

Parrotta, J.A. and M. Agnoletti. 2007. Traditional forest knowledge: challenges and opportunities. *Forest Ecol. Manage.* 249 (1–2), 1–4.

Patriquin, M.N., J.R. Parkins, and R.C. Stedman. 2007. Socio-economic status of boreal communities in Canada. *Forestry* 80(3): 279-291.

Peluso, N. L. 1992. The ironwood problem: (mis)management and development of an extractive rainforest product. *Conservation Biology* 6(2): 210-219.

Pokharel, R.K. and H.O. Larsen. 2007. Local vs official criteria and indicators for evaluating community forest management. *Forestry* 80(2): 183-192.

Potvin, F., R. Courtois, and L. Bélanger. 1999. Short-term response of wildlife to clear-cutting in Quebec boreal forest: multiscale effects and management implication. *Can. J. Forest Resour.* 29, 1120–1127.

Ribe, R.G. 2006. Perceptions of forestry alternatives in the US Pacific Northwest: Information effects and acceptability distribution analysis. *Journal of environmental psychology* 26: 100-115.

Ribot, J. C. and N. L. Peluso. 2003. A theory of access. *Rural sociology* 68(2): 153-181.

Robinson, M.P. and Ross, M.M. 1997. Traditional land use and occupancy studies and their impact on forest planning and management in Alberta. Forestry chronicle 73(5): 596-605.

Robottom, I and Sauvé, L. 2003. Reflecting on Participatory Research in Environmental Education: Some Issues for Methodology. Canadian Journal of Environmental Education, 8: 111-128.

Rollins, R., M. Robson and D. Robinson. 2001. Towards increased citizen influence in Canadian forest management. *Environments* 29(2):21.

Ross, M.M. and P. Smith. 2002. Accomodation of Aboriginal rights: the need for an Aboriginal forest tenure. Sustainable Forest Management Network, Alberta.

Saint-Arnaud, M. 2009. Contribution à la définition d'une foresterie autochtone : le cas des Anicinapek de Kitcisakik. PhD thesis, University of Quebec in Montreal, Montreal, Quebec,Canada.

Saint Arnaud, M; Sauvé. L. et Kneeshaw, D. 2005. Forêt identitaire, forêt partagée : trajectoire d'une recherche participatice chez les Anicinapek de Kitcisakik (Québec, Canada). Vertigo 6(2).

Sathyapalan, J. 2005. Households' dependence on protected forests: Evidence from the western Ghats. *Indian Journal of Agricultural Economics* 60(1): 60-70

Sauvé, L. et Brunelle, R. 2003. Environnements, cultures et développements. Éducation relative à l'environnement – Regards, Recherches, Réflexions, 4, 378 p.

Sauvé, L. 1997. Pour une éducation relative à l'environnement - Éléments de design pédagogique, Guide de développement professionnel à l'intention des éducateurs, Montréal: Guérin - Eska, 2e édition, 361 p. Première édition: 1994.

Senge, P. and C.O. Scharmer, J. Jaworski, B.S. Flowers. 2005. Presence: An exploration of profound change in people, organizations, and society. Currency Book: New York, NY.

Sheppard S. 2001. Forest certification and aesthetics: proposed criteria and indicators for visible stewardship. In Looking beyond the trees: Visual stewardship of the working forest. Visual resource management conference compendium. Kamloops, BC apr 17-19 2001. Http://www.for.gov.bc.ca/HFD/Pubs/Docs/MR/Rec034.htm.

Sheppard, S. 2003. Knowing a socially sustainable forest when you see one: implications for results-based forestry. *Forestry chronicle* 79(5): 865-875.

Sheppard, S.R.J. and M. Meitner. 2005. Using multi-criteria analysis and visualisation for sustainable forest management planning with stakeholder groups. *Forest ecology and management* 207: 171-187.

Sheppard, S.R.J., H.W. Harshaw, and J.R. McBride. 2001. Priorities for reconciling sustainability and aesthetics in forest landscape management. In:

S.R.J.Sheppard, H.W. Harshaw (Eds.), Linking Ecology, Sustainability and Aesthetics. IUFRO Research Series No. 6, CABI Publishing, Oxford.

Sherry, E., R. Halseth, G. Fondahl, M. Karjala, and B. Leon. 2005. Local-level criteria and indicators: an Aboriginal perspective on sustainable forest management. *Forestry* 78 (5), 513–539.

Shields, D.J. and J.E. Mitchell. 1997. A hierarchical systems model of ecosystem management. Working paper. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Shields, D.J., S.V. Solar, and W.E. Martin. 2002. The role of values and objectives in communicating indicators of sustainability. *Ecological indicators* 2(2): 149-160.

Shindler, B. A., M. Brunson, and G. H. Stankey. 2002. Social acceptability of forest conditions and management practices: a problem analysis. Gen. Tech. Rep. PNW-GTR-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 68 p.

Sikor, T. and C. Lund. 2009. Access and property: a question of power and authority. *Development and change* 40(1): 1-22.

Smith, P. 2000. Inclusion before Streamlining: The Status of Data Collection on Aboriginal Issues in Sustainable Forest Management in Canada, for the Streamlining Local Level Information for Sustainable Forest Management Workshop, University of British Columbia, August 28-29, 2000

Smith, P. 2004. Inclusion before streamlining: the status of data collection on Aboriginal issues for sustainable forest management in Canada. International

Perspectives on Streamlining Local-level Information for Sustainable Forest Management: 94-104.

Smith, P. 1998. Aboriginal and treaty rights and Aboriginal participation: Essential elements of sustainable forest management. Forestry Chronicle 74(3): 327-333.

Spak, S. 2005. The position of indigenous knowledge in Canadian co-management organizations. Anthropologica 47(2): 233-246.

Stevenson, M. G. 2006. The Possibility of Difference: Rethinking Co-management. *Human Organization*; Summer 2006; 65.

Stevenson, M. and P. Perreault. 2008. Capacity for what? Capacity for whom? Aboriginal capacity and Canada's forest sector. Sustainable Forest Management Network, Edmonton, Alberta. 64pp.S

Stevenson, M.G. and J. Webb. 2003. Just another stakeholder? First Nations and sustainable forest management in the boreal forest. In towards sustainable forest management in the boreal forest, P.G. Burton, C. Messier, D.W. Smith and V. Adamowicz (editors), NRC Press, pp65-112.

Tindall, D.B. 2001. Variation in public values and visual quality preferences. In: Visual Resource Management Conference Compendium. Looking Beyond the Trees: Visual Stewardship of the Working Forest. Kamloops, BC, 17–19 April. URL: http://www.for.gov.bc.ca/HFD/Pubs/Docs/MR/Rec034.htm.

Tobias, T. N. 2010. Living Proof: The Essential Data-Collection Guide for Indigenous Use-and-Occupancy Map Surveys. UBCIC and Ecotrust Canada. 461pg. http://ubcic.bc.ca/News_Releases/UBCICNews12180901.htm

Trombulak, S. C. and C. A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14: 18-30.

Turner, N.J., R. Gregory, C. Brooks, L. Failing, and T. Satterfield. 2008. From Invisibility to Transparency: Identifying the Implications. *Ecology and Society* 13(2): 7.

Turnhout, E., M. Hisschemo¨ller, and H. Eijsackers. 2007. Ecological indicators: between the two fires of science and policy. *Ecol. Indicators* 7, 215–228.

Wilkie, D., E. Shaw, F. Rotberg, G. Morelli and P. Auzel. 2000. Roads, Development, and Conservation in the Congo Basin. *Conservation Biology* 14(6): 1614–1622.

Woodley, S., G. Alward, L. Iglesias Gutierrez, T. Hoekstra, B. Holt, L. Livingston, J. Loo, A. Skibicki, C.Williams, and P. Wright. 1999. North America Test of Criteria and Indicators of Sustainable Forestry. USDA Forest Service: Inventory and Monitoring Institute.

Wright, P.A., Alward, G., Colby, J.L., Hoeskstra, T.W., Tegler, B., and Turner, M. 2002. Monitoring for forest management unit scale sustainability: the local unit criteria and indicators development (LUCID) test (Management edition). Fort Collins, CO: USDA Forest Service Inventory and Monitoring Report No. 5 54.

Wu, J. 2006. Landscape ecology, cross-disciplinarity, and sustainability science. *Landscape Ecol.* 21, 1–4.

Wyatt, S. 2008. First Nations, forest lands and "Aboriginal forestry" in Canada: from exclusion to comanagement. *Can J For Res* 38: 171-180.

Yamasaki, S.H., M.A. Côté, D.D. Kneeshaw, M.J. Fortin, A. Fall, C. Messier, L. Bouthillier, A. Leduc, P. Drapeau, S. Gauthier, D. Paré, D. Greene, and R. Carignan.

2001. Integration of ecological knowledge, landscape modeling and public participation for the development of sustainable forest management. SFM Network Project 2001–27.

APPENDIX 1 VALIDATION EXERCISE

We interviewed J. Munroe, a representative in charge of resource development issues for the Maiyoo Keyoh, (interviewed 11/01/2010) as a validation exercise. In this validation exercise we asked how roads affected the Maiyoo Keyoh territory in order to determine whether similar issues would be observed in a different community at a different geographic site. All comments and ideas extracted from the interview were then checked and validated against the Québec data. The Maiyoo Keyoh (Keyoh is a family territory) of British Columbia (Canada) developed forestry scenarios to assist the members in participating in future development and establishment of management decisions in their forest (17013 Ha) which has undergone increasing forestry operations over the past 40 years. When defining scenario preferences, roads emerged as a determining parameter against many scenarios (Morben et al., 2009). Furthermore, the Maiyoo Keyoh are presently concerned with the resulting roads planned as a consequence of the increasing forestry activities in their territory (Morben et al., 2009). The level of disturbance as a result of forest operations is projected to increase from 17% to 84% of the territory.

The validation exercise raised similar preoccupations to those found in this study. The following paragraphs show how respect, value for the land, and socio-environmental dynamics have changed in association with road development.

The effects of roads on issues of respect and its effect on access mechanisms used to control and maintain access was raised. According to the respondent, traditional

Keyoh land use and rules have changed. "The passing of respect for Keyoh has been lost". The way people travel the land is different. People travel down a road and have to go through other Keyoh to use their Keyoh, traditional routes are no longer used so the rules have changed. As such the families of other Keyohs often feel they are disrespected.

Road hunting was also raised as an issue affecting land use, traditional practices and socio-environmental relations. "On one hand the older generations are disoriented by the new access mechanisms because they used to travel by trails and now they access by roads. On another hand the kids do not recognize the land in the same way as elders. People used to walk the trails now they use the roads. As a result their attachment to the land is challenged". The changes in knowledge (socio-environmental or territorial) which influence access mechanisms were therefore mentioned here as well. The environmental experience derived from the environment has been changed and is also creating generational conflicts.

Intra-, inter-Aboriginal relations have been affected by roads as well as foreign relations in this case. "We (the keyoh and community) avoid access to the land. We don't go because we don't want to be seen nor do we want hunters to know where the cabin is. We feel alienated from the land. This fear exists because of hunters but also because of all other users including natives. We (community and keyoh members) build cabins which are hidden. The land is no longer ours and we don't feel we can protect it ... so we hide. This is taxing to the community. We (the community) have meetings to plan how to protect our culture. There is so much change and activity which we need to synthesize, it is exhausting and at the same time we are on guard to preserve our relationship with the land." In this case we get a sense of a loss of control over who and how actors can benefit from the resources. Roads are disturbing the role of Aboriginal identity and Aboriginal rights in influencing access.

Morben, M. and M. Kirk, N. Farrer, D. Dolejsi, A. Sawden. 2009. Scenario Analysis for the Maiyoo Keyoh. Maiyoo Keyoh Society & University of British Columbia. FRST 424, April.

APPENDIX 2

CONFRONTING PERCEPTIONS OF ALTERNATIVE FOREST MANAGEMENT SCENARIOS IN AN ABORIGINAL COMMUNITY: THE EFFECTS OF PRESENTING TRADE-OFFS.

ADAM, M.C., D. KNEESHAW AND A. FALL

This section was meant as a bouncing board for future research. We use the results from the first two sections to begin thinking about other ways to accommodate Aboriginal environmental values in forest management. More specifically we explore Aboriginal relation to forest management indicators. We explore a bottom-up approach to better understand local implications and issues.

Trade-offs in indicators are explored as a medium to evaluate forestry goals/effects/scenarios and Aboriginal perceptions. Since informing regional stakeholders about the effects of different forest management operations has been shown to effect both values and perceptions (Berninger et al 2009), we wondered how providing information on the effects of simulated forest management scenarios to an Aboriginal community would affect acceptability of different forest management strategies. If, how and when do Aboriginal respondents change their perception and acceptability of forestry strategies? Will important trade-offs affect perceptions and acceptability and show important Aboriginal values?

2.1 Abstract

To date there is little evidence that the Aboriginal perceptions of forest management strategies have changed despite greater discussion between managers, scientists and communities. This study explores how simulated forestry scenarios that enhance knowledge of their consequences affect Aboriginal perceptions and acceptability. Through an Aboriginal case study and indicators of forest management that are relevant to both the community and management, we identify trade-offs among forestry strategies. We explored Aboriginal acceptability of forest strategies (CC- clear cut, PC- partial cut and mix-50/50 mix of clear cut and partial cut) based on simulated changes in the following forest management indicators: volume, type of cut, extent of forest operations, and roads. The results show that presenting trade-offs stimulated the cognitive based judgments and helped respondents shape acceptability and perceptions of forestry scenarios. Trade-offs between harvesting strategy, extent of forestry operations and road networks, for example, changed the acceptability of different harvest types. Acceptability of both clear cutting and partial cutting was dependent on the trade-offs presented. However, perception of partial cutting changed while clear cutting was consistently received with a strong negative attitude from respondents. It is suggested that perception of harvest types were complicated by past experiences. This study highlights that in order to arrive at acceptable Aboriginal forestry strategies, managers need to: 1) provide sufficient information to allow Aboriginal analysis of forest management scenarios; 2) present the trade-offs they entail; and 3) maintain a clear understanding of Aboriginal values and objectives as they are affected by forestry strategies.

Key words: Aboriginal forestry, acceptability, perception, trade-offs, alternative forest management, clear cut, partial cut, roads, volume, area harvested.

2.2 Résumé

Bien qu'aujourd'hui il y aie plus de discussions entre aménagistes, scientifiques et communautés, il y a cependant peu de preuves d'un changement dans les perceptions autochtones sur l'aménagement forestier. Cette étude explore comment les simulations de scénarios forestiers, qui augmentent les connaissances sur leurs conséquences, affectent les perceptions et l'acceptabilité autochtone pour ceux ci. Au travers d'une étude de cas autochtone et avec des indicateurs d'aménagement forestier pertinents pour les communautés et l'aménagement, nous identifions les compromis entre les différentes stratégies forestières. Nous explorons l'acceptabilité autochtone de ces stratégies (CC- coupe totale, PC- Coupe partielle, et un mélange de 50% de coupe totale et 50% de coupe partielle) basée sur les changements simulés pour les indicateurs d'aménagement forestier suivants : volume, type de coupe, étendue d'opération forestière et routes. Les résultats démontrent que la présentation des compromis a stimulé les jugements cognitifs et aidé les répondants à développer leur acceptabilité et perception des scénarios forestiers. Les compromis entre les stratégies forestières, l'étendue des opérations forestières et les routes, par exemple, ont changé l'acceptabilité des différents types de coupe. L'acceptabilité des coupes totales et des coupes partielles était dépendante des compromis présentés. Par contre, la perception des coupes partielles change alors que celle des coupes totales était constamment considérée négativement par les répondants. Il est suggéré que la perception des types de coupe a été compliquée par les expériences antérieures. Cette étude met en valeur la nécessité pour les aménagistes afin d'arriver à des stratégies forestières autochtones acceptables de : 1) mettre en place suffisamment d'informations pour permettre une analyse autochtone des scénarios d'aménagement forestier; 2) présenter les conséquences (répercussions) des compromis pour la communauté; 3) maintenir une compréhension des valeurs et des objectifs autochtones et de comment ceux ci sont affectés par les stratégies forestières.

Mots clefs : Foresterie autochtone, acceptabilité, perception, compromis, coupe totale, coupe partielle, route, volume, surface récoltée

2.3 Introduction

Developing Aboriginally acceptable forestry strategies has become an important task for many reasons including among others: sustainable forest management (SFM) initiatives; and assuming the responsibility of legislative mandates which recognize Aboriginal rights to use, occupy and benefit from their land. Although many efforts exist to define and include Aboriginal values and objectives (Natcher and Hickey, 2002; Karjala et al, 2004; Sherry et al, 2005; Saint Arnaud, 2009) these need to be paralleled with increased efforts to gain Aboriginal support for forest management.

This article specifically focuses on the difficult task of assessing Aboriginal acceptance of forestry strategies because Aboriginal support of forest management is currently lacking. The general impression among Aboriginal communities and organizations such as the National Aboriginal Forestry Association (NAFA) is that the importance of Aboriginal issues is minimized (Smith 2004).

Most acceptability studies have included Aboriginal perception as one set of perceptions among many other groups (Pâquet, J. 2001; Berninger et al., 2008; Burchfield et al., 2003). Although according to Kearney (2001), there is overlap in landscape preferences across different groups and cultures, Aboriginal peoples as a group are different. These differences are part of Burchfield et al. (2003) and Ford et al. (2009) list of important factors affecting acceptability judgments including the differences found in: Aboriginal culture, Aboriginal relation to the environment and Aboriginal social context (Agrawal, 1995; Banuri and Apfell-Marglin, 1993; Davidson-Hunt and Berkes, 2003). Many Aboriginal communities are associated with a strong sense of place as well as traditional, cultural and experience based knowledge of the forest and forestry activities which encourage important cognitive based judgments forming acceptability. Specifically defining and attaining Aboriginal perception and acceptability for forestry strategies is therefore pertinent.

Assessing acceptability is daunted by many challenges. In general, it is challenging because it requires determining how and what needs to be presented to

the public to ensure that appropriate perceptions are gathered so that acceptability can be assessed. According to Bell (2001) landscape perception is organized as "the physical aspects of the perception of visual stimuli, the intuitive recognition of an aesthetic quality and the ability of the mind to connect sensory information to other knowledge and so develop opinions about what has been perceived." We focus on the cognitive component of acceptability because although there are many studies evaluating the aesthetics of forestry strategies (Sheppard and Meitner, 2005; Lewis and Sheppard, 2005; Pâquet, 2001), recent evidence has demonstrated the importance of cognitive components in public decision processes. Burchfield et al. (2003) highlight that participant interpretations are based on both visual and cognitive reflections about the trade-offs of multiple resource objectives. More recently, Ford et al. (2009) suggest that acceptability ratings have a greater cognitive component than scenic beauty. The authors refer to the cognitive hierarchy model where human beliefs are organized in a structure with those which are more central to the personality being more stable (including values), and peripheral beliefs being more open to change (including attitudes to objects or in this case forest harvest). Values are organized into a system along a continuum of relative importance. The previously mentioned studies by Ford et al. (2009) and Burchfield et al. (2003) suggest that information does and can change acceptability of harvest systems and that there is a deeper social reason to forest harvest perceptions.

To date, most studies on acceptability and perception of forestry activities have not arrived at a consensus. According to a study by Burchfield et al. (2003) a single, optimum type of timber harvesting treatment does not appear to be a viable goal for attaining social support among residents. The authors mention the importance of going beyond stand level patterns to include cumulative effects, site specific considerations and scale (spatial and temporal considerations). Also in Ribe's (2006) study of 19 different treatments of forest management with residents from the US Pacific Northwest, perceptions remained conflicted. According to Kimmins (2001),

acceptability studies based on an aesthetic reaction are in effect a static representation of the landscape and do not accurately represent the temporal and landscape dynamics of ecology. According to Daniel (2001), lack of consensus on what landscape aesthetic quality is, constrains verification of the validity of perception based landscape aesthetic quality assessments. We suggest that efforts towards assessing perception and acceptability have focused too much on an ideal forest harvest system rather than an ideal justification of which harvest system to use in a territory. Indeed, Kearney (2001) mentions that the dilemma is in the trade-offs between public perception and factors such as ecological, economic goals and constraints. It therefore becomes questionable to seek acceptability of forestry strategies in isolation of the trade-offs and landscape objectives for which they were developed. Prioritizing and evaluating these trade-offs could help assess Aboriginal acceptability of forest strategies.

We focus on Aboriginal acceptability and perception of forestry strategies at a landscape scale with simulated temporal variations such that trade-offs between selected indicators can emerge. We used a case study approach to explore if perception and acceptability of forestry strategies will change when respondents are confronted with different sets of trade-offs.

2.4 Study area

Kitcisakik is the Aboriginal community for this case study. It is an Algonquin community (population= 385) located in the Réserve faunique La Vérendrye in Quebec (Canada). The community can be described as isolated from major centers and markets; the education level is low (82.3% do not have high school diploma, college certificate nor university degree), it is poor (35.3% employment rate), and community conditions are difficult (there is no permanent water, sewer or electricity facilities). The territory (5227 km^2) is composed of mixedwood boreal forest. Extensive forestry activities have occurred on the territory. At least 60% of the

territory has been harvested using largely clear cutting silviculture. Today 43 km^2 per year are logged on the territory (Papatie, 2004). Although there is an extensive and dense road network (4834km including all types of roads) present in Kitcisakik, the community persists as isolated from markets and major centers. Regardless of the high resource development pressures and consequential changes to the territory; the environment continues to be a key component of Kitcisakik culture and way of life. According to Papatie (2004) the community members are the guardians of this territory and have the responsibility to ensure that use and occupation patterns preserve its heritage for future generations.

2.5 Methods

2.5.1 Indicators and trade-off analysis

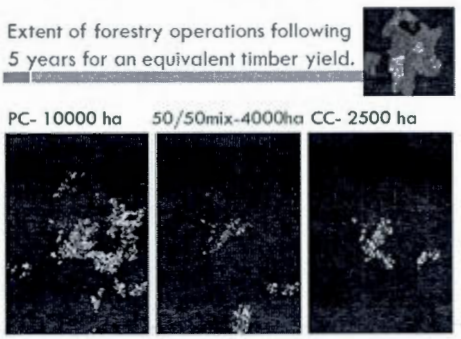
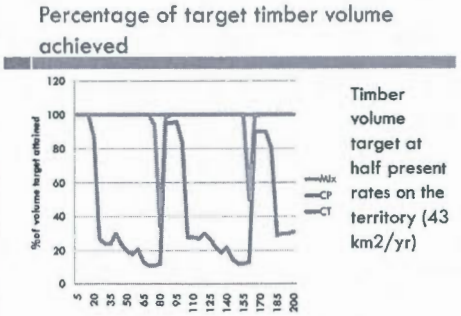
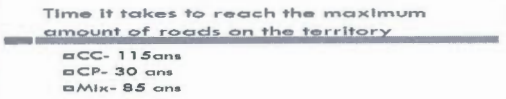
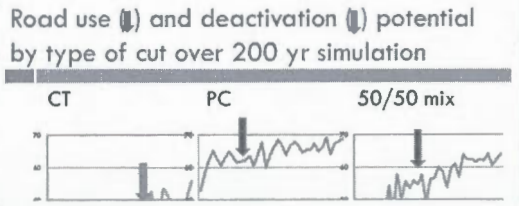
To assess ecological trade-offs between indicators we used the MAFK (Modèle d'Aménagement Forestier de Kitcisakik by Larouche, 2007) model developed using SELES (Spatially Explicit Landscape Event Simulator). SELES is a tool used to build spatially explicit simulations modeling the role of disturbances (in this case forestry operations) in creating and maintaining landscape structures (Fall and Fall, 2001). This study uses maps and simulated data to present the trends and trade-offs of different forest operation strategies.

The forestry strategies simulated were Clear Cut (CC), Partial Cut (PC) and 50/50 CC and PC (mix) scenarios over 200 years on the Kitcisakik territory. CC and PC were chosen because these forestry strategies have opposing effects on extent of forestry operations, roads and volume and can thus expose clear tradeoffs. The mix scenario serves as an intermediate forestry strategy and a compromise in the tradeoffs between CC and PC. All forest operation strategies followed the government of Quebec's forest operations regulations. More specifically the minimum harvest age was set at 75 years and block sizes were distributed as follows: 70% between 10-50ha, 20% between 50-100ha, and 10% larger than 100ha. Adjacency rules were set to not

allow any harvesting before 35 years (the time it takes for the regeneration to reach 7m in the region). The partial cut was set at a minimum where only 25% of the cohort over 75years was cut. The model functions with an area based estimation of potential harvest sites such that it would take 4 times the area to reach an equivalent timber yield for PC than CC. The model either simulated to control for timber yield or for area operated.

The trade-offs between the indicators (harvest type and extent of forest operation, road configurations (use, deactivation, time to saturation on the territory)) which were presented were gathered from the simulations and can be found in Table 2.1. These indicators were chosen for this study because they: could easily be modeled; were relevant to forest management and developing forestry strategies; and had connections with the community reported in previous studies by Larouche (2007) and Saint Arnaud (2009). From the resulting simulations a temporal series of maps showing changes in the indicators due to harvesting were presented. This was complemented with a trade-off analysis which was translated into relative terms (table 2.1) because we chose to focus on simulation trends and respondent perception rather than trying to determine optimal thresholds for each indicator. We compared respondent perception and acceptability of trade-offs associated with the indicators from the interviews with the expected preoccupations and information from the forestry committee and previous studies done in the community (Table 2.2).

Table 2.1Relative trade-offs between forestry strategies (CC,PC and mix) as simulated over a 200 yr period and by either controlling for volume or extent of forestry operations.

	Clear cut (CC)	Partial cut (PC)	MIX (50%CC+50%PC)	Example of simulation results presented
Extent of forest operation outside protected areas when volume is equivalent	Small	Large	Intermediate	
Potential for volume of wood extracted when extent of forestry operations are equivalent	High	Low	Medium	
Time it takes to reach the maximum amount of roads on the landscape when volume is equivalent	Slow	Fast	Medium	
Road use (as measured by traffic with harvesting and transporting extracted lumber purposes) by industry for the same volume	Low	High	Intermediate	

Road deactivation potential (roads which are not used for the last 5, 15, 20 years by industry) for the same volume	Yes	No	Not really	

Table 2.2. Rationale **for the indicators selected for the study and evidence of their relation to the community based on previous studies.**

Indicators	Roads	volume of timber harvested	Harvest type	extent of forest operation
Indicator rational	Access	Employment opportunities in the community	Potential for alternative forest operations on the territory	Protection as a strategy to relieve some of their forest preoccupations.
	Aboriginal territorial use and occupation	Community relations with the industry	Respondent associations with past forestry activities in the territory	Forestry presence and occupation of the territory
	Socio-environmental dynamics	Degree of deforestation		
	Community social and economic isolation	Sustainability of forestry activities on a territory		
	Forestry ecological footprint			
Known relation to the community based on previous studies	There are 4834km of roads in the territory which have been shown to affect community way of life (Saint Arnaud 2009, Adam et al (appendix 2))	The forestry industry offered occasional and seasonal work opportunities since the 1940s with variable success in the community. The relationship between community development and the forestry industry is not apparent (Leroux et al. 2004; Saint Arnaud 2009)	Past forestry strategies were dominated with clear cutting which according to community members left the forest devastated, ugly and desert like. Culturally and environmentally acceptable harvesting strategies seem difficult to conceive or trust but partial cuts seem to be a potential alternative (Saint Arnaud 2009)	More than 60% of the territory has been harvested today. There is a request to conserve and protect 21% of the forest on the territory (Saint Arnaud 2009)

2.5.2 Questionnaire and presentation

The forestry committee was approached for interviews because it is the Aboriginal institution in this community which best represents forest community objectives. The committee was specifically developed by Kitcisakik to: ensure the community's participation in forest management; protect Aboriginal values; and discuss measures in which management of some of the territory can be shared in the short term and measures in which self-governance and management can occur (Papatie, 2004). This committee was chosen because it represents community interests for the forest and because its members are the most educated and active in forest related issues.

Fourteen forestry committee members divided among 5 group sessions (4 groups of 2, and one group of 6 (of which only 2 completed the questionnaire)) were presented a paper copy and power point version of the questionnaire (1hr20min-2hr45min). Ten respondents completed the entire survey: 3 were young 18-35yrs (2M/1F), 5 were mid-aged 36-50yrs (all Males) and 2 were older 51-65yrs one of which is considered an elder (both Females). Recording the sessions was an issue for the respondents, so all notes were gathered with the presence of three presenters (an interviewer and 2 research assistants) in each interview session.

Simulations both controlled for and tested indicators to see their effects on each other. The questionnaires were based on simulation results. It should be noted that because the sample size is small, although results are presented quantitatively we do not focus on respondent choices in forestry strategies but rather the respondent changes in perception and acceptability when trade-offs are presented. The questionnaire sought acceptability ratings by asking respondents to choose forestry strategies as their effects on the indicators are presented. They also allowed an assessment of respondent perceptions because discussions about forestry strategies as related to the indicators presented were recorded. Dominant preoccupations as well as

respondent relation to the presented indicators and trade-offs were identified in these discussions. The effects of trade-offs were determined by noting if and when respondents would change their selection of forestry strategies.

Table 2.3.Indicator matrix and the resulting questions. The questionnaire sections (horizontal) were organized by varying one indicator and demonstrating its effect on the other indicators (vertical). Shaded boxes are questions which were included in the initial section. () shows the number of questions pertaining to interaction. Clear cut (CC), partial cut (PC) and 50/50 percent CC and PC (mix) are the harvest types. Roads were not included as section because their effects on forestry operations are limited in this model to availability of operations on the territory.

	Section in questionnaire (effect of varying this parameter on the indicators of vertical sections).		
	Extent of forest operation	**Harvest type**	**Volume**
Extent of forest operation	Varying extent of forest operations on map; grouped versus dispersed extent (2)	Extent of forest operations needed per type of cut to attain equivalent volume on map (1)	Map and bad graph showing the possible volume attainable per type of cut for a same extent of forest operation (1)
Harvest type	Maps showing varying extent of forest operations with: CC, PC, Mix (3)	Pictures and pictogram explaining PC versus CC (1)	Line graph showing attained and unattained volume over time per type of cut when the objective volume is the same (2)
Volume	X	Pictogram showing max volume attainable by type of cut (1)	On a map and explanation of past volume extracted on the territory, that the scenarios consider 21% protection of the territory to serve as a reference to determine what volume should be extracted in the future (1)
Roads	Maps of roads resulting from 3 scenarios (no mention of which scenario) showing the amount of roads, use of roads for forestry operations, deactivation potential (3)	Pictogram showing that time to max amount of roads varies by cut type; Line graph showing road use and deactivation potential per type of cut (3)	Maps showing that increasing volume leads to increase droads and decreased deactivation potential (2)
# of questions	9	8	6

There are three sections to the questionnaire. The indicator matrix in table 2.3 shows how questions were organized to ensure that the effects of forestry strategies on each indicator could be presented. The initial section evaluated respondent preference

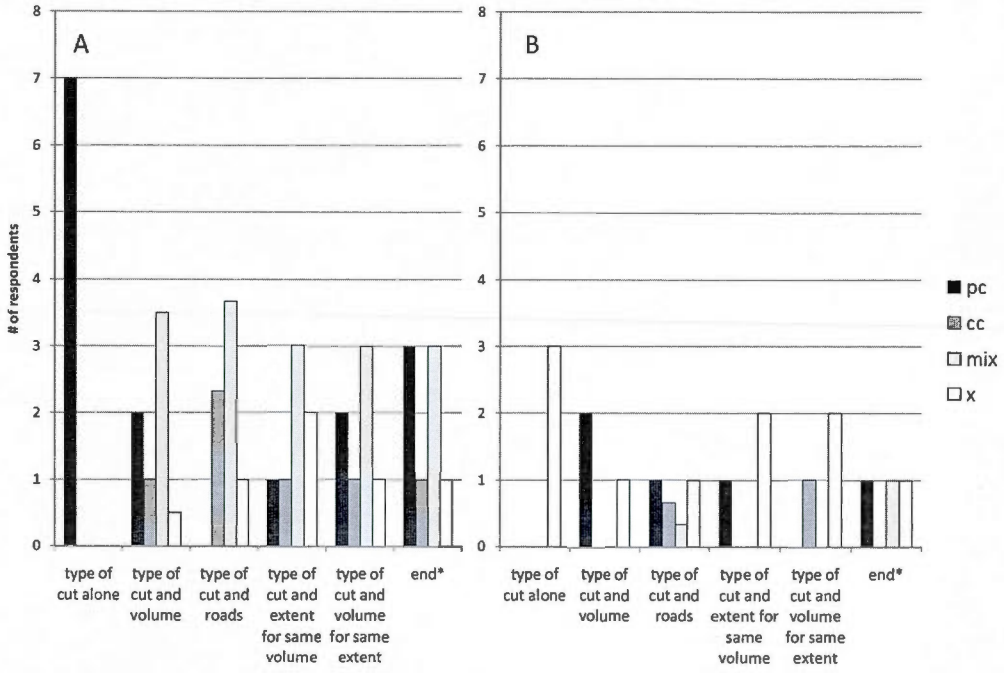
without considering trade-offs. The middle section was divided among indicator sections which controlled one indicator and tested its effect on the others. They include a section on the extent of forest operations, a section on harvest type presenting the effects of types of forest cut (clear cut, partial cut and a scenario with an even mix of the two types of cut) on the other indicators. And a section on the effects of varying the volume extracted. These sections were presented in varying order. The final section showed the general trade-off table (table 2.1) and asked respondents to choose a forestry strategy and explain why they made that choice.

2.6 Results

2.6.1 Acceptability of forestry strategies

The results show that acceptability of forestry strategies changed throughout the questionnaire. When comparing initial choices with the choices once trade-offs were presented, we see at the end of the questionnaire that more than half the respondents accepted another harvest type than initially selected (Fig.2.1). Initially when trade-offs were not presented, respondents either chose partial cutting or no cutting at all (Fig. 2.1). As simulations of the scenarios were presented, respondents who had chosen partial cutting initially agreed to some clear cutting either with the mixed scenario or by choosing the clear cutting option as trade-offs were presented. As for respondents who did not want to choose a harvest type initially, they generally agreed to some cutting (either with partial cutting or a mixed scenario) once trade-offs were explained. We also note that those who initially chose partial cutting or no cutting did not maintain their choice of forestry harvest type throughout the questionnaire (fig. 2.1).

Figure 2.1.Changes in respondent preference for Clear cutting (CC), partial cutting (PC), 50% CC and 50%PC, or none of the presented scenarios (X) when varying trade-offs are presented. A shows respondents who initially preferred PC and B shows respondents who preferred none of the presented scenarios in the beginning.



*End- respondent preference for the scenarios when all trade-offs are considered. PC requires higher extent of forestry operations, allows less volume extracted, higher forest cover, and requires more roads. CC requires less extent of forestry operations, permits high volume extracted, creates less roads and has a higher potential for road deactivation. The Mix scenario leads to results which are a compromise between CC and PC.

2.6.2 The effects of trade-offs

When the discussions based on the questionnaires and the presentation were analyzed, the extent of forest operations, harvest type and roads were the indicators consistently discussed (Fig. 2.2). More specifically, although the presentation and question did not relate to these indicators specifically, respondents maintained a concern for these indicators. It is these indicators which had an effect on acceptability and perception of forestry cut type. Volume harvested on the other hand was not

perceived by respondents as an important trade-off affecting their acceptability or perception of harvest type.

2.6.2.1 Volume

Volume only rarely emerged as a preoccupation in the discussions (Fig 2.2E). In this study, respondents tended to choose options which would minimize the amount of volume extracted from their territory. The trade-offs between volume, industrial operations and different forestry treatments presented did not raise respondent preoccupation for potential community employment and opportunity. The model also showed that regardless of the scenario (PC, CC or Mix), volume determines road use and deactivation potential. Although respondents did choose to minimize volume, the suggested correlation between volume and roads (which as will be seen in the next section had strong affects on acceptability and perception) did not affect harvest type choices. Volume was perceived by respondents throughout the questionnaire as "the industry's problem" and thus not their preoccupation. Also as can be seen in Figure 2.3, volume did not have an effect on forestry harvest type acceptability.

2.6.2.2 Roads

Road considerations seem to be an important factor in determining acceptability and perception of harvest type. Respondents show an increasing preoccupation about roads in this study (fig 2.2D). In Figure 2.3 we note that acceptance for CC and the mixed scenario is at its highest when the effects of roads are considered while acceptance of PC is at its lowest. More specifically, CC becomes somewhat more acceptable considering that: 1) the time it takes to reach the maximum amount of roads on a territory is longer for CC than PC; 2) there is a higher use of roads in PC than CC; and 3) there is a lower potential for deactivation of roads in PC compared to

Figure 2.2.Expressed preoccupation (y- there is preoccupation, mix- there is preoccupation but it is for a scenario which either compromises between harvest types or the preoccupation is negotiable) for indicators (forestry extent, harvest type, roads, volume extracted) when respondents were presented scenarios and questionnaire sections which showed the varying effects of these indicators. The first section presents each indicator in isolation. The extent of forest operations shows the effects of this indicator on the other indicators. The section on harvest type presents the effects of types of forest cut (clear cut, partial cut and a scenario with an even mix of the two types of cut) on the other indicators. The section on volume shows how varying the volume extracted affected the other indicators. The final section presents all three forestry strategy scenarios with their results for all indicators and respondents were asked to select a scenario and the primary (indicator) reason or preoccupation for which it was chosen.

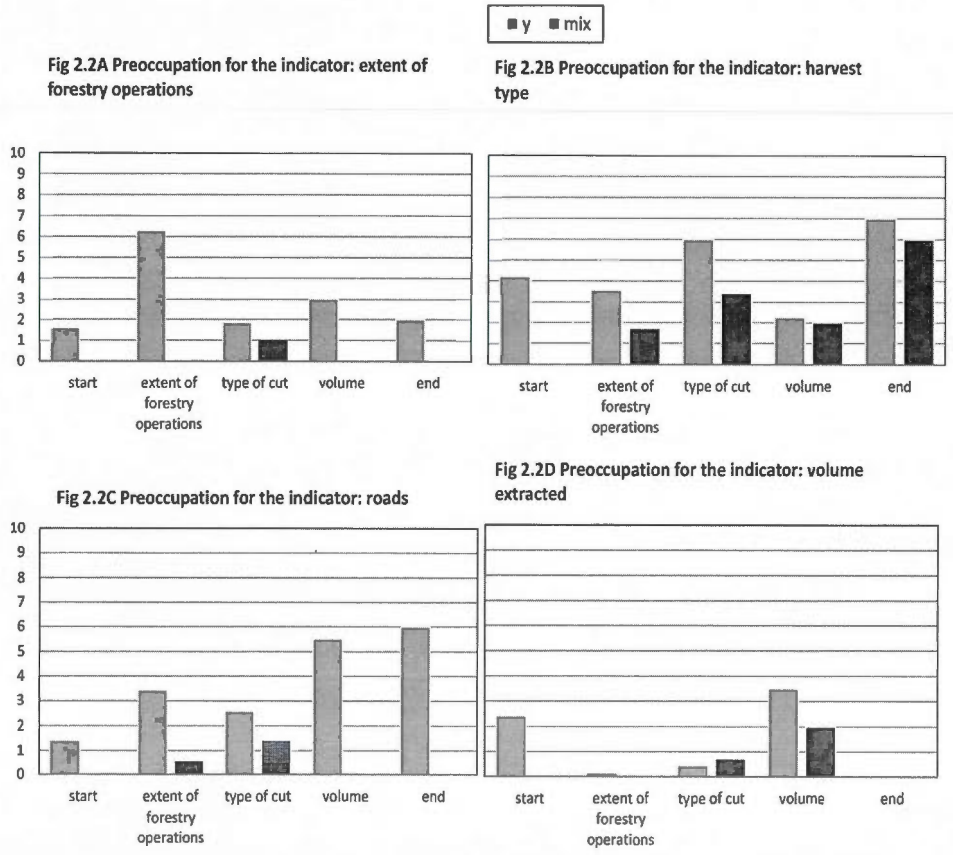
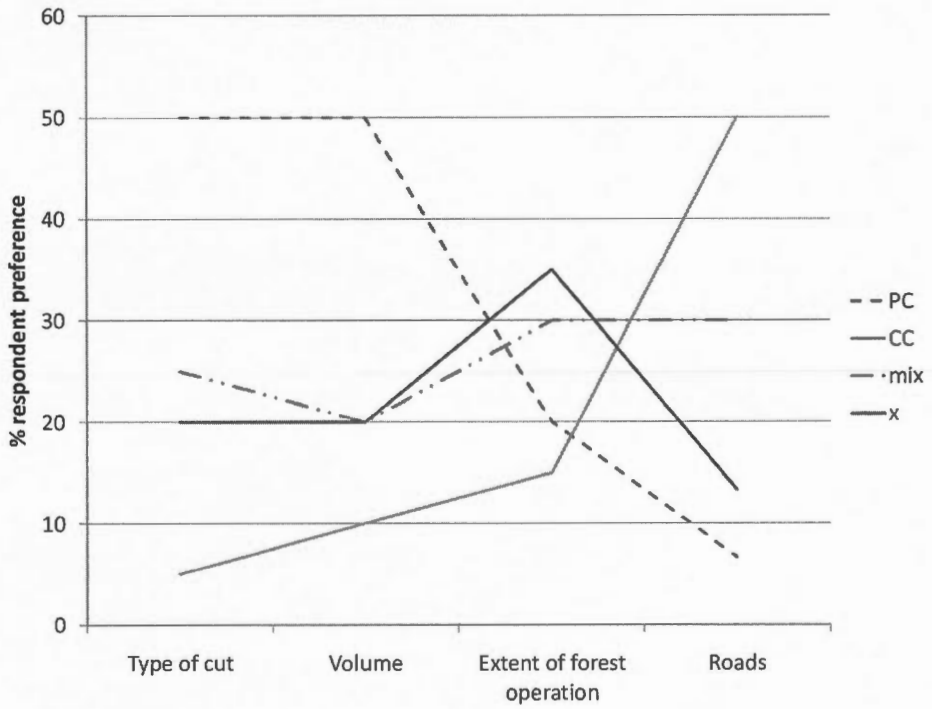


Figure 2.3.Percent preference for harvest type (partial cut (PC), Clearcut (CC), 50%PC and 50% CC (mix), or none (X)) when their varying effect on the indicators (harvest type, volume, extent of forestry operation and roads) are presented.



CC. In general, respondents prefer a scenario which uses and constructs fewer roads and permits the most deactivation.

Respondent discussion about roads illustrated some issues. Specifically, the perceived benefits in deactivating roads are not clear for respondents and thus deactivation does not necessarily serve as an option for or against harvest type. For example, respondents highlight that although many of the 4834 km of forestry roads present in the territory are not used very much by community or family, respondents find it difficult to decide who and how decisions for road deactivation would be made: "should consult. It is hard to make decisions for others". In effect, it was difficult for some respondents to understand or judge the effects forestry strategies and roads because: 1) in the end, roads are built everywhere to access the resource no matter the

scenario; and 2) the proliferation of roads becomes a difficult concept as it is expansive and would require making community choices as to which roads are important and which ones aren't. Respondents did however provide some alternative options such as: "Minimizing the doors to the territory" (minimizing access points into the territory) and deactivating roads in family territories.

2.6.2.3 Extent of forestry operations

Preference for PC also dropped when its effect on extent of forestry operations was presented (Fig. 2.3). Although the presented material included 21% of the area dedicated to protected areas, the results show that respondents still felt a need to limit the extent of forestry operations on the rest of the territory. Respondents tended to choose the lesser extent of forest operations. The extent of forest operations chosen by participants never exceeded 37.5 km^2/yr, and for all respondents the acceptable forest extent of CC was less than PC. Furthermore, preference for none of the harvest types was highest when their effects on extent of forestry operations were presented (Fig. 2.3). Respondents who did not choose to answer were either choosing against CC or mentioned that the forest extent was too large. The effects of harvest type on forest extent therefore presented an important trade-off to consider in this study.

2.6.3 Perception of forestry strategies

Perception of the indicators and presentation of their trade-offs affected acceptability and in some cases they also affected perception of forestry strategies. Initially, respondents expressed concerns over the effects of forestry activities on: cultural activities, portage routes, occupation and distribution of fauna (in general but for moose and martin), community employment/economic opportunities, aesthetics, illicit hunting activities and family access to resources. From the discussions there is a negative attitude towards CC and harvesting in general. Many respondents actually

chose against CC and we also noted that six out of ten individuals answered that there shouldn't be any cutting at least once in the questionnaire. The reasons for choosing against any forestry scenario included: 1) a fear of forestry interfering with cultural activities and important fauna; 2) no cutting unless determined by the community; and 3) a request to leave the territory to regenerate and be as natural as possible. PC was only perceived by respondents as an alternative at the beginning when trade offs were not presented.

One respondent maintained a preference for no cutting throughout the study. This respondent felt it (discussing and studying Aboriginal responses to forestry strategies) was a means for the industry to negotiate forestry activities when according to this respondent, forestry strategies should be determined and managed by the community.

In general, a negative attitude towards CC was maintained throughout the questionnaire while arguments supporting PC diminished as trade-offs were presented. For example, as mentioned previously, many respondents actually chose against CC. When the extent of forest operations was presented respondents mentioned: "It (forest extent of 100 km^2/yr) is too large even though PC is better at maintaining forest cover"; "PC is too large and I don't like CC. There are trees you have to maintain". With this indicator, although perceptions of CC remained negative there was an increased willingness to select it as an option with this indicator. On the other hand, perceptions of PC as an alternative changed as trade-offs were presented. One respondent mentions that he: "neither wants CC nor all these roads. Would choose PC but without all these roads". It was also apparent during the discussions that although PC requires a large amount of road use which may be a deterrent to this harvest type, it wasn't enough to overcome the strong negative perception against CC. When respondents perceived trade-offs to weigh beneficially towards CC as a forestry strategy, they tended to choose the mix scenario. Although acceptability of

harvest type changed throughout the questionnaire, the perception of harvest types was mostly maintained for CC and changing for PC as the indicators were presented.

2.7 Discussion

As mentioned by Ford et al. (2009) and Burchfield et al. (2003), this study shows that information does affect perception and acceptability of harvest types. Changes in the harvest system chosen by respondent occurred between the initial responses and the final responses when trade-offs were presented. Most of those who initially refused any cutting on their territory accepted some partial cutting or a mixed partial cut and clear cut scenario by the end. Furthermore, respondent preference towards harvest types changed depending on the trade-offs presented. Indeed, respondents reacted to the different trade-offs in concordance with the cognitive hierarchy model where values are organized into a system along a continuum of relative importance. More specifically, some trade-offs were more important than others in affecting their choices of forestry harvesting strategies. Roads and extent of forestry operations in this case caused respondents to change their preference of forestry strategies from partial cut to preferring other forestry strategies which could better minimize the extent of forestry operations, road use and expansive configurations of roads on the territory. On the other hand, respondent perception of volume harvested suggests that this indicator is considered a forestry related issue. There is little relation felt by respondents between volume, industry and community employment and economic opportunities. This raises questions as to the contribution of the forestry sector in community employment, income and well being. According to Patriquin et al (2007), forestry contribution to the labor, employment and socio-economic status of boreal regions were found to be uneven.

In effect, providing information on the trade-offs and landscape effects of varying forestry strategies over time has further helped define and shape perception and acceptability judgments. More specifically, acceptability in this study was not limited to the harvest type but was dependent on the trade-offs presented. In this study it depended on the intended extent of operations on the territory and the road configurations it will lead to. The effects of trade-offs on perception however were more complicated. A strong negative attitude towards clear cutting was maintained throughout the questionnaire suggesting the influence of past experiences. According to previous studies by Saint Arnaud (2009), the community is in reaction to past harvest strategies dominated by clear cutting which have, in their words, left the forests as devastated, ugly and with large expanses of desert like scenes (Saint Arnaud, 2009). However, increasing acceptability for this harvest type as trade-offs were presented has shown that respondents find this strategy acceptable under certain circumstances. It could be speculated that should these trade-offs be realized in the field and create new experiences with this harvest type, the possibility for some perceptions to change may exist. Presenting trade-offs did however affect respondent perception of partial cutting. Respondent experience for this harvest type on their territory is limited suggesting that with the presentation of the trade-offs, respondents are still in the process of shaping their judgments.

The model used in this study has helped simulate landscape level configurations reflecting forest ecological considerations. Minimizing trade-offs seemed to be the means of arriving at an acceptable solution rather than achieving a consensus on the appropriate forestry strategy. As a consequence it is important that perceptions be based on complete understanding of the trade-offs as well as the relation of indicators on the community at ecological, economic and social levels. Assessing responses to trade-offs can be beneficial in developing alternative forestry strategies as the limits of acceptability for operations and harvest type can be raised as well as some of the

cultural considerations. For example, this study suggests that roads impose important trade-offs to be considered in alternative forestry strategies because: 1) roads seemed to be an important indicator limiting acceptability for partial cutting as a harvesting technique; 2) road issues can increase or justify the use of some clear cutting on the territory; 3) road management strategies need to be considered in forestry strategies with careful community consultation because roads serve a trivial role based on their use and non-use in the community. Respondent discussion regarding the extent of forest operations on the territory for this study is another example. The discussions suggest that protection is not enough to warrant unlimited activity on the rest of the territory. Respondents showed concern over how the rest of the territory would be managed as well as requesting some control over management. Previous studies showed that community members showed concern over the possibility of conserving forests while allowing forestry activities (Saint Arnaud, 2009).

The dialogue initiated by presenting trade-offs between indicators and varying forest harvesting strategies stimulated the cognitive components of acceptability. Indeed, by presenting the trade-offs, respondents are made to view forestry strategies as a whole and with varying effects depending on the execution of the harvest type rather than being made to accept forestry strategies as viewed only by their harvest type. Generalizing a forestry strategy as a more acceptable forestry harvesting solution is therefore an over simplification because it depends on respondent process of minimizing trade-offs which are of community concern. Furthermore, by reacting to the trade-offs, respondents have an opportunity to get involved in the development of forestry strategies on the territory. A respondent explicitly mentioned that they had learned a lot from the questionnaire and could respond better to forestry scenarios.

2.8 Conclusion

Seeking acceptability of forestry strategies is important to develop appropriate forestry alternatives especially when Aboriginal values and objectives need to be integrated. Presenting landscape and temporal trade-offs with forestry strategies has been effective in beginning a dialogue and support for forestry alternatives. Indeed, this study suggests that acceptability of forestry strategies will depend on the trade-offs presented. The challenges are therefore twofold: the first is that it is important to present the most trade-offs applicable to the context; the second is that it is important for presenters to understand how respondents will seek to minimize the effects of forestry strategies on their community reality. Therefore although studies by Ford et al. (2009) and Burchfield et al. (2003) suggest that public support and acceptability would increase if only the public knew what ecologists and foresters knew, this study also suggest that if only ecologists and foresters know what and how forestry strategies are affecting respondents things would also change. Forest managers can more easily prescribe acceptable forestry strategies based on respondent: perception of indicators, identification of important trade-offs, and emergence of other preoccupations. This is further pertinent in efforts towards Aboriginal forestry initiatives because it emphasizes the importance of understanding Aboriginal values and objectives and the need for alternative forestry strategies. Seeking acceptability emphasizing on the ecological, economic and social trade-offs of forestry strategies for managers and the public would have the beneficial effect that the Aboriginal targeted public serves to develop alternatives rather than just being sought to accept forestry strategies.

2.9 References

Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. Development and Change 26: 413-439.

Bell, S. 2001. Landscape pattern, perception and visualisation in the visual management of forests. Landscape and urban planning 54: 201-211.

Burchfield, J.A. and J.M. Miller, S. Allen, R.F. Schroeder, T.Miller. 2003. Social implications of alternatives to clearcutting on the Tongass National Forest: an exploratory study of residents' responses to alternative silvicultural treatments in Hanus Bay, Alaska. Gen. Tech. Rep. PNW-GTR-575. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28p.

Côté, M-A, Bouthillier, L., 2002. Assessing the effect of public involvement processes in forest management in Quebec. Forest Policy and Economics. 4: 213-225.

Daniel, T.C. 2001. Whither scenic beauty? Visual landscape quality assessment in the 21st century. Landscape and urban planning 54: 267-281.

Davidson-Hunt, I and F Berkes. 2003. Learning as you journey: Anishnaabe perception of social-ecological environments and adaptive learning. Conservation ecology 8(1): 5.

Fall, A. and J.A. Fall. 2001. Domain-specific language for models of landscape dynamics. Ecological Modelling 141: 1-18.

Ford, R.M. and K.J.H. Williams, I.D. Bishop,T. Webb. 2009a. The value basis for the social acceptability of clearfelling in Tasmania, Australia. Landscape and urban planning 90: 109-206.

Ford, R.M. and K.J.H. Williams, I.D. Bishop, J.E. Hickey. 2009b. Effects of information on the social acceptability of alternatives to clearfelling in Australian wet eucalypt forests. Environmental management 44: 1149-1162.

Karjala, M.K., Sherry, E.E., Dewhurst, S.M., 2004. Criteria and indicators for sustainable forest planning: a framework for recording Aboriginal resource and social values. Forest Pol. Econ. 6, 95–110.

Kearney, A.R. 2001. Effects of an informational intervention on public reactions to clear cutting. Society and natural resources 14: 777-790.

Kimmins, JP. 2001. Visible and non-visible indicators of forest sustainability: beauty, beholders and belief systems. In: Sheppard, SRJ, Harshaw, HW (eds) Forests and landscapes linking ecology, sustainability and aesthetics, IUFRO Research Series #6. CABI Publishing in Association with IUFRO, Wallingford, Oxon, pp43-56.

Larouche, M. 2007. *La modélisation de scénarios d'aménagement forestier à J'échelle du paysage: un outil d'aide à la décision en foresterie autochtone.* Mémoire de Maîtrise, Département des Sciences Biologiques, Université du Québec à Montréal.

Leroux, 1., Chamberland, R., Brazeau, E. et Dubé, C. 2004. *Au pays des peaux de chagrin: Occupation et exploitation territoriale à Kitcisakik (Grand lac Victoria) au XX' siècle.* Québec: Les Presses de l'Université Laval et le Musée canadien des civilisations.

Lewis, JL and SRJ Sheppard. 2005. Culture and communication: can landscape visualization improve forest management consultation with indigenous communities? Landscape and urban planning in press.

Meitner, M.J. 2004. Perceptions of forest landscapes. Landscape and planning: 435-440.

Natcher, D.C., Hickey, C.G., 2002. A criteria and indicators approach to community development. Sustainable forest management network. Working Paper 2002–2.

O'Flaherty, R.M. and I.J. Davidson-Hunt, M. Manseau. 2008. Indigenous knowledge and values in planning for sustainable forestry: Pikangikum First Nation and the Whitefeather forest initiative. Ecology and Society 13(1): 6.

Panagopoulos, T. 2009. Linking forestry, sustainability and aesthetics. Ecological economics 68: 2485-2489.

Pâquet, J. 2001. Public preferences of forest management practices in Québec. In Looking beyond the trees: Visual stewardship of the working forest. Visual resource management conference compendium. Kamloops, BC apr 17-19 2001. Http://www.for.gov.bc.ca/HFD/Pubs/Docs/MR/Rec034.htm.

Patriquin, MN and JR Parkins, RC Stedman. 2007. Socio-economic status of boreal communities in Canada. Forestry 80(3): 279-291.

Ribe, R.G. 2006. Perceptions of forestry alternatives in the US Pacific Northwest: Information effects and acceptability distribution analysis. Journal of environmental psychology 26: 100-115.

Rollins, R M Robson, D Robinson. 2001. Towards increased citizen influence in Canadian forest management. Environments 29(2):21.

Saint Arnaud. 2009. Thèse UQAM.

Sheppard S. 2001. Forest certification and aesthetics: proposed criteria and indicators for visible stewardship. In Looking beyond the trees: Visual stewardship of the working forest. Visual resource management conference compendium. Kamloops, BC apr 17-19 2001. Http://www.for.gov.bc.ca/HFD/Pubs/Docs/MR/Rec034.htm.

Sheppard, S. 2003. Knowing a socially sustainable forest when you see one: implications for results-based forestry. Forestry chronicle 79(5): 865-875.

Sheppard, SRJ and M Meitner. 2005. Using multi-criteria analysis and visualisation for sustainable forest management planning with stakeholder groups. Forest ecology and management 207: 171-187.

Sherry, E., Halseth, R., Fondahl, G., Karjala, M., Leon, B., 2005. Local-level criteria and indicators: an Aboriginal perspective on sustainable forest management. Forestry 78 (5), 513–539.