

LAND USE PREFERENCES OF THE ADAMS LAKE INDIAN BAND: EMPLOYING  
THE Q SORTING TECHNIQUE IN NATURAL RESOURCE MANAGEMENT

by

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## **Abstract**

This thesis presents the application and results from the Q Sorting Technique to elicit land use preferences among the membership of the Adams Lake Indian Band of Chase, British Columbia. First Nations in BC and elsewhere have historically articulated their land use preferences through different paradigms than the frameworks employed by the provincial and federal governments, private industry and non-governmental organizations. A literature on that paradigm—the Criteria and Indicator framework—explores areas where shortcomings of the paradigm can be enhanced to include land management objectives set by First Nations stakeholders at the resource level.

The Q Sorting Technique and factor analysis reveal one dominant mode of thinking among the membership regarding management of the ALIB traditional territory, which is bifurcated into discrete dimensions: the Secwepemc land management paradigm, and prescriptive management direction. In addition, subsequent individualized perspectives emerged from the Q Sorting Technique and factor analysis, however, the dominant factor shows significant consensus among differing perspectives among the ALIB membership where factors two through eight are more individualistic.

Further, this thesis explores the translation of Aboriginal concerns into a Criteria and Indicator framework, the utility of the Q Method and the potential for including this approach to elicit Aboriginal values as a decision support mechanism for natural resource management decision makers.

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## Chapter 1: Introduction and Justification of Research

### Background and rationale

This thesis addresses the difference between land management paradigms employed popularly by different levels of government in British Columbia and Canada and those of First Nations peoples within the province. Increasingly, Aboriginal peoples are advancing towards full managerial authority of their traditional territories, or co-management arrangements in various institutional settings. The New Relationship, advanced by the Campbell administration in 2005, is one of the leading examples of increasing deference to indigenous groups within British Columbia about the decision making process about natural resources in their traditional territories. Additionally, the Supreme Court of British Columbia has ruled in ways that further the spirit of the New Relationship. The *Haida* and *Taku River* decisions galvanized the obligations incumbent on the State or firms acting on Crown resource areas to consult and accommodate affected Aboriginal peoples by activities occurring on the land.

The work of this thesis has been informed by these preceding documents and exists in the context of these agreements between First Nations and the Government of British Columbia and other stakeholders. Despite motions that move toward Aboriginal managerial authority of traditional territory lands overlapping with the Crown, management decisions are made at varying levels of Provincial government and with subsequent referrals to inform local Aboriginal residents. While the *Haida* and *Taku* decisions serve to establish the *de jure* doctrine of consultation and accommodation of Aboriginal interests, the extent to which that activity occurs in praxis is often contingent upon the legal resources a Band or Nation can allocate towards pursuit of those objectives and outputs.

## **Research description and organization**

A better approach is needed that allows for sufficient treatment of priorities from within the First Nation to shape the policies that govern their immediate resources and territories. What this research advocates is the development of a systematic, structured way of identifying the land use priorities within an Aboriginal community, and secondly, determine their relative importance to each other. The utility of this task rises from a clear need for Aboriginal communities in BC and Canada to communicate their land use preferences in equal language with governmental agencies and other stakeholders outside of the Nation or Band. Using a case-study approach with a First Nation Band in British Columbia, the research team proposed an alternative methodology that quantitatively gauges the various management objectives that an Aboriginal group may have. The intent was then to insert the outputs from those processes into fora that leaders in participating Band governments and the private sector to inform existing processes in decision making and advise First Nation leaders.

The work of this thesis specifically concerns a member of the Shuswap Nation Tribal Council of Chase, British Columbia, the Adams Lake Indian Band. The research was conducted with consent from the Chief and Council and collaboration from a community data collection assistant whose expertise guided our investigation during data collection stages. The output from the data collection included an inventory of concerns from the ALIB membership and a detailed analysis of which concerns were more highly valued relative to others. One of the beneficial purposes of this research was to provide a decision support mechanism for the Band leaders to represent their membership's land use preferences.

This thesis is organized in a manner that describes the steps taken to inventory land management priority areas within an Aboriginal community, rank them and attach statistical

confidence intervals to different groups of rankings across the sample frame. The first chapter establishes the background and rationale for this research. Objectives and questions that shaped this research are presented there. It also provides an historical context of the Criteria and Indicator management paradigm from which the impetus for this exploratory project originated. Through a review of the relevant literature, the chapter argues that the C&I system that is employed by the Provincial and Federal governments reveal shortcomings in conveying the aboriginal land use philosophy. Chapter two introduces and builds the case for the methodology—the Q Sorting Technique. The third chapter presents results from interviews, followed by rankings and analysis. A report on the usefulness of the Q Methodology from the perspective of the Aboriginal partners builds on these results. Chapter four summarizes the entire research process and associated outputs, discusses the weakness of our approach and draws conclusions to present possible extensions of the work presented in this document.

### **Research questions and objectives**

The principal objective of this research is to develop a tool that organizes and ranks aboriginal resource management preferences that enables First Nations peoples to articulate, in their own words, their priorities on their own behalf to stakeholders outside the community. Previous work to elicit input from community members through general membership meetings have suffered from the difficulty that some individuals may be more inclined to speak out and limit the input of others who may choose not to voice their concerns. In response to this difficulty, individual interviews were designed to provide the Band leadership with the views of groups of individuals without one dominant voice overshadowing others. The output is a method or tool that produces a set of desired outcomes for First Nations communities to utilize that

provides substantiation to their institutions. To accomplish these tasks, this project was guided by the following questions:

1. How successful have C&I systems been in representing indigenous values in BC and elsewhere in Canada;
2. Which elements of resource management, vis-à-vis indigenous value systems, do aboriginal groups rank with greatest importance;
3. What is the translation of First Nations values and attitudes into C&I prescriptive management outcomes;
4. How can the C&I rubric be enhanced in a way such that it will be useful to aboriginal stakeholders; and
5. How can existing C&I models incorporate ranked resource use preferences identified in First Nations communities be accurately conveyed to land management bodies?

In the process of addressing the research questions posed here, the aim was not only to better understand First Nation values related to natural capital management and use preferences of the land and waters, but to engage underrepresented aboriginal stakeholders into natural resource management discourse by developing a tool for First Nations peoples to better understand the myriad values within a particular community. Of course, the underlying supposition at play is that a better understanding of these preferences and values would give rise to better management solutions of natural resources. The hypothesis of this project is that increased local stakeholder input and collaboration into contemporary natural resource policy will better serve underrepresented First Nations interests in British Columbia, elsewhere in Canada, and internationally.

## **Criteria and Indicators literature review**

A vast literature on C&I has developed since implementing the framework that originated from the terms of the Montreal Process in 1993 (Anon 1995). This review of relevant literature provides an overview and critique of the C&I system establishing the difficulty it has in conveying aboriginal priorities in natural resource management fora at the local level. Having become the predominant land management paradigm at national and provincial levels since its inception, C&I systems need to be reviewed to address the strengths in achieving ecosystem-based management and consider the weaknesses that need to be remedied for the inclusion of Aboriginal values. The review grows from prior research directed at enhancing the Criteria and Indicator rubric by considering alternative methodologies that identify and rank indigenous values and incorporate them into contemporary Criteria and Indicator models. The body of work that is described below concludes that although the C&I system is a useful tool for quantification for monitoring and evaluation, there are challenges that C&I demonstrates for the use of First Nations peoples. As will be demonstrated, there some feel the shortcomings to the C&I framework can be addressed to include to the land use preferences of Aboriginal groups at the local level.

That establishing management objectives through performance measures that can be monitored is a valid strategy towards achieving sustainable forest management motivates the Criteria and Indicator paradigm. The inherent strength of this approach is that it dissects complex challenges in resource management into discrete units that can be acted upon and whose progress can be monitored. Conceptually, this approach makes sense in achieving performance measures however there are areas of concern that arise out of the way those management challenges have

been structured. Such challenges emerge when one considers the ways in which Aboriginal management paradigms misalign with the external criteria that are established without input from the local level. Aboriginal stakeholder land use preferences have not been comprehensively conveyed through C&I rubrics to accurately reflect indigenous natural capital use values at the local-level. However, as the C&I framework is used popularly at varying levels of government and management authorities, this *lingua franca* may hold the potential to be modified to accurately articulate the needs and desires of First Nations peoples in their management efforts. What follows is a discussion of the strengths and weaknesses of the Criteria and Indicators approach towards sustainable natural resource management, its correlation with Aboriginal management systems and extensions that may allow the two to be bridged.

The need for Criteria and Indicators grew from the observation that inclusion of communities in forest resource development and conservation was a central concept of achieving sustainable resource management. The strength of a system like Criteria and Indicators is that it seeks to quantify the extent to which change can be monitored within a set of valued ecosystem or social components. That is, ecosystem components of high instrumental and inherent value can be identified as objectives and monitoring regimes are established to quantify the extent to which change has occurred. In social terms, Hartanto et al. (2002) and Prabhu et al (1998, 1999) have demonstrated that inclusion of local communities which are most affected can benefit them by recruiting their local expert knowledge and understanding of their needs and goals. Criteria and Indicators function on different levels that seek to provide a venue for stakeholders in the resource communities to incorporate their management objectives in a consistent format as those on regional, provincial and national levels of governance. This vision has been proven difficult to realize, however, in indigenous communities in BC and worldwide. This weakness needs to be

reconciled for C&I systems to achieve their mandate in achieving sustainable resource management objectives across differing scales of government.

Critiques of the structural deficiencies to C&I are abundant (Sherry et al. 2005, Smith 2006, Karjala 2001), resulting in the inhibition of transferability of aboriginal land use values to governing bodies on separate scales. Cash et al. (2006) and Gibson et al. (2000) define what is meant in the literature by distinguishing the “scales” from “levels”. The former is the spatial, temporal, quantitative or analytical dimensions used to measure and study any phenomenon where “levels” are the units of analysis located on different positions on that scale. Establishing a common definition across different levels within a regulatory scale, for example, is the first critical challenge that C&I faces in communicating land use preferences among stakeholders in the resource area to governmental management agencies. By framing prescriptive management objectives through Criteria and established indicators, Gibson et al. (2000) show that there is considerable disagreement among international, national and provincial agencies as to which items should be pursued. That is, questions can and do arise in how Criteria are decided upon and how the indicators that monitor those modifications were selected. This issue must first be established before analyzing how C&I management goals operate on the site or landscape levels. Drawing from prior work on the challenges encountered at multiple scales of the sustainable natural resource management (Gibson et al. 2000), Sherry et al. (2005) unify a central critique that comparison of both Criteria and, even more so, Indicators across national and site-levels is not entirely direct. The authors conclude with evidence which shows high instances of non-correspondence between comparison frameworks that were denoted at the local-level as most important, and regional management authorities. This evidence presented by Sherry et al. (2005) leads one to conclude that there is considerable disagreement over the correlation between land

use management prescriptions by centralized governing boards and the natural capital use priorities held by citizens and resource users in the local area of concern. A second element that compounds difficulty of resource management through Criteria and Indicators emerges in the context of the cross-scale, cross-level divide. Beckley et al. (2002) report that management outcomes that have developed through C&I frameworks over the past decade have been constrained by a “one-size-fits-all” approach across institutional levels of prescriptive policy execution. When C&I is approached as a "top-down" assessment of land management, it may incorporate limited or no input from the peoples who live in the forested or resource-rich communities. A top down approach towards achieving ecosystem-based management can contradict the diversity of land use priorities (or the diversity of indigenous worldviews and values) found in aboriginal communities—and by extension, community, economic, and ecological sustainability. In a case study with the Little Red River Cree Nation of Alberta, Natcher and Hickey (2002) document how the insistence of ‘top-downism’ inhibits C&I in achieving sustainable resource management outcomes by contributing to an approach that has, and continues to, alienate First Nations stakeholders from management negotiations with separate levels of government and industry.

The weaknesses from the incorrect assumption that a “one-size-fits-all” management paradigm propagated through the C&I system are readily apparent. The most obvious is that complex interactions and intercorrelations among wildly diverse land management priorities are reduced to a level that simplifies management actions, omitting potential indicators of community-well being or symmetrical resource allocation to those most affected. Primarily through the consideration of the political context in which management decisions are made, Cash et al. (2006) illustrates that organizations are comprised of different actors who seek to achieve

different objectives by either strengthening or weakening interactions within an institutional scale. Lebel et al. (2005) support that justifications for such behavior among actors within and across institutions are to make complex decision mechanisms tractable and within their jurisdictions.

The different roles and organizational mandates within regulatory bodies are drawn into sharp focus when one considers the case of the temporal scale as an example. Across this scale, the division becomes apparent when short electoral cycles conflict with long-term planning needs. People who live in or near a resource correctly note that there is a division between how a particular timber stand or watershed is managed at a landscape level in contrast with a regional, provincial and national levels where governing policies of those lands is crafted. This disconnect occurs when long-term planning cycles intersect with short-term election cycles of and contributes toward a weaknesses of Criteria and Indicators. Often, C&I does not capture nor satisfy the gap of management preferences among individuals who live in the producing area and the intention of bureaucratic agencies to satisfy institutional roles to achieve their mandates as decision makers. This is to say that the gaps between levels within a temporal scale at which decisions are made and the level where action is taken is a critical challenge that Criteria and Indicator framework must address to become relevant for the uses of Aboriginal land managers. It is also a valid explanation for the lack of appetite among local resource managers where the expectation among regional or provincial decision makers is to execute policies made with little if any inclusion of local expertise; particularly when the mandates of one government may be superceded by another.

There is significant concurrence among authors—Sherry et al. (2002), for example—that a further core critique to Criteria and Indicators is the notion of non-comparison across levels of

governance. This disconnect is observed in both directions: both from national or provincial to the local level, and in reverse. Indeed, Wright et al. (2002) summarize this perspective towards C&I developed at international and national scales; namely, that they ‘do not translate well to the forest management unit’, casting doubt as to their relevance in their incorporation among decision makers who possess local expertise. In a cross-scale comparison of international indicators from the Centre for International Forestry Research and local indicators from the Local Unit Criteria and Indicators, Sherry et al. (2005) suggest that there is weak correspondence in different scales however some aboriginal ecological needs and goals correspond well to non-aboriginally developed management frameworks. Between the most important management objectives of Tl'azt'en First Nation and the international CIFOR frameworks they were compared against, ecological indicators seemed to be consistent between them, though originating from disparate rationales. However, this is not to say that outlining and planning for management outcomes using C&I for local-level communities is a wholly nonproductive exercise. Rather, the strength of Criteria and Indicators is that it has become the predominant land use paradigm employed at all levels of natural resource governance. Some authors (Prabhu et al. 1998) consider C&I to be a salient development mechanism for sustainable forest management by incorporating an understanding of local-level land use priorities.

A distinction between process-oriented and outcome-oriented Criteria and Indicator frameworks is another area that provides a better sense of how aboriginal communities differ in how objectives are prioritized in their natural resource management planning. This distinction gives rise to the emergence of separate scales of investigation in First Nation communities and non-Aboriginal management systems: the output and outcome-based scale; and the process-oriented scales are two such examples, though there are many others. Beckley et al. (2002) and

Sheppard (2003), among others, highlight that resulting land management policies—the outcome-oriented models similar to C&I—are often ancillary concerns to First Nations peoples who may allot equal, if not greater importance on how such decisions were made in the first place. Leaders and decision makers in First Nations communities highlight that the process through which decisions were reached should be acknowledged with equal weight as the policy outcomes themselves. This notion exists in contrast to centralized decision-making bodies that proffer outcome-based assessment indicators as a means to streamline their management efforts. This point is taken to illustrate a disconnect between local-level stakeholders and centralized governing agencies: from the perspective of the local aboriginal stakeholder, management authority remains seated outside resource-based communities and directed instead by national or provincial levels of government that wield C&I frameworks to underscore project outcomes instead of the processes used to achieve them. This tack to C&I places emphasis on deliverables and has advantages for governments or industries that seek performance indicators that link with respective mandates. Possible examples include consultation and accommodation in the case of the provincial government, and continuity of commodity flow for forest products industry. As Adamowicz (2003) points out, since C&I system outcomes can be used for performance measures and as a basis for certification regimes, change among agents involved in their drafting and implementation can, and does, occur to justify management decisions or explain deliverable shortfall or other areas on nonperformance. Clearly, governmental data massaging to justify annual operational budgets does little to promote holistic land management overall, much less for stakeholders in forest-dependent communities.

The cross-scale and cross-level difficulty that the C&I rubric falls victim to is the function of an oversimplification of causality when cross-scale and cross-level interactions are

evaluated. Because lists of indicators can be broad and far-reaching in their mandate to monitor particular Criteria, the Indicators often do not reflect these desired outcomes because the lists encompass cross-scale and cross-level indicators. Across spatial, temporal and jurisdictional scales, for example, there is still little understanding of the dominant mechanisms of interaction among actors and mandates (Cash et al. 2006). As complexity increases in a system that is comprised of multiple scales that are composed of multiple levels, a solution to complex management problems should treat equally the network of interactions and incentives among agents. Criteria and Indicators demonstrate difficulty in accomplishing this.

Categorization of Criteria into cleanly labeled groups vis-à-vis economic, ecological or social distinctions has been a method of compartmentalizing management decisions for the sake of operational division of labor. Compartmentalization of knowledge is a fundamental approach in western societies to facilitating the learning experience by providing a simplifying strategy that aid in comprehending complexity. However, separating natural capital stocks into purely ecological Criteria operates blindly to the fact that economic performance Criteria also hinge on the resilience and commodity flow of those resources. This creates a double-counting issue in accounting for particular Criteria and compromises the validity and measurability of an assigned indicator. More to the point, the goal of holistic natural resource management is irreducible into its component parts as they each influence outcomes in other focus areas. Again citing Beckley (2002), our current accounting system does not accurately or fully value each service or good that ecological stocks provide in sustaining forest-dependent communities at the local level. As such, universal categorization of indigenous preferences or value systems is potentially antithetical to efforts aimed at constructing a value-representation system, like C&I, which are ostensibly designed to achieve prescriptive management objectives with the explicit support at

the local level. Several other instances in the literature establish that Criteria variance between agencies is a significant concern in accurately representing indigenous preferences – Smith (2006), Sherry et al. (2005), Karjala and Dewhurst (2003) present evidence of noncorrelation of C&I to important management areas through locally defined processes. Further to this point, Brunkhorst (2000) warns that ‘reductionist’ approaches—inclusive of C&I—in representing First Nation land-use values through non-aboriginal paradigms force inappropriate categorizations on indigenous stakeholders. Nadasdy (2003) cautions against ‘distillation’ of aboriginal values and land use priorities by bureaucracies who must shoulder the onus of consultation and accommodation. Webb (2001) takes a decidedly more polarizing stance toward non-aboriginal management mechanisms, suggesting categorically that aboriginal values cannot be captured by a list of indicators that tie into non-defined indigenous value areas. This assertion rises from the difficulty found in establishing indicators across levels, as different actors in government or industry may not share the same management objectives as indigenous groups.

For Criteria and Indicators to be useful as a decision support mechanism in realizing theoretical and practical gains towards sustainable resource management, the rubric should be judged by consistent units of analysis between indicators to their comparison Criteria. Taking the criticisms toward C&I that shows difficulty in representing Aboriginal land use preferences into account, for Criteria and Indicators to succeed in facilitating ecosystem-based management poses a significant challenge. Confusing overlap among Criteria or the lack of evaluation altogether—ecological and economic in relation to social and economic indicators are key examples—is evidence of at least one barrier towards establishing consistent units of analysis. This challenge arises in research that asks how many of a particular stock of wildlife in exchange for an alternative management objective. People’s willingness to pay or willingness to accept often

occurs when the items that will potentially be lost are not easily monetized – What is an adequate level of compensation for the displacement or removal of a pod of whales, or the liquidation of a stand of Culturally Modified Trees?

At this point, the usefulness aspect arises of when considering how a C&I management framework is designed to monitor indicator change over time. A critique that has been well documented in the C&I literature is the dearth of baseline data against which ecological indicators can be gauged. Lindsay and Smith (2001), Berkes (1988), Sadler (1996) point to insufficient baseline data as the foremost reason for failure of environmental monitoring schemes and the further exclusion of stakeholders most affected by development regimes. Including stakeholders that are most affected by centralized agencies' decisions in an inventory process would not only address this baseline data deficiency but through effective engagement and knowledge transfers, provide an added human capital investment in the target First Nation community.

Measurability of specific Criteria that are poorly constrained through vague definition—maintenance and enhancement of biological diversity, for example—presents another challenge towards creating consistent units of analysis. Sheppard et al. (2005) suggest that “fuzzy” social outcomes are poorly quantified through Criteria containing compartmental discrepancies among social, ecological and economic categories. For example, in some C&I frameworks the number of attendees from the general public at community-planning meetings is taken as an indicator of social satisfaction. This is an incorrect criterion—objections to outcomes might motivate attendance—as what is being measured is the participation in that process, not satisfaction. Considering alternative mechanisms that perhaps provide a stronger correlation to social value areas—a survey of community satisfaction with natural resource management decisions, for

instance—social indicators often demonstrate shortcomings in measuring and providing for prescriptive social C&I outcomes. This is, of course, to say nothing of other non-quantifiable Criteria for inclusion in a management framework; 'A sense of place' has little tangible criterion that can be documented, analyzed and quantified in the C&I paradigm using current accounting methods, however ongoing work in this area may help in identifying ways that such an indicator can be crystallized. Beckley (2002) points out that community sustainability is predicated by factors that create vibrant, resilient people systems; the chief reasons among local stakeholders who choose to live in such communities is overlooked when assigning indicators that are designed to forecast ecosystem or social resilience. People create vibrant communities in different ways, however current accounting systems only function through tightly-defined indicators—through forestland and fishery productivity, respectively—these Criteria have higher economic correspondence, but are designed to reflect indirect social outcomes. Incorrect criterion that C&I frameworks are composed of suggests an omnipresent disconnect between areas or resources that are highly valued at the local level by contrast to centralized prescriptive management decisions made at a higher level in different units of analysis, or scales.

Peggy Smith (2006) dissects obstacles towards establishing consistent units of analysis in C&I by arguing for clearer definition of Criteria. The logical basis of this argument rests on the evidence that obfuscation through “top-down” approaches to C&I, in part, stem from the opaque boundaries that indicators are framed within. On the other hand, Smith notes that local vague Criteria language are often drafted in non-quantifiable terms: respect for traditional values; “Hahuuli” and spirituality; traditional resource use and subsistence use, for example. Further clarification of semantic vagueness found in such indicators—what Sheppard names “fuzzy” social outcomes—provide measurable characteristics that augment current Criteria monitoring

challenges. Certain "fuzzy" social outcomes may pose significant difficulty in measurement; a sense of place and spiritual connection to the land that many aboriginal cosmologies are built upon are examples of such instances. In both cases, Smith and Sheppard demonstrate that some local Aboriginal indicators are difficult to measure. Related to this finding, Adam and Kneeshaw (2008) propose that some Aboriginally-developed C&I frameworks do contain indicators of well-being that are able to be measured, though with different ends than originally intended by policy architects outside the First Nation community – access is their leading example. The authors conclude that access has multiple functions for the ability to practice traditional activities such as hunting and fishing in addition to the ecological stocks that are of use and of high quality. In effect, access is taken to be an indicator of multiple criteria: ecological sustainability, in addition to cultural health. When this occurs, Adam and Kneeshaw advocate duplicating Indicators but associating them with different Criteria.

Extending beyond poorly-quantifiable Indicators, Smith continues to argue that the individual indicators of a Criterion to evaluate and enhance the quality of life and productivity through well-being and satisfaction in First Nations communities is an inappropriate categorization of performance measures. That is, the indicators themselves extend beyond the simple sum of their component parts. To wit, cultural indicators of well being can include the maintenance of a traditional way of life, language retention and transmission in addition to the identification and protection of cultural values. The underlying assumption in these indicators is that they themselves are Criteria and the output of a suite of issues that must be addressed before they can be taken as representative of the well being of an Aboriginal community.

Smith continues that a further consideration in the debate concerning assignment of the “correct” indicators is the notion of Criteria thresholds. This notion addresses the question, “At

what point have management objectives been met?” Framed a different way, the question asks what is often intended by incorporating quantifiable indicators to justify when various monitoring schemes have achieved their objectives? An example of such an indicator may deal with the amount of time needed to regenerate species diversity concentrations in a timber harvesting lot from baseline conditions. As Smith (2006) writes, the point at which indicators have achieved their prescribed management target may be indistinguishable to serve as an informational tool until the shortcoming of sufficient Criteria thresholds have been selected.

Economists who have contributed to the literature on Criteria and Indicators point to incomplete linkages between C&I and developing sustainable businesses (Bull et al., 2005). The shortfall between economic indicators and their further connection into holistic land management is explained by Kant (2003), who stipulates that current economic models, namely neoclassical accounting systems, are insufficient in realizing sustainable forest management outcomes. Neoclassical approaches towards assessing non-market valuation of forest commodities underestimate, or omit entirely, the net present or future values of forestland services: maintenance services to potable water, nutrient and carbon cycling, are three such examples. This is consistent with the findings that Adam and Kneeshaw report in that the inclusion of Aboriginal forest values is poorly linked with anticipated forest conditions in the C&I system as it currently exists.

Kant’s proposal for new economic paradigms that more accurately account for and better correspond to sustainable forest management stem from Nordhaus and Kokkelenberg’s (1999) call for a consensus-based definition of sustainability in a manner that allows for theoretical and empirical quantification. The neoclassical economic paradigm shift that is needed is similar to what Kant and other authors (Sheppard et al. 2005) have argued for: a way of visualizing forest

management that allots accurate weight on the indicator, in outcome-based terms that support corresponding Criteria. That is, establishing tightly focused site-level indicators that link with monitoring schemes to represent value systems of forest-dependent community members is needed in sustaining small businesses using C&I.

Assessing the sustainability of communities, economies or ecological stocks through single-sector analysis—as is common practice in economic C&I investigation with respect to forestry—provides an inaccurate depiction of the interaction between the pillars of ecosystem-based management (Adamowicz, 2003). A holistic analysis of cultural, economic, environmental and social focus areas would provide better indicators of success in sustainable forestland management; however, owing to combinations of multiple C&I structural difficulties outlined earlier in this review, such an analysis has yet to be completed (Nordhaus and Kokkelenberg 1999).

A further shortcoming of Criteria and Indicators emerges through division of value areas that Criteria broadly categorize into economic, environmental or cultural realms, namely, that economic valuation techniques operate on different ontological planes than valuation of ecological capital. This is to say that using current contingent valuation processes—willingness to pay, or accept—economic Criteria are gauged in terms of their instrumental value; namely through the economic rents that a commodity flow from the forest into the market generates. Conversely, the deontological value of ecosystem services is a function of value of an object on its own sake: a sense of place, a feeling of belonging or another intangible, “fuzzy social outcome” or a similar non-quantifiable motivation stakeholders have for living in their territories. C&I, when used as a decision support mechanism, should reflect consistent valuation processes that are comparable across categories. To that end, some advocate the duplication of

indicators across Criteria. In cases where the effect is on a particular species of wildlife that is of high value for cultural and social practices, ecological as well as cultural and social Criteria will be needed to manage for them. Given the difference between intrinsic and instrumental values present in the current C&I iteration, further development should include a consistent values baseline for comparison of indicators that can be meaningfully and accurately evaluated.

To this point, this review of the relevant literature has considered Criteria and Indicators in terms of its structural shortcomings in achieving ecosystem-based management and in its omission of local-level and aboriginal stakeholder land use perceptions. Shifting focus, the remainder argues for a future direction in refining the Criteria and Indicator rubric through examination of prior research directed at conveying local—or aboriginal, in some cases— stakeholder preferences accurately in natural resource governance settings.

Using disparate methodological approaches, several others have already engaged in cataloguing aboriginal preferences toward land management that provide substantive backing for an aboriginal-created Criteria and Indicator framework. As Beckley (2002) acknowledges, inculcating centralized policy mechanisms from the ‘bottom-up’ with local First Nation values connects success in sustainable forestland management with the stakeholders that are directly dependent on forest products and services outputs. Parkins et al. (2001) is an example of past research that has catalogued and prioritized aboriginal values and land use values with the Montreal Lake Cree Nation, culminating in a First Nations generated C&I framework. The authors of this study collected their data of aboriginal community value systems by employing a combination of survey and interview techniques. Parkins and his colleagues note that in developing the resultant framework, a methodological concern was " to identify indicators consistent with community goals while at the same time aligning those same indicators with a

broad suite of sustainability concerns." The researchers identified indicators through community workshops that were incorporated into follow-up questionnaires as an evaluation and ranking of each indicator. As a further deliverable to this research, and for the sake of continuous refinement of the framework, their resultant C&I framework included a monitoring process of the locally denoted management issues identified throughout the research process.

Adam and Kneeshaw (2008) clarify the differences between non-aboriginal C&I systems and those crafted by Aboriginal peoples. The conclusions from their work point to the difficulty that areas of high value to First Nations peoples have in transmitting their preferences in a framework that was not designed by the Aboriginal community itself involved at the local level. Access to a traditional area is the leading example that the authors cite in relation to the multifaceted issue for First Nation peoples. Access to areas where indigenous people can practice their traditional activities (hunting, fishing, trapping and the like) are inextricably linked with the quality of the resource. The authors explored what is meant by quality in this sense and determined it to be defined as the productivity, integrity and proximity of the resource to the people that used in that area. That is, the notion of access is a multifaceted Indicator that provides a narrative on ecological health of the game as well as the state of cultural retention the First Nation community practicing the traditional activity. These differences point to an overarching issue at play between non-aboriginal C&I systems and ones that have been generated by indigenous groups at the local-level: That traditional activities are poorly represented in non-Aboriginal C&I systems for their inability to monitor the quality of hunting, trapping or other traditional activities as the C&I framework currently exist. This divide stems from the ways in which Aboriginal frameworks have linked their forest values to the desired

forest conditions and that non-aboriginal C&I frameworks have not clearly articulated these desires.

Adam and Kneeshaw conclude that C&I has been the most popular method of conceptualizing, implementing and monitoring sustainable forestland management, however for Aboriginal peoples, this approach does not account for the cultural attributes that need to be included in frameworks for management considerations. They present three reasons for the lack of deference paid to cultural components for indigenous peoples.

Building from the work of Sherry et al., their findings of correspondence between Aboriginal ecological needs and suitability frameworks developed by non-Aboriginal peoples indicates that ecological criteria are relevant only for biodiversity protection or species population health. This may be accurate to gauge ecological sustainability, but what is omitted from this type of evaluation is the cultural importance that a particular species may have to a First Nation. That is, ecological stocks may be quantified, but to ends with multiple accounts where only one value is measured.

The second observation is that holistic perspectives of forestland management lead to poorly measured indicators that are unspecific and show considerable difficulty in quantifying. This challenge was mentioned earlier and is consistent with the literature that has developed on C&I, pertaining directly to contributions of Smith and Sheppard.

The third challenge that C&I has for characterizing Aboriginal concerns at the local level is translating hierarchical values and forest attributes from a holistic perspective into discrete Cartesian units. Some scholars such as Parrotta and Agnoletti (2007) feel that this weakness of C&I is an attempt at reducing holistic land management into compartmental parcels and does not adequately represent an Aboriginal cosmology which, in the view of some (Davidson-Hunt and

Berkes, 2003), does not distinguish between society and individual, culture and nature, nor society and the environment.

Natcher and Hickey (2002) have contributed to the literature on community-generated C&I frameworks in their work with the Little Red River Cree Nation in Alberta. Unlike Parkins et al., however, they approached their data collection from different methodological tack; they collected values and land use preferences in a three-tiered system: with community workshops, an indicator evaluation framework, and through surveys. Individual values or perspectives were collected during the workshops, generating a broad ‘catch-all’ list, which was further reduced by considering its relevance to specific quantifiable indicators. Providing continuous refinement to the C&I system that the researchers developed in tandem with community members, they employed a survey that monitored indicator relevance to ongoing land management policies. In that manner, the community has the option of refining and adapting their C&I framework to future forestland management challenges.

Alternative methods that reach towards aboriginal values ranking exist still, as Mendoza and Prabhu (2005) show in their efforts to connect multi-criteria analysis (MCA) with community-based forest management (CBFM). They combine this methodology with participatory modeling approaches, whose scope, in the authors’ view, is too general to be used on its own in assessing Criteria for individual communities because it relies on static integration modeling. However, by wielding a union of MCA and participatory modeling in the Mafungautsi Forest, located in Zimbabwe, the article concludes that employing this approach to organizing, refining and employing community-generated motivators into the land use policy was helpful by functioning as a vehicle that relied on local-level stakeholder input throughout the entirety of the research process. While this article does not deal with the C&I framework directly, the

opportunity to employ MCA and participatory modeling to collect aboriginal stakeholder preferences is a promising possibility in answering the research questions of this proposal.

Turing toward development of well-being indicators in forest-based communities, Parkins, Varghese and Stedman (2004) conducted a similar study in the Robson Valley of British Columbia to their earlier work with the Montreal Lake Cree Nation in 2001. This article contributes to the literature by developing a method of identifying and ranking community values that generate a suite of well being indicators developed at the local level. To accomplish this, the study incorporated workshops, interviews, community surveys, and a sustainability evaluation framework. At the conclusion of the project, the data produced a suite of indicators, which streamlined community values into a Criteria and Indicator paradigm. Perhaps more importantly, the researchers' choice of utilizing well being as a mechanism to gauge C&I effectiveness at the local stakeholder level serves as a further avenue through which the framework may be evaluated and enhanced. This study highlights the use of well being of local stakeholders to evaluate policy efficacy; in this case, the resultant science-based C&I framework was gauged against social processes that help define management priorities. This article allows for observation the dynamic tension that exists between theoretical and actual issues and outcomes in evaluating sustainable forest management practices.

Despite the rich literature on Criteria and Indicators that has developed over the past decade, research is needed to address data gaps in accurately aligning the values of aboriginal stakeholders with the *lingua franca* employed by governmental agencies and the forest industry. Adam and Kneeshaw (2008) concluded that C&I is a valuable step towards the inclusion of First Nation perspectives that serve toward realizing ecosystem-based management. The conclusions from this study suggest that some are coming to an understanding of the problems C&I presents

for Aboriginal people, however there is a difference of opinion among authors on whether C&I can adequately be retooled to represent the concerns of First Nations or if such a task can be addressed by this paradigm at all. The review of the relevant literature for C&I has established that problems exist in representing the preferences Aboriginal people at the local level have in managing their traditional resources and points toward a method for enhancing the existing framework. Using the language of the community at the local level as a starting point, the work with Indian Bands should attempt to enhance the current iteration of C&I towards achieving sustainable forest management by addressing the shortcomings of the framework explicitly.

Development of a tool to identify First Nations land use priorities by minimizing researcher bias to the greatest possible extent is the focus of the research trajectory undertaken in this project with the Adams Lake Indian Band. The methodology, process and results grew from a clear need for First Nation communities to communicate in an equal language with governmental agencies is addressed in subsequent chapters of this thesis. This work relies on the hypothesis that once First Nations values and land use preferences have been appropriately ranked, tribal governments would be better equipped to develop management plans for their membership's preferences of and articulate actions to land management regimes outside the community. Such preferences have been measured in language used by individuals across the membership and provide a valid representation of their land use incentives using their own words. In the following chapters of this thesis, the methodology is outlined which allowed the research team to provide observe a catalogue and ranking ALIB resource management preferences in the context of the Criteria and Indicator management framework. The success—if there is an appropriate indicator of whether this work has achieved what it set out to accomplish—of our attempts to understand First Nation land use priorities through a systematic

methodology will be addressed in the concluding chapter of this thesis. The section entitled “Usefulness of the Q Methodology” elaborates as to whether our research goals and questions have been met from the Aboriginal partners’ perspective.

### **Overview of thesis**

From this introduction, the remainder of this thesis shifts focus from previous work that has already advanced our understanding of Aboriginal management strategies and the Criteria and Indicator management paradigm. Chapter Two presents the Q Sorting Technique through an investigation of its application in structuring land use objectives with the Adams Lake Indian Band. The necessary stages that resulted in this process are explored in detail: the statement generation process; approach to sampling; administering the interviews and the articulation of land use preferences through statements that were measured in this process. Chapter three presents the results from the interviews and provides a ranking of the most pertinent management priorities among the ALIB membership. Chapter four summarizes the results and draws connections between Criteria and Indicators, the Q methodology and the Adams Lake Indian Band. A report from the perspective of the Aboriginal partners that comments on the usefulness of the approach taken follows. Finally, the thesis concludes by revisiting the research objectives and questions that shaped this research in addition to highlighting areas of possible extensions of this technique presented in this work.

## **Chapter 2: Adams Lake Indian Band Research Partnership**

### **Introduction and Context**

In the summer of 2007, a research partnership was established between Aboriginal land management research team and the Chief and Council of the Adams Lake Indian Band of Chase, British Columbia. In late spring of 2007, the author of this thesis contacted the director of the Natural Resources Department to gauge the level of interest that the band governance may have in utilizing the Q sorting technique as a decision support mechanism in development of objectives for management of their Traditional Territory. The proposed approach was viewed by aboriginal partners not only as an additional toolkit in aiding decision making to pre-existing methods, but also as a process that demonstrated potential for incorporating resulting data into the ALIB Land Use Plan (LUP). Prior to the contact between the research team and ALIB, the Director of the Natural Resources department was tasked with composing the LUP and expressed an interest in participating in this research project to elicit a broader range of values from the band membership.

After an introduction of the project and its methods, an outline of research objectives and in-kind contributions from the Adams Lake Indian Band were presented. The Chief and his councillors deliberated on the usefulness of the proposed methodology in complimenting their existing strategic natural resources management objectives. Their conclusion was that the Q Sorting Technique had the potential to yield multiple outputs for their management objectives and agreed to participate in this research process. A summary of these is outlined below:

- (i.) Foremost among these outputs would be a community-specific inventory and ranking of land use preferences that directly reflected the strategic goals and objectives of the Adams Lake Indian Band's traditional territory LUP. These data could serve as a decision support mechanism to different departments of the Band government: the Natural Resource department, development of the Comprehensive Community Plan, and the Chief and Council as a feedback mechanism to inform their policy.

- (ii.) Input would be solicited from various members and leaders from ALIB in the development and refinement of a toolkit to document in a compact and concise manner individual aboriginal land use preferences of traditional dwelling areas. The method would take a participatory approach towards multi-attribute value measures relying on the Q Sorting methodology. In this sense, ALIB positioned themselves to assist in the development of a metric that could be utilized across regions, cultures and management objectives.
  
- (iii.) From the perspective of the Aboriginal partners, investment in local social capacity could be an additional benefit from participating in this research project. A local data collection assistant would be hired to facilitate the graduate student in identifying prospective participants in the interview process. That person would need to be trained to administer the interview and collect notes on the process as it unfolded. She would also be instrumental in shaping the sample frame construction of the members from ALIB to be interviewed during the study.
  
- (iv.) Participation in this study and the associated outcomes would position ALIB to use the resulting data from the study as a baseline against which future studies of similar nature could be repeated. A primary basis for doing so would be to document the extent to which, if any, individual land use preferences have changed in the future. Training made available to the data collection assistant and key contacts within the community were logical extensions towards issues scoping, task delineation and rational strategizing of research objectives in future Band-initiated endeavors.

An appropriate overview follows of the methodology used to sketch broad individual land use preferences that were hypothesized to strongly influence the shape of the Adams Lake LUP. Social science research methodology highlights a need for research samples to be both valid and reliable for the sake of peer review through triangulation and replication. The approach undertaken with the Adams Lake Indian Band fulfills these Criteria and is discussed at length in Chapter 3, Results – Adams Lake Indian Band Case Study.

## Methodology

Two fundamental questions dictate the choice of research approaches that provide answers to the research questions and objectives. The first of these is: What is the proof that the specified method will provide valid and reliable evidence to support the research project? The second: What are the inherent qualities of the proffered tool that may undermine the validity and reliability of the data to be collected? While considering these two issues concomitantly, we provide an attempt at answering the research questions presented in Chapter 1. We do so by providing a method and research strategy, informed by the research questions and objectives in cataloguing and ranking individual land use values in two First Nations communities in British Columbia. In this pursuit, we used the Q Sampling Technique that was initially shaped by the Criteria and Indicator framework. As the research process unfolded and key members from the community voiced what was important to members the Adams Lake Indian Band. As a result, direct connections to C&I framing in this study proved more and more difficult and were eventually removed from consideration altogether.

Documenting and rank ordering a suite of clustered viewpoints and land use preferences in diverse aboriginal communities across the province requires a tool that satisfied multiple dimensions of social science research. One such criterion is that the method be both valid and reliable in conducting the proposed study and in future replication efforts by other scholars. A necessary property from this study is that the tool be dynamic and allow for patterns to emerge from the dataset rather than support the *a priori* hypotheses of the investigator. Such approaches falsely assume that the observer holds a complete understanding of the complex network of preferences linkages among the membership and a dependent-independent relationship can be sketched. The Q Sampling Technique assumes no prior knowledge of individual land use values

and allows for them to inform the investigator for this study. This noteworthy element deserves attention as it allows the information in a language familiar to participants to emerge and become the basis for better decision making within the Band. Building upon this required characteristic and perhaps the greatest challenge that the Q Method must satisfy is that the approach imposes minimal researcher bias on the participant. Employing a data collection mechanism that introduces a presupposition of the researcher on a respondent yields a distorted dataset that is separate from the personal views of the research subjects, themselves. In this project the tool that satisfied these requirements was the "Q Sampling Technique." The Q Method provides the methodological structure to this thesis project in measuring the existence and the magnitude of various individual land use preferences in the Adams Lake Indian Band traditional territory.

### **Q Sorting Technique Overview**

In 1953, "Q Methodology" or "Q Sorting Technique" was developed for use in psychology by William Stephenson for its treatment of an extensive, unbiased and statistically robust approach to conducting research about human subjectivity. From a large dataset with multiple duplications, Q offers the researcher an opportunity to reduce the number of statements such that the patterns within the original set can be observed.

In brief, Q involves sorting a set of 60 to 100 statements about a specified topic—the research concourse—into stacks that correspond to ones ranking from those most disagreed with to those most agreed with akin to a graduated scale. That is, sorts of the statements are made using numerical values to indicate degrees of concurrence across a spectrum of +5 (most agree or most like my point of view), 0 (value neutral or indifferent), to -5 (most disagree or least like my point of view). The individual places each card along this continuum until each statement has

been grouped with similar statements that he or she most disagrees with, is indifferent to, or agrees with. The resulting stacks, called "Q sorts" indicate the respondent's individual ranking of each statement that translates to a discourse—or the perception of the respondent's point of view about the concourse—of individual views or attitudes in relation to the concourse. In the case of the Adams Lake Indian Band, the concourse was the on-reserve membership's preferences among management alternatives for the traditional territory; the discourses and results is a set of the individuals expressed through the Q Sorts and factor loadings. Each individual ranking is then compared across the research sample frame and systematically analyzed based on the degree to which people agree or disagree significantly with each of the respondents and each value statement presented in the cards.

In the next stage, factor analysis and vector rotation are used to highlight and extract elements of high concordance among individuals within a participating community: these are factors that are most agreed or disagreed with by participants as they are ranked consistently throughout the sample frame. Analysis of the 'factor loadings' across individuals of a population sample frame indicate which aspects of the concourse are present and their relative importance to each other. Finally, the factor loadings are converted into a set of statements that typify that factor. These statements are instructive in framing the factor narrative, which dictates specific values that are heavily loaded on positively or negatively and assists in identifying which preferences are exhibited among the members of the Adams Lake Indian Band. In this project, the researchers reported their findings to the respondents to serve as a decision support mechanism in identifying and ranking values or attitudes with respect to aboriginal values or land use preferences in natural resource management in their community.

An element of the statements worth underscoring is that they directly relate to priorities

and preferences within a given research population because the statements originate from areas of concern identified by the respondents themselves. Brown (1990) notes that the topic of investigation or the concourse in the language of Q Method practitioners—is concerned with life as it is lived from the vantage point of the persons involved as respondents that complete the sorts. In the case of the Adams Lake Indian Band, the concourse is the nature of management preferences exhibited by the individual members for their traditional territory. In this study, during workshops involving prominent members of the community, the investigator and team worked with prominent community members and Band leaders to draft statements resulting in a tableau of "Q Statements" relevant to the management alternatives expressed by ALIB members. To obtain these relevant management objectives, workshop participants were asked questions regarding what they would like to see included in the Land Use Plan for ALIB's Traditional Territory. It should be noted that the potential exists for a bias to be introduced to the set of statements biased by the views of those involved in the generation workshop. Special care should be given to ensure that a sufficient amount of diversity is contained in the inventory of statements. These statements constitute the discourse about the concourse – the relevant management priorities concerning the land use of ALIB's traditional territory. The anticipated outcome by utilizing the Q method was that inputs from individuals in the community would assist in identifying commonly held views or attitudes among the on-reserve membership regarding natural resource management. Our proposition and extension to Aboriginal partners would be that such knowledge would facilitate the Adams Lake Indian Band and other First Nation communities that used this technique to articulate their unique land use values to others on their own behalf, using their own words. Of course, the statements and analysis for the Adams Lake Indian Band are specific to that group. The tool is a suggested way of eliciting these values,

not the specific land use objectives from one community that can be extrapolated to other Bands. The resulting information from a Q study is a concise dataset that represents potential diverse points of view among the on-reserve membership of the Adams Lake Indian Band.

To complete this overview, three main characteristics of the Q sorting technique bear repeating that crystallized the decision to undertake this study using this technique. The first is that the people being studied in this investigation provide the input that the researchers will examine as the statements are crafted terms familiar to the community. The validity and reliability issues that are at the center of most social science survey approaches become moot points in Q. That is, Q is wholly subjective in the sense that it represents the point of view of the person completing the sort. As such, there is no external criterion to appraise the perspective of one individual to the next. The interest of Q is in the relative ranking of statements from one person to another, not the existence or absence of a loading on one particular value. Because Q addresses these deficiencies of survey instruments by using the language of the people being studied—their natural units—Q is capable of revealing categories of operant subjectivity, or a respondent's subjectivity, to the investigator.

### **Subjectivity and Self-Reference**

Given the qualitative nature of researching human perceptions and values, an essential element of the data collection strategy used in this case is that it not omit a respondent's personal experience or point of view in favor of a dataset envisioned by the researcher. This is to say that the priorities and values of the community should dictate the elements of land management that need investigation; not what the research team perceives the predominant management questions to be. The tool must consistently maintain the respondents' self-reflexivity across the sample

frame such that researchers gain a richer understanding about the amount of agreement or disagreement among respondents with respect to the concourse. McKeown and Thomas (1988) point out that Q entails a method that systematically studies human subjectivity. From their perspective, subjectivity "means nothing more than a person's communication of his or her point of view." Q allows for the subjectivity needed in this task by requesting a rank-ordering process from statements that are most or least characteristic of the respondent's worldview. The inherent advantage of using the Q Method toward this research undertaking is that it imposes no premeditated researcher hypotheses on the respondents (Stephenson, 1953; Brown, 1980; Dryzek, 1993); Q is a method best suited towards exploring a discourse within a study population rather than patterns across statements. For Q, the statements about forest, rangeland and water management that we asked the individual members of the Adams Lake Indian Band to rank are the units of analysis.

The Q sorting method enables the researcher to observe individual respondent reactions toward the concourse rather than other statements outside the study domain. Brown (1986), and subsequently Dryzek and Berejikian (1993), define a concourse formally to be "the volume of discussion on any topic representing an interplay or running together of positions, ideas and opinions." The analysis of the discourse among respondents in relation to the concourse has an output of diverse values and attitudes, factors, that shape their distribution—a factor distribution—among individuals and across communities. Dryzek (1988), following van Dijk (1985) provides that a discourse "embodies a shared set of capabilities which enable the assemblage of words, phrases, and sentences into meaningful 'texts' intelligible to both readers and listeners." In simpler terms, our discourse is the set of statements that we asked members of the Adams Lake Indian Band to sort.

Because of its sensitivity to respondent subjectivity and self-reference, Dryzek and Berejikian (1993) argue that Q is a 'reconstructive technique' by including those elements into a discourse analysis from resulting factors in and among research sample sets. Minimizing the researcher bias that may be imposed on participating individuals from a community through an *a priori* response structure—about which independent variables like gender, income, or education levels influence the topographical shaping of the resultant factor loading—Q allows for unanticipated and novel results to emerge from the data previously unconsidered by the researcher (Addams and Proops 2000). Enlisting the Q Sorting Method in their study on political discourse, Dryzek and Berejikian identified four categories that related a disconnect between conceptual democratic theory to "live possibilities in democratic discourse." These categories, discourses among respondents, are the result of four factor loadings in response to statements about theories of democracy: Contented Republicanism, Deferential Conservatism, Disaffected Populism, and Private Liberalism. The resultant factor loadings are significant because none of these four factors "represents the liberal democratic model often thought basic to the political culture and regime of the United States." Owing to the self-reflexivity and subjectivity of Q, the transitions among conservative and liberal-minded citizens were observed without the inherent researcher bias influencing the accuracy and precision of their data collection. In this case, and in other Q studies, the method allowed for unanticipated results to emerge from the data, allowing Dryzek and Berejikian to highlight that democratic theory is "rooted in the way people 'out there' really do think about democracy, about themselves and about how they do or can act politically." This example illustrates that Q is context-specific in that factors of the discourse do not exist independently; they, the factor loadings, indicate the relative importance of each factor to the subject through their ranking of agreement or disagreement with them. This vital characteristic

allows the statements to be rank-ordered in a way that allows subjects to articulate their preferences towards the concourse on their own behalf.

Q Methodology is a tool that provides a foundation for the study of human subjectivity in a systematic fashion. The interest of this approach is to determine the elements that compose the nature of the concourse and the extent to which statements that paint those elements represent a participants' point of view. In tandem with consistently and systematically maintaining self-reflexivity and respecting operant subjectivity in a straightforward manner, Brown (1986) emphasizes that Q is a statistically rigorous approach towards subjective data collection that fully captures the relative importance of the intercorrelation of factors among subjects. Further, Brown states that 'The concept of validity has very little status since there is no outside criterion for a person's own point of view.' Addams and Proops (2000) argue that—in contrast to the R approach, which suggests differences between subjects indicates the level of the variable contained by each subject—Q highlights the relative importance of each statement to the other. It is entirely possible for the researcher to have expectations about the content of the resulting factors for a research population using the Q Method. However, the relative position of statements to each other underscores an important element of the tool: the researcher's expectations can easily be contradicted. As an example, the researcher may assume that components A, B and C exist and develop instruments to determine the prevalence of those variables. In actuality, the study population may have views D, E and F that are not foreseen by the researcher. The conceptual categories that exist among community members that are not fully understood or known are allowed to emerge from the data through the mathematical functions of matrix algebra and factor analysis. It is through these support mechanisms that Q focuses on the concepts of operant subjectivity and self-reference in is a statistically rigorous technique

involving the application of three statistical procedures to support cataloguing and ranking of statements across the research sample (Addams and Proops, 2000):

- Calculation of a correlation matrix;
- Extraction and rotation of significant factors towards the concourse; and
- The computation of factor scores among the sample frame.

McKeown and Thomas (1988) note that a core difference between Q and R methodologies with respect to statistical reliability and validity is the manner through which the factors were collected. This is to say that the mathematics in the calculation of the factor scores are identical using the Q method as they are in a technique of matrix algebra applied to a different purpose than survey design.

Revisiting the notion of self-reflexivity, it is worth noting that Q involves a consistent unit of analysis—the individuals—as they rank various statements of the concourse. This is because the pertinent statements are generated from participant observations using the words or phrases of the participating individual or groups thereof. Dryzek and Berejikian suggest using a cell structure or matrix as a classification device in constructing a mixture of types of statements.

Our approach in drafting pertinent statements resulted in a list of statements, or concerns that was guided during a two-stage workshop through open-ended questions of what leaders and the membership would like to see in the community plan and land use plan for the traditional territory. The number of statements may limit the expression of subtle distinctions. That is, each sort is unique given the suite of available statements. Respondents cannot add statements as they represent the discourse of land management preferences within the study community.

It is at this stage—the drafting of the statements to be sorted—that the self-referent and unbiased assets of the Q sorting technique may be compromised: What is the outcome of a sort

of statements that do not pertain to the concourse within a given community? The statements must be relevant to the respondent for an ordering of them to represent individual attitudes towards the areas of discourse. Indeed, Addams and Proops note that a useful set of statements must be "comprehensive and representative selection of statements to be sorted by the participants." Further, the authors emphasize that a necessary condition in conducting salient Q studies requires that the statements be deliberately selected to reflect the entire range of participating individual opinions as they relate to the research topic. McKeown and Thomas (1988) contribute that when this condition has not been satisfied, the "[c]ategorical definitions miss or misinterpret meaning from the respondent's own frame of reference."

In addition to the necessity of relevant statements to the study population for a meaningful ranking to occur, other objections are sometimes raised about the Q sorting technique. Bolland (1985) argues that the act of sorting a vast number of statements that ensures sufficient diversity lies beyond the cognitive capacity of the respondent. Successful Q studies have avoided this qualification by limiting the concourse elements to be sorted through rigorous pre-testing of Q statements. McKeown and Thomas also caution against mistaking a participant's ranking of statements that relate to the factor importance in the sorts to be cardinal rather than ordinal. That is, in Q, a respondent's ranking of elements of the concourse functions on a presence of 'more than or less than' either the factor is relevant to the correlation matrix, or it is or it isn't. The quantification of the statements is done to allow examination of the orders selected by different individuals.

Further to potential caveats that can arise from the salience of statements that relate to—or worse, do not have any relevance to the sample frame—an additional element needed to be acknowledged through our methodology. The notion of the framing effect needed

acknowledgement in our documentation to the governmental leaders of the Adams Lake Indian Band. One kind of framing effect concerns the issue of who is asking. That is, non-Aboriginal investigators working with indigenous groups can produce conflicting data based upon who asks the respondents to sort a set of statements. Our tack in addressing this issue is transparent and straightforward: in our report to the leaders of the Band, we will acknowledge the externalities of the framing effect in a manner supporting a case for future Q studies conducted independently by members of the community. This issue also crystallized our decision to enlist the expertise of a data collection assistant from ALIB to administer a majority of the sorts. Armed with knowledge of how an issue has been framed *a priori*, community leaders will be able to build a convincing case for participating in future research that collects and ranks indigenous land use preferences. Data presented from the results of this thesis were originally intended to be extended further as baseline information for comparison with future development in this area.

The exact language used in with the respondent was also an additional consideration that could have affected how statements were sorted during the interviews. Appendix II contains a sample copy of the questions that were asked of the respondents. Attention should be given to the final section where the data collection assistant recorded the statement numbers as they were sorted into different columns. These columns begin at -4, meaning completely disagree to +4, meaning completely agree. This language was used with the understanding that the semantics could have held implications for how a respondent may rank a particular statement. Given the list of statements (Table 2.1), we decided that this language was the least obtrusive and fit with the type of responses that participants would feel best represent their point of view.

For the purposes of this research, we maintain that the Q method will allow for sufficient emphasis to be placed on the subjective viewpoints of the respondents in a statistically rigorous

manner without using measures that have been imposed by the research team. This is because the mathematics of principal components and factor analysis are identical in this application using Q as those of any other body of data. Special care was given to develop a set of diverse statements for sorting, which we acknowledge through our statement generation process during workshops with community leaders and advisory panel. With the assistance of prominent community members, those affiliated with the Tribal government and other leaders, we developed pertinent community-specific statements ensuring that the Q sorting technique adequately gauged individual preferences towards natural resource management decisions among and across indigenous communities in British Columbia. At the conclusion of this study with the Aboriginal partners from ALIB, this research project did not use statements crafted to emulate the C&I framework based on a lack of interest on their behalf. The lack of appetite for structuring statements in the language of Criteria and Indicators was due to the combination of weaknesses expressed in the literature review in Chapter One of this thesis. The overarching justification was that C&I, in its current iteration, does not completely portray the priorities and preferences of Aboriginal people satisfactorily in the view of the government of ALIB. In Chapter Four, this thesis addresses this issue at greater length in a section entitled “Correlation between emergent factors and Criteria and Indicators.” There, the case is made that the factors from this investigation are poorly characterized through a C&I system to articulate the concerns, management objectives and priorities of the Aboriginal community.

### **Generation of Q Statements**

The approach towards comprehensive measurement of management priorities for the membership of the Adams Lake Indian Band is rooted in the listing and selection of statements

available for the respondent to rank. The statements were developed jointly between the ALIB research advisory council, which was composed of band leaders and the author of this thesis. The process that resulted in the final statement listing was guided by one workshop over two days with knowledgeable individuals from the community who formed the research advisory council.

In September 2007, the research assistant facilitated a first day of the workshop with ten individuals from ALIB who were invited to participate based on their expertise with contemporary management issues of the traditional territory. Both days of the workshop was held in Chase, British Columbia and relied on in-kind contributions from the Aboriginal partners in terms of their availability and willingness to participate. Eighty-four statements resulted from the first day and were transcribed by the facilitator for distribution to the participants with the instructions that they perform a pre-test from that statement set before the second day of the workshop.

The goal of second meeting with the director of the ALIB forestry department and a councillor was to pare the list of statements to a number that presented fewer demands on the endurance of the respondents. Duplicate statements were eliminated and particular care was given to represent all of the diversity that would allow each respondent to rank disparate uses of the land with equal opportunity. The graduate student facilitated the statement editing exercise to capture all of the areas for management of the traditional territory; in many cases the original statements were reworded to reflect specific objectives. The final number was forty-four statements that influenced management of the traditional territory and as further information for ALIB's comprehensive community planning endeavors. The key role of the advisory committee was that they were the keepers of the knowledge in the community and that they were the ones to select which areas should be investigated in this study.

## **Listing of Concerns and Values**

At the conclusion of the second day of the statement generation workshop, input from participants resulted in the production of a list of statements that would be used in the interviews with the Adams Lake Indian Band membership. The list, presented below, was the product of two separate iterations of statement generation with informed leaders of the community, guided by multiple objectives during that process. The first, and perhaps most important of the objectives was to create a comprehensive listing of the land management issues and preferences that were relevant to Band leaders and the membership, alike. The raw statements that were generated in the first day of the workshop totalled 84 and were reduced by the conclusion to the final listing of 44 independent variables printed below. The raw listing of statements can be found in Appendix I: Raw Statements for Q Sort Templates. Each listing constitutes an inventory of the concerns from knowledgeable leaders and members from the Adams Lake Indian Band regarding management of their traditional territory.

**Table 2.1 – Q Statements of Adams Lake Indian Band<sup>1</sup>**

1. Livestock are important to my family.
2. Agriculture in Adams Lake traditional territories should be ecologically sustainable.
3. Cattle should have should have restricted access to riparian areas.
4. Clear cutting permanently destroys non-timber values.
5. An indigenous land and food system is the forest, waterways, plants, animals and their interaction that sustain our people.
6. Any forestry practice should be ecologically and culturally sustainable.
7. Secwepemc ecological knowledge values and wisdom combined with a scientific approach is critical to sustainable land management.
8. Forestry and land management should result in diverse and resilient ecosystems.
9. Forest land management should take into account the effects of climate change on ecosystems.
10. To address catastrophic forest health issues (like mountain pine beetle), those areas should be harvested and planted.
11. Traditional Secwepemc use of fire on the land is an acceptable management tool.
12. Preserving sacred areas for spiritual and ceremonial uses are important to me.
13. It is important that a localized model of land use planning must benefit the community by providing realistic and diverse regional economic opportunities.
14. Land use planning should balance short term with long-term management goals.
15. The "us vs. them" mentality should not be used to manage natural resources.
16. Water quality has degraded over the past ten years.
17. Water is a significant part of my cultural heritage.
18. Cultural strategies and practices (e.g. how to dig roots and prune trees) are important ways to participate in the management of our traditional harvesting sites.
19. The people are part of the natural systems; they are not separate from nature.
20. We have an obligation to see ecosystems are healthy and functioning for present and future generations.
21. Natural resource management is maintaining relationships between humans and the natural systems, as opposed to simply using resources.
22. Resource extraction should not negatively impact water quality or quantity.
23. Excess Irrigation can impair water quantity for surrounding areas.
24. Inappropriate Hydro (power generation) projects damage the ecosystem.
25. Tourism is important to my family.
26. Fishing is important to my family.
27. Plant gathering (birch bark, root digging, medicinal plants, berry picking) is important to my family.
28. Hunting is important to my family.
29. Certain types of mining (like gold panning) are acceptable in the traditional Secwepemc territory.

<sup>1</sup> These forty-four statements were used during interviews with the respondents of this study. The Director of Natural Resources for ALIB, council members and elders worked together to produce these in a participatory workshop. See Appendix I for that list.

**Table 2.1 – Q Statements of Adams Lake Indian Band – Continued**

30. Forest industry is important to my family.
31. The existing land base of ALIB is insufficient to sustain present and future generations.
32. Active political lobbying is necessary to influence governmental policy and implement ecologically and culturally sustainable land use plans.
33. Traditional resource management emphasized community health and resilience; contemporary forested land management focuses on individuals.
34. Our stories and oral history tell us of ways to manage the land that are in harmony with nature.
35. Traditional aboriginal values paid respect to all of the resources because they have a spirit and were created for a purpose.
36. I believe in taking only take that which I need – nothing more.
37. Our language embraces our traditional ecological values, allows us to communicate them to each other and is the key in teaching traditional land use.
38. Contemporary management allows for us to trade with neighbouring communities. We trade fish for access to good hunting areas, for example.
39. The political process creates awareness about aboriginal Title and Rights and is a lobbying power that can be used by the band.
40. We need to remember our lost social values: pride, self-esteem, our language, and parenting.
41. Short and long term planning is essential in managing our natural resources.
42. ALIB needs to develop an information package to educate the general public. This packet would include our history in addition to the current goals and aspirations held among community members.
43. Global demand for ALIB's resources impact the local economy and land base.
44. There is a need to re-learn Secwepemc traditional values, norms and laws.

### **Interview Sampling Structure**

The research assistant worked closely with key contacts in the community to scope and structure the spatial limits of the research population. In the case of ALIB, the sample frame was the entire listing of registered members who resided both on reserve in Chase and on an additional reserve in Salmon Arm, BC. The director of Forestry served as the conduit between the research assistant and the Adams Lake Health Department that held the entire membership listing which was used in sample frame construction.

At this stage, the director of Forestry for the Band identified an assistant from the Band who aided in conducting the interviews with the respondents. The data collection assistant was

selected based on her presence in the community as well as her affiliation as a member of the band and interest in applying the Q Sampling Method in future studies. Additional factors that guided in her recruitment included her expertise and knowledge of potential respondent availability and relevance to the current research. The assistant was trained to implement the sorts and interview questions with additional guidance on how the results were to be recorded to facilitate data analysis at a later stage. The training process for the data collection assistant contributed towards one of the goals of this research undertaking, which was to build capacity such that the Band could repeat the study at a later date without intervention from the UBC research team. This involved a topical training of the data collection assistant in Q Method and administering the interviews. The legacy benefit of training in Q Methodology was instilled in the key contact at ALIB, their Forestry Manager who participated in all stages of the study and was exposed to the original statement generation workshop to the presentation of the results to the chief and council at the conclusion.

Among the responsibilities that were required from the data collection assistant were contacting and administering the interviews with the respondents from the membership. She was also involved in structuring of the sample frame and sampling interval. The investigator and data collection assistant established a sampling interval from a coded list of the membership from ALIB's Health Department. From 284 registered names, a sample of 50 respondents was determined to be a representative and was subdivided by age and gender demographic attributes. The following table presents the sample frame and interval for our approach with the membership of the Adams Lake Indian Band. Exact numbers of individuals that were provided from the Health Department's listing along age and gender cohorts dictated the sample interval for those categories. These exact numbers and sample interval for each age and gender cohort are

presented below in Table 2.2. The target number of interviews for members aged 18-35 was 20; for ages 36-55 was again targeted at 20 interviews; for elders, our target was 10 to obtain a total of 50 individuals.

**Table 2.2 – Sampling Intervals with the ALIB Membership**

	<b>Age: 18-35</b> Sample interval from 112 members	<b>Age: 36-55</b> Sample interval from 114 members	<b>Age: 55+</b> Sample interval from 58 members
Male Interval	target = 10 4,7	target = 10 5,8	target = 5 2,4
Female Interval	target = 10 6,5	target = 10 5,6	target = 5 3,4
	<b>20</b> 112	<b>20</b> 114	<b>10</b> 58
Total, n=	<b>50</b>		

It is worth noting that neither the research assistant nor the principal investigator from UBC were informed as to the identities of the individuals whose names were chosen as respondents in this project. The research assistant and data collection assistant worked together with a coded list that excluded the names and locations of the respondent at the behest of the University Behavioural Ethics Review Board. As such, raw numbers of the membership along gender and age cohorts were provided by the Health Department; an interval was developed to interview a representative number of individuals from each gender and age cohort. Table 2.2 above shows the number of individuals that were characterized by the age and gender cohorts from the Health Department roster. Working from this list, the data collection assistant located the prospective respondents and contacted them. The target number of interviews per cohort is given in the left-hand column with the sample interval listed to the right. Taking males between 18 and 35 as an example, the sample began at a random start of the fourth name on the list and proceeded to every 4.7, or 5<sup>th</sup> person. This was the approach that was utilized throughout the rest of the cohorts to attain 50 interviews in a stratified representative sample with a random start.

## **Administering the Interviews**

The data collection assistant was an instrumental figure in conducting the interviews. The decision to maximize on the expertise of the assistant was made based on several qualifications. The first of these was the assistant's level of knowledge with respect to respondent availability and location. This was the obvious advantage from engaging someone from the community to administer the sorts. In many cases interviews were scheduled days or hours in advance and provided considerable flexibility in terms of the interview timing and location. In nearly all cases, the assistant traveled to the respondent's home to conduct the interviews and noted any further input the respondent may have offered.

Another consideration that led the research assistant and principal investigator towards the selection of representative from the community to collect the data was the potential of observation bias that might have influenced the statement rankings of an individual. The data collection assistant was known throughout the membership and already possessed levels of trust that far exceed what the graduate student could have earned in a short amount of time allotted for data collection. The decision to involve a local data collection assistant also contributed to the capacity that was alluded to earlier in this section.

The research assistant and data collection assistant interviewed 50 members and leaders from the Adams Lake Indian Band in a stratified representative sample with a random start. A list of registered Band members was obtained from the Adams Lake Indian Band Health Department and the data collection assistant coded each of the names into research control numbers. Once this step was complete, together the research assistant and the data collection assistant subdivided the sample frame into demographic subgroupings: by gender and age,

respectively. The first age cohort was divided among those who were 18-35, the second 36-55 and the last encompassed 55 and above. Each of these three groups was further divided by gender class resulting in six total cohorts for this study.

Training on interview sampling structure and data collection and collation was another factor that shaped the decision to recruit a member from ALIB in this process. In this component, the graduate student worked closely with the data collection assistant to ensure that the data quality was consistent and that the response level was consistent and adequate for the data analysis stage. Instructions for the data collection assistant were to visit the respondent in their home for a period of 20 to 30 minutes and deliver the survey attached in this thesis as Appendix II. The respondent was then given a stack of note cards with statements printed individually on each card. The assistant gave direction that the cards be sorted into groups that are most like their point of view in a far right column, to those that that did not represent their point of view at all at the far left. The statements to which the respondent was indifferent were to be put in the middle, indicating a neutral opinion. The respondent forced no normalization of statements with the participant at the time of sorting. That is, each individual sorter did not uniformly distribute the statements symmetrically with an equal number of statements in -2 as +2. Rather the raw asymmetrical ranking and placement of each statement was recorded to better capture the perceptions of the respondent's ranking of each statement.

The data collection assistant administered the interviews between December 2007 and January 2008. The interviews were recorded on the surveys that each responded was given with identifying age and gender characteristics and was assigned a research control number. These hard copies were then mailed to the research team at UBC. A sample interview form is provided at the conclusion of this report, in Appendix 2.

## **Objectives and research extensions for Factor Analysis**

Factor analysis is a statistically robust approach that quantifies a set of variables that interact with individuals, which have been observed under specified conditions (Gorsuch, 1983). It is the statistical tool of choice for many research applications for its satisfactory treatment of large and impenetrable data sets that contain a significant amount of variance among the variables without losing information contained within them (ibid). To that end, factor analysis has been utilized for reducing the overall number of statements into a cluster of individuals who rank particular statements similarly that assist in analysis. The aim of this tool is to summarize variable interrelationships in a concise yet accurate manner without omitting any non-trivial information (ibid). This process abets efforts in conceptualizing complex interactions among statements relating to the concourse. This is the discourse from interactions of rankings of each statement relative to the concourse of this study.

The functions in which factor analysis is helpful to the researcher are primarily twofold. First, the number of defining statements is reduced such that combinations or groups of individuals that share variance are clustered together so that their view of the concourse can be described through a factor narrative of defining statements. After the number of variables has been reduced, the second task of the factor analysis is to determine an underlying structure in the relationship between them such that a classification across them can be made without losing information contained in them. This latter function is one of two central goals of factor analysis in any research context: Reduction of variable breadth without omission of cumulative discourse variance, and; formation of a structure among those variable interactions with respondents.

Reduction of variables into factors is a necessary step in identifying complimentary and contrasting relationships among them that is applicable to any social research setting. That is,

factor analysis attempts to document in a systematic fashion, independent relationships among variables. In the research with the Adams Lake Indian Band, groups of people who share the same points of view through clustering of their values is the desired outcome from the Q sorting technique and factor analytic processes. This aspect of factor analysis cannot be stressed enough: Practitioners in Q have long advocated the use of factor analysis to produce a set of synthetic sorts, or factors, upon which clusters or groups of individuals who rank statements similarly are subsumed.

This is to say that resulting perspectives among the individuals who compose the sample, or factors, are independent of each other. This is an inherent mechanism of factor analysis, because each factor has been extracted as to maximize the variance among relationships between variables, which are not captured by the preceding factor. In a normative sense, consecutive factors are perfectly uncorrelated, or orthogonal, to each other. Further, factor analysis operates in a subtractive function. The maximum amount of variance is taken by the first extracted factor and removes it from consideration for the rest of the subsequent factors. That is, the second factor, while perfectly uncorrelated with the first, extracts the maximum amount of remaining variance from a correlation matrix except for the variance that has been consumed by the first factor.

It should be noted that the relationship between independent and dependent variables is not investigated in a factor analytic framework. Latent causality between variables extends beyond the scope of this technique; such is not the fundamental concern of factor analysis as a research tool. Rather, what factor or principal component analysis does allow for is the emergence of patterns or variance among multiple variables so that the investigator may determine the *extent* of variance across a research population and the *depth* that variance reaches.

Although the relationship between independent and dependent variables is not the thrust of a factor analysis, it does assist in describing the nature of the relationships among all the variables by proposing answers the following questions:

1. How many important factors (or points of view) are there in a sample frame?
2. What is the nature of these worldviews?
3. How well do the hypothesized factors use up the variance in the data?
4. How much unique variance does each factor include?

### **Rotation of factors and rotational techniques**

The literature on multivariate statistical analytical frameworks is rich enough to include factor analysis among the serviceable tools of any statistician. Factor analysis is of course grouped with this body of knowledge, where many have applied the approach to large and varied data sets with the intention of culling thematic groupings among the interactions among the independent variables. However, factors that have been extracted from such data sets through statistical software packages are constructed such that the factors maintain a zero-correlation value between each of them. While this is done to reduce the overall commonality expressed by each individual cluster of viewpoints about the concourse—that is, each factor represents a different orthogonal view relative to another—the units of analysis, the people involved in our study from ALIB, are at risk of loading significantly on subsequent vectors. When this happens, the researcher can rotate each of the axes such that the factor, or clusters of individuals, loads significantly on those cases and is a better representation of relevant participant perceptions.

Gorsuch, Tabachnick (2007), and others provide an informative inventory of techniques available to researchers who choose to employ factor rotation. They can broadly be categorized into two camps: orthogonal rotation and oblique. The former rotates factors with the precondition

that each of them remains uncorrelated with the other; the latter seeks to maximize the incidence of factor correlation with data observation points. Both are advantageous in their own regard, however the choice of which technique to employ hinges on the objectives and propositions that the researcher intends to explore.

The literature on Q Methodology suggests that a varimax rotation is an appropriate rotation choice for its orthogonality. As Gorsuch elucidates, the chief advantage of varimax is that the variance of the squared loadings *among the factors* are maximized, rather than the variance of the squared loadings *among the variables*. In essence, varimax seeks to maximize the variance across all factors in the correlation matrix such that each factor maintains a unique non-correlation with another while minimizing a general factor solution.

As the discussion below will enumerate for the reader, the choice of rotation in the case of the perceptions of sustainable forestland management with the Adams Lake Indian Band is of a peripheral concern for the investigators of the research team. For the factor rotation and subsequent selection of a technique to be pertinent, one must have extracted more than one factor. Such is not the case with ALIB as 80% of the interviewed population loaded significantly on the first factor. There are other factors that are composed of a few respondent, however, the defining statements of these suggest that their views are similar with the first factor, but differ in individualized ways.

## **Chapter 3: Results – Adams Lake Indian Band Case Study**

### **Overview of Data and Analysis Procedures**

The decision to use the Q Methodology came from an exploratory basis to determine whether this approach that has been used extensively in psychology could illuminate new understanding in working with First Nation communities. The results of this exploration are presented in this chapter.

At the outset of the presentation of the results from the Adams Lake Indian Band, a brief description of the approach used in this study will assist in issues scoping and conceptualizing the myriad facets in managing for community values in the context of land resource management in Aboriginal communities. The Q Sorting Technique exists in contrasting origins from a traditional survey approach towards social science research. That is, the respondent is asked to sort a stack of cards rather than complete a multiple page survey where the variable parameters have already been predetermined by the researcher. A collection of specific value-oriented statements are printed individually on index cards and given to the respondent with the explanation that he or she sort them into groups that best represent how he or she thinks about a topic. That topic, the land use preferences among Adams Lake Indian Band members, this is the research concourse. The typical sort can resemble a scale with a graduated distance of strong disagreement (-4), indifference (0) to strong agreement (+4) with his or her perspective. The respondent reviews each of the statement and orders them according to his or her interpretation—that is, their individual ranking—of the variables. In this application with ALIB, the variables are values or resource use preferences that pertain to land use planning in the study area.

At this stage, analysis of the individual responses to each card across the sample frame can be made with the assistance of a computer and statistical software that has multivariate statistical analytical capacity. Principal component analysis, factor analysis and vector rotations are all required attributes of a useful program to evaluate the range and depth of variance among individual member preferences in the context of use preferences of the ALIB traditional territory. As will be presented in the next section, the results of this thesis only relied on one type of analysis – principal component analysis – as there was little to be gained from rotating other factors than the ones discovered. The rationale for this decision was that a majority of the participants in our study loaded significantly on the first factor and the subsequent variance of perspectives became more individualized. As such, clustering groups of people who think similarly about specific statements would have produced groups of four or five people. PQMethod, an open-source software package that has had extensive utility towards previous Q studies was utilized for its cost, performance and overall interpretability of the emergent viewpoints, or factors, from interpretation.

Factor analysis, principal components and vector rotation—tools used traditionally in a quantitative research context—can be used in our investigation of subjective individual value judgments: qualitative data. This technique to quantify values, a qualitative domain, offers a promising opportunity for a systematic treatment of individual and group land use preferences. Put another way, analyzing individual value rankings across a community through grouping or clustering similar viewpoints with each other provides a statistically robust approach towards quantifying a qualitative domain. Researchers and practitioners who emphasize value-focused thinking stress that people are experts in their own values; Q methodology and factor analysis allow investigators to cluster groups of people who share similar views and determine what

policies they may advocate. Our purpose in doing so is to give underrepresented individuals or groups an opportunity to provide input to decision makers and policy architects whose daily work affects those uninvolved in the strategic planning of communal resources. What is perhaps the most novel facet of this approach is that since this technique was built using statements from individuals within the research community, the results are in their own words and represent their values structures.

### **Resulting Factors for Adams Lake Indian Band**

The social science research outcome anticipated in working with the Adams Lake Indian Band was to identify clusters of people who share the same land use preferences across the list of registered band members. The Q sorting technique allowed for the researchers to record an individual ranking, compare it relative to the rest of the sample frame and draw conclusions as to existing patterns of thinking about land use planning in the study community. Until this point, the discussion above outlines the steps necessary in conducting a factor analysis. From here, we turn our attention to the case of the Adams Lake Indian Band and the resultant factors or clusters of viewpoints that emerge from a survey of their membership.

The first step in completing the extraction and analysis of the factors begins with a correlation matrix composed of the interviewees. This calculates the degree of correlation among individuals within the sample frame. Next, Principal Component Analysis groups people who load similarly into clusters – the largest cluster for ALIB is composed of 40 individuals (See table 3.2). Clustering of individuals generates the factors, or groups of people who load similarly on particular statements. Computation of the factor score involves finding the weighted average of the factor score of each statement within each factor to gain the sum for each particular factor. This process allows for the calculation of the standard deviation into a linear transformation to a

z-score. In the case of ALIB, symmetry was not imposed on the distribution of each set of statements with each respondent at the time of the data collection. When an asymmetrical distribution occurs, PQMethod normalizes into a symmetrical distribution automatically so that normalized factor scores are given as an output. Normalization produces a set of data that has a variance of 1. The maximum amount of variance is taken by the first factor, with each subsequent factor, the remaining available variance decreases in a step-wise fashion. This subtractive feature of factor variance means that the remaining diversity of opinions in factors two through eight is what is left over from what is taken up by the first.

One core factor, or way of thinking about land use planning emerged from fifty individual viewpoints that were observed during the interviews. This factor represents 22% of the variance of perspective across the entire sample frame, which is significant in its own regard as 80% of the respondents loaded significantly on this mode of thinking. Following that factor, there are other, individualized, clusters of opinions that the factor analysis reveals that contribute to the cumulative variance within the research community; the sum of 8 extracted factors yields 56% of variance within the community. The nature of factor analysis is that perspectives that are clustered together represented as a “factor” and are grouped in such way as to maximize the concurrence of opinion with respect to land resource management. In the language of the practitioner, these factors are perfectly uncorrelated or *orthogonal* to each other. This notion is demonstrated mathematically in the table that shows the high (+/- 0.7) or low degrees of (+/- 0.3) correlation among the factors.

The process and results described here pose a question to the analyst involving how in depth of an analysis he or she may perform on all of the extracted factors, or just the first ones on which the majority of respondents have loaded. For these data, we have examined all eight

factors, with particular emphasis given towards describing the first factor, given the magnitude of respondent loading.

**Table 3.1 – Correlations Between Factor Scores**

<b>Factor</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>1</b>	1.0000	-0.6520	-0.4157	-0.3504	-0.3406	-0.7070	-0.5134	-0.0782
<b>2</b>	-0.6520	1.0000	-0.0309	0.2813	0.1405	0.5008	0.1709	0.2551
<b>3</b>	-0.4157	-0.0309	1.0000	0.2883	0.2916	0.4915	0.3259	-0.2000
<b>4</b>	-0.3504	0.2813	0.2883	1.0000	0.3282	0.2117	0.0914	-0.0923
<b>5</b>	-0.3406	0.1405	0.2916	0.3282	1.0000	0.1727	0.0785	-0.2587
<b>6</b>	-0.7070	0.5008	0.4915	0.2117	0.1727	1.0000	0.5137	-0.0532
<b>7</b>	-0.5134	0.1709	0.3259	0.0914	0.0785	0.5137	1.0000	0.0792
<b>8</b>	-0.0782	0.2551	-0.2000	-0.0923	-0.2587	-0.0532	0.0792	1.0000

The first and primary factor extracted at the conclusion of the data cleaning and analysis phases was labelled *Traditional Secwepemc Worldview / Local Expert Resource Mangers* for reasons to be outlined throughout this chapter. Naming a particular factor for descriptive purposes is the result of a complex and labor-intensive process that results at the conclusion of principal component or factor analysis.

The process begins with entering raw data—statement numbers that were each sorted into stacks of cards from the individual interviews—into PQMethod software. Once all of the 44 statements have been entered for each of the 50 individuals, the investigator can continue with the next phase after data entry, performing the principal components analysis. Once the software package completes factor or principal component analysis, PQMethod produces a factor matrix that demarcates defining sorts across the sample. The factor matrix is effectively a factor loading

table that contrasts individuals and the extent of their agreement or disagreement with each of the extracted factors.

**Table 3.2 – Factor Matrix with an X Indicating a Defining Sort (at  $-0.35 < p > 0.35$ )**

Interview Control Number	Factors							
	1	2	3	4	5	6	7	8
1 117	0.7293X	-0.2267	-0.0684	0.2593	-0.0639	-0.1218	-0.0847	0.2669
2 108	0.4228X	-0.1876	0.0352	-0.0525	-0.2607	-0.2972	-0.0495	0.0445
3 120	0.3175	0.1870	-0.1204	0.0998	0.3272	-0.1887	0.3014	-0.1132
4 109	0.4877X	0.0306	0.1842	0.1287	-0.1387	0.0129	0.1835	0.2557
5 102	0.3697X	0.1078	-0.2036	0.1722	0.2179	0.0310	-0.0908	-0.1641
6 124	0.5417X	0.0825	0.0621	-0.2798	0.0759	0.1183	0.0241	-0.1652
7 105	0.3190	0.0595	0.3084	0.1151	0.1634	-0.2848	-0.0094	-0.2412
8 149	0.5132X	-0.4092X	0.1489	0.0882	-0.1865	0.1455	0.1282	0.1314
9 106	0.4172X	0.0895	-0.2491	-0.3631X	-0.2529	0.2437	0.0327	-0.0093
10 129	0.4381X	0.0570	0.0009	-0.1821	0.2964	-0.1396	-0.1795	0.3611X
11 130	0.5156X	0.1513	0.1800	0.1335	-0.2258	-0.2134	0.2430	-0.0741
12 122	0.4237X	0.0533	-0.1493	-0.0505	0.1384	0.0957	0.0045	0.3447
13 145	0.3975X	-0.0364	0.1027	0.1746	-0.2507	0.3394	-0.1341	0.0065
14 121	0.5826X	-0.0498	-0.3606X	-0.0370	0.0953	-0.0469	0.2252	0.0919
15 135	0.4564X	-0.1941	-0.2182	-0.3754X	0.1446	0.0496	-0.0655	0.0777
16 116	0.4562X	0.1387	0.2425	-0.0778	-0.1320	0.1766	-0.2630	0.1597
17 116	0.6312X	-0.1708	-0.3013	-0.0323	0.0022	-0.3977X	-0.1810	0.0844
18 111	0.4498X	0.2973	0.0927	-0.3942X	-0.2140	0.0419	-0.1815	0.0079
19 110	0.3766X	0.3702X	-0.1934	0.1723	-0.2215	0.0652	-0.1114	0.0472
20 127	0.5334X	0.2590	-0.1443	0.0876	0.0939	-0.2255	-0.3814X	-0.1170
21 100	0.2949	-0.1384	0.3658X	0.1999	0.1908	0.3429	0.2322	-0.1571
22 144	0.5460X	-0.4282X	0.1948	-0.0458	-0.2091	-0.2053	0.0639	-0.3804X
23 126	0.2856	-0.1763	0.2498	0.0605	0.1138	0.2385	0.2843	0.1614
24 104	0.6574X	-0.1171	-0.1934	0.0625	0.3990	0.0744	0.1737	0.0044
25 141	0.4834X	-0.4510X	-0.0766	0.0737	-0.2083	0.0957	-0.2150	-0.2392
26 140	-0.0344	-0.2522	-0.1642	-0.1320	0.2502	0.2801	-0.1794	-0.3202
27 107	0.7016X	-0.2643	-0.1538	0.1078	-0.1576	-0.0878	0.0343	0.2129
28 143	-0.3451X	0.1582	0.2028	0.3829	0.0392	0.0284	-0.0964	0.2776
29 112	0.5181X	0.2239	0.0557	-0.1956	0.1144	0.1344	0.3327	0.0944
30 128	0.4608X	0.1982	-0.0665	-0.0995	-0.5260X	0.3142	0.1214	-0.0008
31 139	-0.0489	0.3932	-0.1100	-0.1705	-0.3211	-0.0311	0.1713	-0.1522
32 115	0.3575X	0.0585	0.3189	0.2560	-0.2271	-0.2777	-0.1632	0.0415
33 137	0.5883X	-0.3019	0.2352	0.3408	0.2213	0.1875	-0.1403	0.0399
34 125	0.5748X	0.1011	-0.5524X	-0.1991	-0.0371	0.0204	0.1448	0.0811
35 113	0.4956X	0.2234	0.2253	0.0635	0.0177	-0.2132	-0.2323	-0.1426
36 134	0.5350X	0.2539	-0.3055	-0.2305	0.0646	0.1906	0.2151	-0.2763
37 146	0.6664X	0.2715	0.1864	-0.2201	0.2218	-0.0581	0.0612	0.1841
38 142	0.3764X	-0.3977X	0.1452	-0.3111	0.0587	-0.0584	-0.2617	-0.0763
39 132	0.6921X	-0.3770X	0.0704	-0.0187	0.3172	0.0513	-0.3056	0.1694
40 133	0.4614X	0.0494	-0.2703	0.3642X	-0.2419	0.1289	0.0327	0.0311
41 103	0.2967	-0.1867	-0.2866	-0.0075	-0.2677	0.0366	0.2194	-0.0933
42 147	0.2800X	0.1621	0.1769	-0.1076	-0.0303	-0.1347	0.0282	-0.2979
43 148	0.6843X	-0.1177	0.2247	-0.3042	-0.1686	-0.2384	0.1221	-0.0850
44 123	0.3296	0.1499	0.3622X	0.3071	-0.2270	0.3398	-0.2184	-0.1823
45 118	0.5274X	0.0620	-0.1433	-0.2615	0.3152	0.0202	-0.2901	0.0824
46 131	0.5166X	0.0644	-0.2924	0.0337	0.0306	-0.2981	0.1703	0.2696
47 114	0.4318X	0.3061	0.3150	-0.1051	0.2625	0.3143	0.0996	0.0180
48 138	0.1729	0.1015	-0.2322	0.3500X	-0.1986	0.1398	-0.2317	0.1276
49 136	0.0905	0.3318	-0.0979	0.2470	0.3490X	0.1583	-0.0870	-0.4067X
50 119	0.3064	0.0437	0.1608	0.1153	0.1512	0.0733	0.2701	-0.1628
Percent Variance Explained	22	5	5	4	5	4	3	3
Number of Loadings	40	6	4	5	2	1	1	3

## **Assessment of Concerns from the Adams Lake Indian Band**

The domain of the current research is to inventory and rank the land use preferences among the Adams Lake Indian Band membership with regard to the management of the land water and resources of the traditional territory. The fifty subjects that were interviewed during this project constitute the units of analysis. Each individual sort among the fifty observation interviews represents an individual's value ranking of potential uses for the land and its resources.

Groups of individuals that load similarly on each factor because of the similarity of how particular statements have been sorted is the product of investigation instead of an exploration into causality between independent and dependent variables. Babbie and other social science research methods texts teach that measurement is based on the relationship between the independent and the dependent variable. That is, the independent variable will dictate the outcome of the dependent variable—the data which the researcher has attempted to investigate by conceiving of a methodology that will allow for such an analysis. Q Methodology differs from this independent-dependent distinction in that all statements are treated equally by removing the question of causality from the intercorrelations among them. That is, the list of statements generated with the leaders and elders from ALIB constitute the independent variables whose importance is to be ranked by the membership. A causal relationship is not explored in this process. The questions that Q concerns itself with are does the value exist and if so, how important is it relative to others?

Taken as a whole, the forty-four statements that were produced at the conclusion of the two-phase workshop is a listing of what the concerns that knowledgeable people who were in

leadership positions in Adams Lake Indian Band wanted to gauge in the study presented here. Statements that were generated during the two days of the workshop were nominated, reviewed, edited and agreed upon by the ALIB research advisory council. They were written in the words and pertain to important values of people who possess the best knowledge of concerns that the Band faces in managing their traditional territory.

### **Factor Interpretation**

Interpreting the factors and describing them through a factor narrative is the next phase of the data analysis. The researcher examines the data outputs from PQMethod with particular attention given to the following: the normalized factor scores (also known as its Z-score), the eigenvalue for each of the factors in relation to the respondent number and the distinguishing statements for each extracted factor. Each of these characteristics allow the analyst to look at the Q sorts that have been recorded in the interviewees and compare those individuals to the *normalized sort* the software extracts as a set of factors. The resultant array of normalized factor scores is really an averaged sort of significant positive and negative loadings across multiple individual Q sorts in a research community. The factor attempts to find a medium among multiple interpretations—rankings, to be more specific—of land use planning values and detects an order that represents the value prioritization that best reflects how most respondents think about that domain. Groups of individuals who rank a sub-set of statements with similar magnitude, regardless of the positive or negative orientation “load” or their points of view are best characterized by a factor that PQMethod extracts. An individual’s positive loading indicates that he or she agreed with the statement; a negative loading shows disagreement.

Looking at the unrotated factor scores for factor one, we see that 22% of the variance among values with respect to ALIB land use planning are represented in the rank ordering provided in unrotated factor matrix. Table 3.2 shows that forty of the fifty interviews indicate a significant loading on factor one with a cumulative eigenvalue of 11.05 and 22% explained variance. Subsequent factors extracted by the program show substantial reduction in terms of both percent variance and through eigenvalue scores. Factors two through eight show a percent explained variance of five, five, four, five, four, three and three percent, respectively. This is an additive function; all eight factors represent 56% of the cumulative data variance. Their corresponding eigenvalues are also consistent with the variance: 3.41, 3.21, 2.93, 2.57, 2.42, 2.21, and 2.06 among factors two through eight.

**Table 3.3 – Unrotated Factor Variance and Eigenvalue Scores**

<b>Unrotated Factor</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Eigenvalue</b>	11.05	3.50	2.46	2.12	2.35	1.84	1.73	1.71
<b>% variance explained</b>	22	5	5	4	5	4	3	3

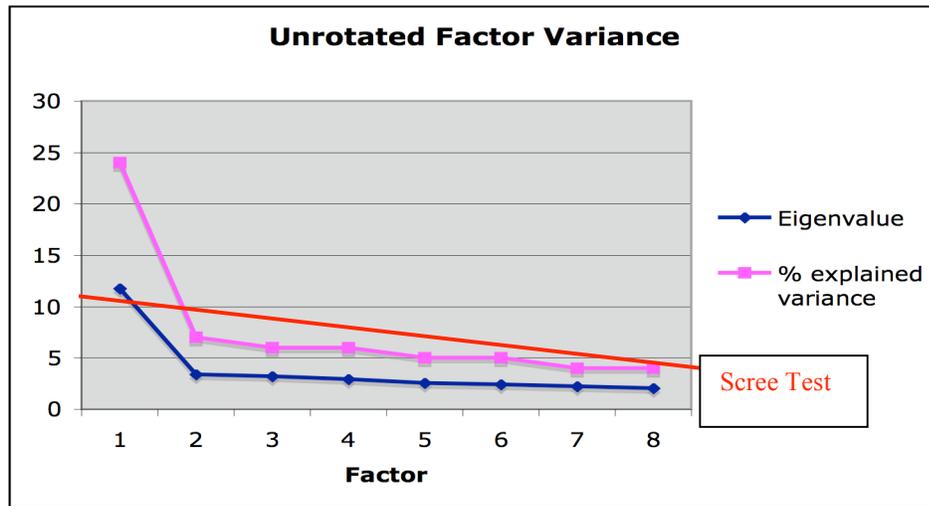
The individual means of each respondent was entered into the correlation matrix to calculate the number of subjects that correlated highly with the group mean. This exercise allows the analyst to determine the number of respondents whose raw ranking correlates with the average ranking across all 50 interviewees. In sum, 13% of individuals correlated highly with the mean (at 0.6); 35% correlated at 0.5; 22% correlated at 0.4; and 24% correlated 0.2.

### **Choice and Selection of Extracted Non-Trivial Factors**

At this point in the analysis, a decision point is reached as to how many factors are to be retained for descriptive purposes in defining the clusters of people who rank the statements in a consistent manner. This is to say that respondents who share the same values hierarchy that emerges from the data from their particular Q ranking are grouped together and are given the defining characteristic that their worldview is best represented by one of the extracted factors. The statistical software has the capacity to extract eight factors. Practitioners of PQMethod and scholars advocate including all of the available factors into the raw data analysis and decide which ones are most salient at the conclusion. Throughout the process of writing a description of the overarching theme that each factor represents, the investigator must make a decision on how many factors are relevant towards the analysis; some may be discarded, while the factors that summarize the views of the majority of the research sample are retained.

Under typical circumstances, the guiding variables in aiding the decision of which factors are to be kept and jettisoned is advised by use of the scree test. Cattell (1966) coined this term based on looking at a visual representation of plotting factors along the x-axis and its corresponding eigenvalue, or its representative value, on the y-axis. What results is a scatter in decreasing order of magnitude from left to right. He used the metaphor of a cliff to represent the factors to be kept and the ancillary ones fall along the base as scree.

**Figure 3.1 – Unrotated Factor Variance**



Predominant factors account for most of the variance as indicated by the larger eigenvalue scores, whereas other factors may be numerous but limited in terms of percent variance explained (Gorsuch 1974). Under the guidance of the scree test, where the factors appear to level off or become a straight line is the point which the factors should be eliminated from the analysis as they represent a small amount of variance from the sample frame. Some scholars think that all factors with Eigenvalues greater than one should be considered significant, however given that all of the extracted factors in these results were greater than one the scree test was used to determine the number of non-trivial factors. These are retained as they represent a greater degree of variance among perceptions relative to the research concourse. The investigator will recognize that as the decreasing magnitude of the eigenvalue progresses, perspectives become more individualized and diversity or variance becomes more constrained. This is to say that factor analysis software can extract factors for unique loadings that result from variable sorts observed throughout the research process. PQMethod can extract a number of factors equivalent to the number of Q sorts entered into the program. However, the reporting mechanism of this program is limited to eight factors, which for the purposes of this research constitutes 51% of the

total variance of land management preferences among the on-reserve members of the Adams Lake Indian Band. Since 80% of the participants loaded significantly on factor one, this was considered sufficient for reporting results to the ALIB chief and council and for this thesis.

In the case of the Adams Lake Indian Band, the scree test indicated that the first extracted factor was the most significant vector that articulates perspective variance in that community. Indicated above in the table of eigenvalue scores, the difference between the first and second factors is significant: 11.05 and 2.50, respectively. Using that gap as an indicator, the first factor was the only one to be included in the subsequent analysis as the remainder was considered minimal in their representation of perspective variance across the sample frame. After the decision to focus the analysis on the first factor was established, the analysis continued with an investigation of statements that loaded heavily on the first factor.

At this point in the discussion, an explanatory note regarding the content of the trivial factors that were not retained for further analysis deserves attention. Cumulative variance across the first eight factors from PQMethod yielded a collective sum of 56% variance of perspectives within the research study sample. Twenty-two percent of that figure is represented in the first factor. The remaining 34% among factors two through eight are highly individualized, the largest instance of which is a loading of five interviewees who load significantly on the second factor. This is not to say that the subsequent factors exhibit contrasting information from the first factor, rather 12% of the individuals in the study sample contribute additional information that the factor narrative may not fully articulate. The high eigenvalues of the subsequent factors led the researcher to consider factors 2 through 8. That analysis, presented in Appendix III, shows considerable agreement among these factors with the first.

Table 3.2 shows that because 80% of the 50 respondents in the Adams Lake case loaded significantly ( $p > 0.35$ ;  $p < -0.35$ ) on the first extracted factor, the conclusions from the factor analysis draws on defining characteristics that pertain directly to the first factor. However, this is not to elide the significance of those who did not load significantly on factor one. Rather, what the data suggest with respect to divergent views about land use planning in the study area, is that there is one dominant mode of thinking—as characterized by factor one—as well as additional individualized perspectives among respondents who agreed or disagreed significantly with particular statements that were not ranked with the same magnitude of the first factor. In a sense, we can report that most people in the Adams Lake Indian Band are of one mode of thinking about particular statements that emerge from the analysis. However, there are variant perspectives about the same statements that the first factor does not fully convey. This is to say that subsequent factors 2 through 8 inform the analyst that there is a diversity of opinion about statements that were heavily loaded on in the first factor, however the diversity is constrained to that first factor, not the entire sample frame. It is also worth noting that, compared to the loadings on factor one, the incidence of individual factor loading on the subsequent factors, 2-8, is significantly lower. The scree test graph above illustrates the discrete variance levels and percent variance explained that each extracted factor represents. The reduced number of people loading on factors two through eight is consistent with the observation that the diversity of opinion is maximized by factor one. This is because there is significant consensus among all participants in this study, however individualized patterns of thinking emerge are characterized in subsequent factors from the first.

## Distinguishing Statements

After evaluating the unrotated factor matrix, the researcher attempts to write a factor narrative by examining the distinguishing statements and the z-scores for each factor. The z-score is a normalized factor score for each extracted factor relative to the statements that were sorted by the respondent. Brown (1991) instructs that the factor score is a score for a statement as an average of the scores given that statement by all of the Q sorts associated with the factor. He continues that the rule of thumb for significance of statements whose factor score correlates two to two and a half times the standard error. The specific formula to calculate the significant factor loadings is  $SE = 1/(\sqrt{N})$  where SE is the standard error and N is the number of statements. For this study the SE is equal to 0.151. Swedeen (2005) elaborates on factor scores to be:

“...A weighted average score for each statement that is associated with each factor according to the following process. A ‘defining sort’ is identified – the sorts which had the highest factor loadings for each factor, and which did not have significant factor loadings for more than one factor. Each Q sort that is significantly associated with a factor is then weighed to take into account the difference in the degree to which that sort is associated with its factor. The weight for each Q sort within the factor is used to calculate a normalized ‘z-score’ or raw factor score for each statement.”

Those with a significant positive (+0.35) or negative (-0.35) loading were included in an analytic procedure to produce a factor narrative. This threshold was established as using 0.151 would have included so many defining statements that, for descriptive purposes, defining factors with an increased number of statements would have posed greater challenge in characterizing each factor. PQMethod creates a normalized sort even if the original distribution was skewed. This output differs from the unrotated matrix for the fact that symmetry was not imposed on the respondents during data collection. For this reason, the decision was made to base the analysis on the z-score and the normalized eigenvalue, to highlight relevant statements that describe the factor rather than.

**Table 3.4 – Normalized Factor Scores – Factor One**

<b>Statement</b>	<b>Z-Score</b>
20. We have an obligation to see ecosystems are healthy and functioning for present and future generations.	1.184
17. Water is a significant part of my cultural heritage.	1.137
40. We need to remember our lost social values: pride, self-esteem, our language, and parenting.	1.132
16. Water quality has degraded over the past ten years.	0.936
36. I believe in taking only take that which I need – nothing more.	.917
41. Short and long term planning is essential in managing our natural resources.	.839
5. An indigenous land and food system is the forest, waterways, plants, animals and their interaction that sustain our people.	.754
44. There is a need to re-learn Secwepemc traditional values, norms and laws.	.744
28. Hunting is important to my family.	.699
9. Forest land management should take into account the effects of climate change on ecosystems.	.661
12. Preserving sacred areas for spiritual and ceremonial uses are important to me.	.602
19. The people are part of the natural systems; they are not separate from nature.	.581
42. ALIB needs to develop an information package to educate the general public. This packet would include our history in addition to the current goals and aspirations held among community members.	.563
34. Our stories and oral history tell us of ways to manage the land that are in harmony with nature.	.539
35. Traditional aboriginal values paid respect to all of the resources because they have a spirit and were created for a purpose.	.493
7. Secwepemc ecological knowledge values and wisdom combined with a scientific approach is critical to sustainable land management.	.479
2. Agriculture in Adams Lake traditional territories should be ecologically sustainable.	.455
14. Land use planning should balance short term with long-term management goals.	.424
26. Fishing is important to my family.	.380
37. Our language embraces our traditional ecological values, allows us to communicate them to each other and is the key in teaching traditional land use.	.352
22. Resource extraction should not negatively impact water quality or quantity.	.316
6. Any forestry practice should be ecologically and culturally sustainable.	.275
10. To address catastrophic forest health issues (like mountain pine beetle), those areas should be harvested and planted.	.235
18. Cultural strategies and practices (e.g. how to dig roots and prune trees) are important ways to participate in the management of our traditional harvesting sites.	.232
21. Natural resource management is maintaining relationships between humans and the natural systems, as opposed to simply using resources.	.225
3. Cattle should have should have restricted access to riparian areas.	.221
27. Plant gathering (birch bark, root digging, medicinal plants, berry picking) is important to my family.	.066
38. Contemporary management allows for us to trade with neighboring communities. We trade fish for access to good hunting areas, for example.	.033
31. The existing land base of ALIB is insufficient to sustain present and future generations.	.004
24. Inappropriate Hydro (power generation) projects damage the ecosystem.	-0.026
13. It is important that a localized model of land use planning must benefit the community by providing realistic and diverse regional economic opportunities.	-0.033
4. Clear cutting permanently destroys non-timber values.	-0.167

**Table 3.4 – Normalized Factor Scores – Factor One – Continued**

8. Forestry and land management should result in diverse and resilient ecosystems.	-0.285
11. Traditional Secwepemc use of fire on the land is an acceptable management tool.	-0.359
32. Active political lobbying is necessary to influence governmental policy and implement ecologically and culturally sustainable land use plans.	-0.472
23. Excess Irrigation can impair water quantity for surrounding areas.	-0.709
43. Global demand for ALIB's resources impact the local economy and land base.	-0.865
15. The "us vs. them" mentality should not be used to manage natural resources.	-0.895
39. The political process creates awareness about aboriginal Title and Rights and is a lobbying power that can be used by the band.	-0.902
30. Forest industry is important to my family.	-1.12
33. Traditional resource management emphasized community health and resilience; contemporary forested land management focuses on individuals.	-1.13
1. Livestock are important to my family.	-2.10
26. Fishing is important to my family.	-2.56
29. Certain types of mining (like gold panning) are acceptable in the traditional Secwepemc territory.	-3.87

Several statements are representative of how clusters of individuals in the ALIB membership think about the land use plan for their traditional territory. The table above shows these values with the greatest magnitude at both ends. The statements are subdivided into two thematic categories that were revealed based on factor analysis. The first, entitled traditional Secwepemc worldview, draws on statements with high positive and negative z-scores that characterize the Secwepemc resource management paradigm, as well as cultural and social components. The second concerns the present natural resource management issues that the membership indicated a present need to include through the ALIB Land Use Plan.

**Table 3.5 – Distinguishing Statements of Factor One: *Traditional Secwepemc Worldview, prescriptive direction for ALIB traditional resources***

No.	Statement	Z-Score
<b><i>Traditional Secwepemc worldview:</i></b>		
20.	We have an obligation to see ecosystems are healthy and functioning for present and future generations.	1.184
17.	Water is a significant part of my cultural heritage.	1.137
36.	I believe in taking only take that which I need – nothing more.	0.917
41.	Short and long term planning is essential in managing our natural resources.	0.839
33.	Traditional resource management emphasized community health and resilience; contemporary forested land management focuses on individuals.	-1.13
<b><i>Prescriptive land management directives:</i></b>		
16.	Water quality has degraded over the past ten years.	0.936
40.	We need to remember our lost social values: pride, self-esteem, our language, and parenting.	0.936
39.	The political process creates awareness about aboriginal Title and Rights and is a lobbying power that can be used by the band.	-0.902
30.	Forest industry is important to my family.	-1.12
1.	Livestock are important to my family.	-2.10
25.	Fishing is important to my family.	-2.56
29.	Certain types of mining (like gold panning) are acceptable in the traditional Secwepemc territory.	-3.87

This table is the result of the steps outlined above from the construction of the correlation matrix, the calculation of the factor scores and the normalization of them – all processes that the PQMethod software facilitated. The non-trivial factor was extracted based on significant positive and negative factor loadings, normalized scores with the correlation matrix relative to each statement based on an individual’s Q-sort against other value orientations latent within the sample frame.

## **Interpretation: Writing the Factor Narrative**

Examining the distinguishing statements that people who are categorized by the emergent factor from the analysis, we see multiple preferences that either strongly represents the respondent's point of view, or completely do not. Table 3.5 above outlines the distinguishing statements for factor one and informs the analyst that there is one dominant mode of thinking among respondents about land use planning in the study area. On the face of this collection of statements, it seems as though they represent general attitudes towards management of local natural resources. However, this is only part of the management preferences for the traditional territory among respondents in the Adams Lake Indian Band.

This extracted factor shows that 80% of the membership load significantly on that the statements in table 3.5 that compose the factor attributes. Of the 50 respondents who participated in our study, 40 loaded significantly with the dominant viewpoint that emerged from factor analysis. The reader's attention should be drawn to the high characteristic value that members of factor one demonstrate: 11.05, which explain 22% of the variance across the entire sample. The demographic characteristics of this factor are also significant: 90% of the elders, 70% of the membership between ages 31 and 55, and 85% of men and women between 18 and 30 loaded significantly.

Closer inspection suggests that two distinct domains emerge from these statements that assists in writing a description for this factor: Traditional aboriginal resource management techniques that are direct products from the ALIB land management paradigm, and; prescriptive management direction for local natural resource stocks in the traditional territory. Components and evidence of each of these thematic groupings follows throughout this section, characteristic of the factor narrative.

### **Factor Interpretation: *Aboriginal Land Management Paradigm***

The first thematic grouping for the extracted factor is the Aboriginal worldview of natural resource management in the Secwepemc Nation. That is, traditional management strategies that are generalized to be of a First Nation origin are strongly reflected through the normalized factor scores and distinguishing statements for this factor. A description of what is meant by Aboriginal land management paradigms is helpful that illustrates distinct strategic and tactical objectives toward land and resource management.

Resulting significant statements that characterize the extracted factor highlight an emphasis on human-environment interaction and individual modes of consumption. Managing ecosystem stocks and services over longer time horizons than contemporary non-aboriginal regulatory regimes was a significant component of the aboriginal approach to natural resource management for this factor. Additionally, cultural components linked with local ecosystem stocks culminate with the other statements in composing the traditional aboriginal approach towards natural resource management. Further, cultural association such as language retention and reinforcing social values are also included in this portrait of the Secwepemc cosmology, but are certainly not the only defining characteristics of that paradigm. To illustrate this point, it is helpful to refer to the table above and select some of the defining statements that assisted in sketching this typology.

The statement which respondents loaded positively and significantly on is number twenty, which reads, "We have an obligation to see ecosystems are healthy and functioning for present and future generations." Respondents sorted this statement with the most significant positive correlation among any of the other 43 statements that were available in the research

study. It has a normalized factor score of +4 and a z-score of 1.18. This statement culminates the descriptor of the Secwepemc Aboriginal worldview towards local land resource management. It emphasizes a temporal framework that extends beyond near and medium-term economic forecasts; more accurately, it encompasses the needs of future generations. Directly, this statement concerns the duty that the ALIB membership recognizes towards ensuring the resilience and continuity of the local resource stocks and flows. Such sentiment is typical of the Secwepemc resource management paradigm, and is identified in other First Nations throughout British Columbia. The onus of managing forestlands or waterways such that they are functioning and provide a continuous yield is on the endemic peoples of that area.

As an example of the onus that the people of the Adams Lake Indian Band have assumed as resource managers, statement seventeen is characteristic of the cultural mechanisms in which groups of people transmit that responsibility. “Water is a significant part of my cultural heritage.” was sorted among respondents with the second highest positive ranking among all the statements in this study. The normalized factor score for this statement is the highest possible loading of +4; its z-score is 1.14. What these statistics may portray is the notable success that First Nations peoples have demonstrated in transmitting a stewardship ethic to their traditional territories through compositional attributes of their cultural, and individual, perspectives. This statement will arise again in the following description of the characteristics for factor one, specifically in the prescriptive direction for land management in the Adams Lake traditional territory.

Statement 36, “I believe in taking only take that which I need – nothing more.” is characteristic of the aboriginal consumptive paradigm. The z-score for this particular statement is significant; it’s value is 0.92, indicating that those interviewed perceive that this statement best

represents their point of view about individual consumption. Perhaps finding origins out of reasons for necessity—resource scarceness or the relative homogeneity of readily available natural resource stocks—local timber reserves or fish populations may have been harvested with less emphasis on immediate production value for economic rent generation as much as the existence value of the resources.

Statement 41, which reads “Short and long term planning is essential in managing our natural resources.” was also strongly loaded on by interviewees from the on-reserve members of ALIB. The temporal element to an aboriginal system of resource management that was identified above in statement 20 is reiterated and validated with this high positive loading. The normalized factor score of +3 signifies that this statement is a strong indicator of how people think in the Adams Lake Indian Band; so, too does its z-score of 0.84. That this value was highlighted in the statistical software as a defining statement for factor one is further evidence which suggests that a significant portion of people interviewed subscribe to the aboriginal management paradigm explicated in this section.

In the vein that defines the non-aboriginal thinking of the Secwempc cosmology, statement 33 may reveals insight in towards forestland management, however there may be multiple meanings. “Traditional resource management emphasized community health and resilience; contemporary forested land management focuses on individuals.” is clearly linked with the examples discussed above as a compositional of an indigenous cosmology concerning resource management and allocation. The ALIB research advisory council crafted this statement to capture beneficial outcomes for community health as a result of traditional Secwepemc resource management strategies. What is difficult to parse from this statement is which part of it respondents loaded negatively on: that that traditional management did not focus on community

resilience or that contemporary strategies does not focus on individuals? The factor loading of -3 and z-score of -1.13 on this statement suggest that respondents disagree with this statement as a positive component towards the outcomes of aboriginal land use planning and resource management. The normalized factor and z-scores that respondents produced for this statement indicates that non-aboriginal perceptions of indigenous land management strategies are inchoate and deserve further investigation by policy authors and decision makers in government and the forest industry.

General investigation of these statements that characterize the traditional Secwepemc First Nation approach towards resource utilization holds implications for personal consumption patterns at the intersection with limited existence of land resource stocks. In the study community, the ranking of statement 17 suggests that water is highly valued as a resource among the Adams Lake Indian Band membership. Ranchers, who derive their livelihoods from cattle, need access to both high quantities and quality water sources. So too do farmers in the Adams Lake Indian Band. Irrigation for crops such that their fields produce foodstuffs also place both water quantity and quality in greater usage strain. Of course, agricultural and rangeland uses of water say nothing of the each individual's need for water in a daily consumption context.

To summarize the position that the membership of ALIB considers themselves as resource managers of their reserve territory in a sentence, it would read that their historical and cultural association with the land qualifies them as local management experts whose acumen eclipses external regulatory or policy making governmental agencies. What this component of the extracted factor articulates is that the Adams Lake Indian Band is the best-suited group of individuals to shape regulatory policies and procedures that manage their traditional territory.

The factor loadings and z-score values for each of these three defining statements are significant for more than one reason. Clearly, the inequitable history that First Nations in Canada have endured since the first contact with European settlers plays an important role in shaping individual attitudes toward governmental assistance to small Bands. However, these are systemic to the larger issue that plagues attempts by First Nation bands in British Columbia that aspire to obtain full management authority over their traditional territories. Indigenous peoples throughout Canada struggle with contemporary land management strategies that are the colonial land policy which was adopted with the first contact between indigenous peoples and the settlers of Canada.

When considered relative to each other, loadings on the defining statements presented in Table 2 and espoused in the discussion above builds the case that the membership of the ALIB is, in their view, best suited as environmental managers—this description is incomplete, rather, stewards of the land to be exact—of their reserve territories. The shared perception among ALIB membership that is revealed through the resultant statement ranking is significant in its own regard. Considerable community cohesion is present among members of the Adams Lake Indian Band based on multiple components: examples include geographical proximity with other members; local-level expertise with contemporary governance issues; shared history and culture. The cultural identity, history, and human-environment interaction inherent to the aboriginal resource management paradigm compliment each other that serves as a basis to draft land use planning policy that considers the preferences of the people who live in the resource area.

**Factor Interpretation: *Prescriptive Resource Management Direction***

The second thematic grouping that defines characteristics for the extracted factor deal with prescriptive management issues that the study community identified a need to manage for in the ALIB Land Use Plan. Whereas the discussion above concerns the cultural components that

shape the worldview of the research sample frame, this mode of thinking reveals tractable and monitorable extensions that land managers and decision makers within the band should address in ALIB's LUP.

Drawing again from the distinguishing statements and their normalized factor scores in Table 3.4, we see that there is considerable concern for the deleterious effects of potential mining or mineral development on the reserve territory. The factor score associated with this variable is -4, or the least representative preference ranking among respondents. The mining statement identified the strongest z-score across all of the statements available for sorting in this research process. The normalized factor score on this particular value was -3.87, which eclipses all of the other forty-three statements in terms of magnitude of responses documented. What the normalized factor score value suggests is that this variable is the most significant land management preference as indicated by the membership on this factor. That it is negative and significant is further validation that respondents who load on the first extracted factor are in complete disagreement with potential mining development on the ALIB reserve territory. Trospen (1995) suggests that the ways in which a First Nation develops its resources may be unique from what is considered economic development. The strong negative loading on this statement compliments this observation given that ALIB holds known mineral resources, however the ranking of this statement suggests that there is strong distaste for their extraction and sale. Following this passage that sketches the topographical contours of the extracted factor for this study, the mining variable arises again in a discussion concerning divergent viewpoints that a minority of respondents. Treatment of the viewpoint is addressed at the conclusion of the factor narrative.

The statement that is closest to the magnitude of mining, in terms of normalized factor scores, is statement 26. “Fishing is important to my family.” was drafted as statement twenty-six as a determinant in revealing a mode of economic production among the ALIB membership. The members of the statement generation workshop included this value as an identifier of the extent to which the membership of ALIB relies on sustained fish catches to generate economic income. The data show that not many, in fact, do: the z-score is -2.56 and factor loading is -4. This variable corresponds with two other economic modes of production in natural resources, ranching and forestry.

To a nearly equal extent as fishing, ranching or livestock production is a source of income for a few families. Statement 1, “Livestock are important to my family.” A factor loading of -4 and a z-score of -2.10 suggests that about the same number of people rely on cattle to generate income as fishing, however these groups of individuals are slightly overshadowed by those who are affiliated with the forestry industry.

Statement 30, “Forest industry is important to my family.” strives to calculate the economic ends of income generation among on-reserve ALIB members from production of forest products. The factor loading of -4 indicates that not many of the membership are involved in forestry as a profession, although this is somewhat abated upon examination of the normalized factor score. That value is -1.12, suggesting that more people are affiliated with the forest industry than those who rely on livestock and fish production as economic drivers. This distinction is potentially significant as land managers and decision-makers consider the economic impacts that directives on the reserve territory may result on those individuals and families whose livelihoods are forestry-based.

The link between ALIB and the provincial and federal governments in British Columbia and Canada is explicitly addressed in statement 39, “The political process creates awareness about aboriginal Title and Rights and is a lobbying power that can be used by the Band.” This statement was ranked with a factor loading of -3 and a z-score of -0.90, indicating that this statement is not representative of individual perspectives of aboriginal Rights and Title negotiations between First Nations and governments. Special care should be given to the interpretation of this particular variable in the analysis as the statement can be read as a description of the current state of Rights and Title discussions between First Nations and governments; so, too can it be read in the light of a desired—or lack of faith in—the political process as a means to increase political leverage in those legal arenas.

Analysis from these three statements provides significant insight in identifying the ways in which members of the Adams Lake Indian Band are employed through local natural resource development activity. The data show that most people who participated in the study are not, in general terms, affiliated with fishing, ranching or forestry as a means to generate income. It establishes a link between those individuals and their dependence on a sustained stock and flow of land and forest resources to local or regional markets, as well as national or international scales. In terms of prescriptive management outcomes, this information serves to illuminate further demographic characteristics that land managers can integrate into the land use plan for the traditional territory. In a sense, this ranking or weighting of each activity relative to the number of people or families dependent on it can serve as further support to ALIB decision makers tasked with prioritization of land use activity in the reserve territory.

From the above discussion, it is apparent that the ranking of each statement has revealed the modes of economic production that people are less dependent upon. In another sense, the

resultant factor loadings and z-scores indicate that, in broad terms, the majority of the ALIB membership does not participate in fishing, rangeland production or forestry as a means to satisfy consumption-side economic demands. Discussed in the next section, we will see that while the majority of the Adams Lake Indian Band membership is not affiliated in these activities, there are individuals who do. Their perspective of land use in the traditional territory does not fit within the contours of factor one and are grouped with other divergent viewpoints that the research sample expressed.

Existence of water on the landscape is significant to the membership of ALIB for more than the ecological role it plays in sustaining life in an arid region of British Columbia's interior. traditional Secwepemc Nation values regard water as a critical component to its cultural heritage. This makes sense on the face of it: aboriginal peoples settled at the opening of Little Shuswap lake for the readily available source for personal use and in irrigation of crops and livestock. One of the statements that concerned water was loaded heavily upon as a significant with a normalized factor score of 1.14 – statement seventeen reads, “Water is a significant part of my cultural heritage.” A factor loading of +4 confirms that water contributes significantly towards shaping the cultural identity of the Adams Lake Indian Band. Not only does this variable establish that water is a central component to the Secwepemc cosmology, it also provides robust evidence that the existence value of water on the local landscape is of high importance to the ALIB membership. Water is central to the sustained stock and flow of natural systems in the community; its presence is a requirement for peoples to inhabit the geographical area.

A second measure of the high land use preference expressed for managing water quality is statement sixteen, which reads, “Water quality has degraded over the past ten years.” Factor analysis of this statement produced a z-score of 0.94, which exists in the context of other land

use preferences as highly significant in terms of prescriptive management direction. The ranking of this variable informs ALIB resource managers and decision makers of the deteriorating water quality and should be incorporated in public health policy and in managing extant water stocks for multiple uses.

Another land management issue arose from the data analysis, namely that there is significant concurrence among respondents as to the existing land base of the study community. Statement thirty-one, which reads, “The existing land base of ALIB is insufficient to sustain present and future generations.” serves as an identifier of multiple aspects to the meaning of the ‘land base’ of the Adams Land Indian Band. The factor loading for this particular variable was +3, indicating that the magnitude of this variable is not the gravest concern among the membership, but it is a value that many of the respondents share notable anxiety over. The normalized factor score—that is, the z-score—for this variable was 0.80, which weights this concern slightly below the above discussion on climate change.

The variable that interviewees ranked as the third most significant and positive was statement 40, which reads, “We need to remember our lost social values: pride, self-esteem, our language, and parenting.” The normalized factor score of +4 indicates that, among the research sample frame, this statement is among the second most significant value that the membership indicated a strong preference to manage for in the LUP. The normalized factor score is only part of the support for this claim; the z-score for statement 40 is 1.32, the third highest positive score among individuals in the factor. This statement deserves a note on operationalization of monitoring social values retention: that is, in an executional context, establishing initiatives to re-learn social skills in a land use plan may introduce an opportunity for resource managers to incorporate cultural and social initiatives in land management practices. Given the magnitude

that the membership weighted this value, a strategic or tactical social component of the LUP could be incorporated for the traditional territory of the Adams Lake Indian Band, however, the manner in which the Band leaders choose to do so extends beyond the scope of this analysis. Appendix II shows provides a narrative for each of the subsequent factors that emerged from this study.

### **Correlation between Emergent Factors and Criteria and Indicators**

What culminates from the discussion of the resulting factors from the Q sampling exercise with on-reserve members from the Adams Lake Indian Band is an acknowledgement that the respondents of this study perceive that they are better qualified to manage local natural resource stocks than external management authorities. Taking the distinguishing statements in the first extracted factor, which eighty percent of the membership loaded significantly on, the results from this study point to a comparative preference among ALIB members to manage their own traditional territory through their own governance structures on their own terms. In addition, there is considerable support that favors environmental conditions before industrialized resource extraction began in British Columbia.

Referring the reader's attention to table 3.5 – Distinguishing Statements for Factor One, we see that there are two thematic groupings that, taken as a suite of indicators, paint a complete picture of the dominant discourse among the on-reserve membership of ALIB. Two categories exist that portray the historical and cultural management contexts that exist to inform contemporary ALIB governance and resource managers through prescriptive directives. At the risk of repetition, considering the statements that comprise these two groups assists in understanding the resistance among the membership and leaders of the Adams Lake Indian Band to adopt and incorporate a Criteria and Indicator framework.

The statements that compose the traditional Aboriginal Worldview include areas that concern the obligation incumbent on the members of the Band to ensure that ecosystems are healthy and productive along timelines that extend beyond the management targets typically associated with government or non-Aboriginal industries. The mode of personal consumption is an additional element that shapes the Aboriginal understanding and stewardship of the ALIB traditional territory. This is evidenced through the high factor loading (+4 and +3) of statements 20 and 36. Similarly, there is little support among ALIB members that the political process is a tool that could be wielded by the Band to generate leverage in negotiating better settlements with outside agents on issues such Rights and Title, Impact Benefit Agreements and Traditional Knowledge (TEK) studies.

The prescriptive resource management input that is articulated through Table 3.5 compliments the foundation of the perception put forth by the statements above. Under the contemporary management strategies initiated and supported by the Provincial and Federal levels of government, water quality has degraded over the past ten years and important social values have been lost through the process of cultural assimilation and the forced abandonment of traditional Secwempc management strategies. In addition, these management strategies have fostered the development of a neo-classical economy in which ALIB's participation was not requested; it was thrust upon them without precondition that their traditional resource management strategies and understanding of the landscape would be allowed to continue.

For the Aboriginal partners, framing the statements that would be available for sorting in this study in language of the Ministry of Forests or the Integrated Land Management Bureau or another agency that generates forestland management protocols without their input would have been akin to making a photograph with an ink pen. Under the C&I framework, the individual

viewpoints among the membership of ALIB would not be allowed to emerge as the risk is present for there to be no indicator of their input. For example, under the C&I system, Sheppard (2005) and others have shown that “fuzzy social outcomes” are poorly constrained as there are few indicators that exist to measure their achievement. Considering the significant and positive ranking of the statement that calls for renewed efforts to retain and teach lost social values that the respondents of this study reported, there is little support that a system such as Criteria and Indicators can lend toward the metric of social or cultural health.

Ignoring the point that cultural or social Criteria are poorly represented in C&I systems altogether and assuming that there were support among the ALIB government and management structures to implement a system of objectives with associated indicators, a persistent question would still remain: Which indicators should decision-makers use, in what context, to what extent and by whom? The difficulty C&I has in answering these questions is the pervasive notion that exists which suggests that a subjective measure of value can be assigned to disparate and inconsistent elements of sustainable natural resource management. Decision-makers and governing boards have been shown to follow standard operating procedures and act to constrain management opportunities through tractable and digestible units within their own jurisdictions (Cash et al, 2006). The land use planners and forestry managers of the Adams Lake Indian Band recognize this problem and elected not to incorporate a management paradigm that fails to represent the interests of their membership or their cultural and social background.

What is perhaps systemic and a contributor to the shortcomings of the C&I system is that complexity is reduced to its component parts for the digestibility of the policy architects who are tasked with demonstrating action taken to achieve management or performance targets. The lack of faith demonstrated in the ranking of statement 39 “The political process creates awareness

about aboriginal Title and Rights and is a lobbying power that can be used by the Band.” The ranking of this statement indicates that members of ALIB understand that the political structures in the Provincial and Federal governments were not enacted with their best interests, nor those any other First Nation. Criteria and Indicators may be the language of the contemporary land management strategies supported by government and industry, however in the view of the ALIB membership it is another hollow management system that fails to convey their natural resource use preferences.

On the face of it, the perception among on-reserve members makes sense: those who live in or close to the natural resource logically express the view that they are the best suited to manage local ecological stocks using a component of the aboriginal cosmology that has guided land management decisions since time immemorial. This view is supported by many factors that extend beyond the current discussion. However, in light of the complexity that shapes individual and group perceptions, it is sensible that both the membership and leadership of the Adams Lake Indian Band consider themselves to be the best stewards of the productive land base of their traditional territory. That the members live in the study area and have a local expertise of resource management is obvious enough. What may be excluded from the understanding of non-ALIB members is that the study area has been occupied by native peoples throughout generations and has allowed for a complex interaction between inhabitants and the ecosystem to evolve. What emerges from that lineage of human-environment interaction over the course of hundreds of years is a site-specific knowledge of how to best manage the resources of the Adams Lake Indian Band traditional territory.

Those strategies continue to be articulated through transparent and digestible format even to those who are not affiliated with the ALIB research community. That the ALIB leadership and

Natural Resource Department have participated in research presented in this thesis is one such example of their expertise with their lands and resources, another is the willingness to document the Band's strategic management objectives through a Land Use Plan and Comprehensive Community Plan.

However, contemporary strategies proffered by external agents to First Nations in Canada and elsewhere continue to be the *lingua franca* among regulatory and policy making units in Provincial and Federal government agencies and private natural resource industries. Such techniques are offered to Bands that do not express their land management strategies in a satisfactory manner to governments or the private sector because the Aboriginal resource management cosmology does not align with these Cartesian models. Both the provincial and federal governments in British Columbia and Canada incorporate a system of land and resource management that extends to Crown land overlapping with asserted First Nations traditional land claims. This is the case with the land management paradigm outlined in the review of Criteria and Indicators in BC and Canada in Chapter One.

Taking from the literature review of Criteria and Indicators in Chapter One, this system is becoming the predominant mode of structuring land management strategies and objectives in government. While some authors such as Steelman and Maguire (1999) have suggested that the Q Sorting Technique may result in the generation of a framework that portrays the management objectives and indicators to meet them, our findings with ALIB demonstrate some resistance towards participating in this system.

Briefly revisiting the shortcomings of the Criteria and Indicators approach that was enumerated in Chapter One, Aboriginal partners from ALIB have chosen not to frame their natural resource management policies in a C&I system for the overarching reason that it does not

represent the Aboriginal perspective of the resource challenges and opportunities as their traditional and ongoing approaches do. The perception among prominent decision makers with respect to the C&I system is that it is a foreign rubric that denudes the network of complexity in social, cultural and ecological components that compose the Secwepemc worldview. The C&I system presupposes an order between separate factors and is designed to investigate modes of causality and independent-dependent relationships among variables that can be subsumed and monitored.

The ALIB perspective is that network of relationships between the membership and their land, waters and other resources is emergent; that there is a way of observing those relationships through the complexity. By contrast, the C&I system puts forth projections of relationships between variables that assume causality and compartmentalizes effects from one category to the next. The cross-Criteria linkages are omitted from consideration and the complexity and emergent structure are lost in the genre of performance-based assessment. Many dimensions of the challenges to C&I are apparent that culminate in a lack of appetite for ALIB to utilize this approach towards land management: double counting of indicators per criterion; altogether incorrect criterion and loosely linked indicators; poorly measured cultural and spiritual uses of the land.

Adam and Kneeshaw (2008) wrote that the C&I system could be enhanced through construction of C&I frameworks designed by Aboriginal groups. Linking forest values with anticipated forest conditions, among others, was a central point in making C&I work for First Nations and to fully represent the issues that native peoples have in land management. Their example that access has deleterious effects on the quality of their cultural and ecological stocks speaks to the results that were observed in this study. The participants in this study highlighted a

need to manage for the cultural attributes that have been diminished over time, however the C&I system does not allow for those desires to be represented as it is expressed, and subsequently monitored. The work we conducted with ALIB is consistent with the findings that Adam and Kneeshaw put forth that C&I could be a viable launching pad for an indigenous management framework to emerge using Criteria and Indicators. To conclude, there may be support for building a network of management targets and measures within the literature on Criteria and Indicators, however taking the results from the study with the Adams Lake Indian Band, there is little appetite to participate in that process until their perception of holistic land management is supported.

## **Chapter 4: Summary and Conclusions**

### **Summary and Response to Research Questions**

In response to the research questions that were put forth in the beginning of Chapter One of this thesis, Chapter Four seeks to respond to them by including an evaluation of the results and process from the perspective of the Aboriginal partners, and point to subsequent research directions that may potentially succeed the work presented here. This section addresses each of the questions posed in turn.

The first of the questions reads “How successful have C&I systems been in representing indigenous values in BC and elsewhere in Canada?” The review of the literature on Criteria and Indicators in the context of Aboriginal land management in BC and Canada speaks to the question of whether First Nations preferences have been communicated through that framework. The reluctance that Aboriginal partners expressed in framing statements through a C&I system and the resulting sorts from the Q Sampling Technique from our investigation indicated that there are elements of land use preferences that are important to the Adams Lake Indian Band at this point in time. The distinguishing statements that compose all factors are these elements of high importance to ALIB. Moreover, Criteria and Indicators suffers from the weakness that it does not represent the values that were identified as pertinent to the Adams Lake Indian Band in their endeavors to manage their traditional territory. The previous section outlining the weak correlation between a Criteria and indicator framework and the resulting significant statements responds directly to the first research question, namely from the ALIB perspective, C&I has not been successful in representing their land use preferences.

The second research question built upon the first through a more direct inquiry by exploring which elements of resource management Aboriginal groups ranked with greatest

importance. The response to this finding responds directly to which management components that were ranked as most important among ALIB participants through their Q sorts. The management preferences that the on-reserve membership ranked with the greatest weighting were: the traditional Secwempc management strategies that combine cultural and spiritual objectives with prescriptive preferences. Those preferences showed high support for water quality monitoring and enhancement regimes, a retention and transmission of social values; that fishing and ranching are practiced on the landscape to a lesser extent than anticipated, and; that certain types of mining are not supported for exploration in the traditional territory. This study took the direction from the ALIB research partners: Each community is unique and has individual management challenges and opportunities, thus a comprehensive framework of indicators does not allow for adequate consideration of that individuality and emergent linkages through complex decision systems.

In response to the third question, “What is the translation of First Nations values into C&I prescriptive management outcomes?” our results suggest that there is no sufficient one, based on the factors from ALIB. A translation between the perceptions of proffered land uses in the Adams Lake Indian Band and the compartmentalization of tasks and associated indicators that C&I propose, attempts to accomplish a translation through efforts insensitive to the Secwempc resource management paradigm. The management preferences that were articulated through the Q sorts of the ALIB membership are poorly constrained through a systematic compartmentalized understanding the myriad challenges and complex interactions between the Secwempc people and the land base on both current and historical temporal scales.

The fourth question asks, “How can the C&I rubric be enhanced in a way such that it will be useful to Aboriginal groups?” There is potential for the C&I system to be refined as to fit the

uses of First Nation peoples as a decision support mechanism similar to the Q Methodology put forth in this work. So long as resource managers and Band leaders consider the C&I system as a complimentary system that augments their resource management priorities, the model could be added as another tool that assists in identifying and ranking objectives in a systematic fashion. However, a potential danger can occur during translation of indigenous land use preferences into indicators and should be treated with caution. An example of cautionary treatment would be where to incorporate social and cultural values when there is overlap with ecological and economic Criteria. The success in First Nations utilizing C&I as a complimentary tool operates under the assumption that their current perspective would change from C&I as a foreign rubric with which they must grapple to a complimentary tool put forth by government and industry. However, the C&I system contrasts with the holistic understanding of complexity that the Secwempc peoples have developed to manage their natural resources.

The final question asks how existing C&I frameworks can incorporate the ranked preferences that emerged from the Q sorts in this study to accurately convey Aboriginal values to external land management bodies? From a methodological perspective, the results presented in Chapter Three show that from a data set of 50 individual rankings of 44 separate statements one dominant mode of thinking—with smaller, individualized perspectives on which few people loaded—emerged concerning use of the land, waters and resources in the ALIB traditional territory. Eighty percent of the on reserve ALIB membership expressed a support for their traditional Secwempc land uses through prescriptive land use direction that is informed by their cultural and social legacies. The nature of this worldview is characterized by a people who have developed a rich history and deep interaction between the land base over hundreds of years. As the literature review concluded, this network of complexity is not adequately portrayed in the

C&I system. The results from this study with ALIB directly relate to the article by Adam and Kneeshaw (2008) in that we confirm their assertion on “resource values.” That is anticipated forest conditions that are managed for through systems like C&I need to include the forest values of the stakeholders at the local level. In the case of ALIB, the Q sorts indicated that great importance should be given to capture and preserve cultural practices that enhance water quality and monitoring resource extraction activities. However, it is the position of this thesis that those preferences are not be adequately communicated to regulatory bodies outside of ALIB on the basis that their management objectives differ greatly through dissimilar ways of structuring the understanding and practicing natural resource management.

### **Report on Usefulness of Q Methodology**

In October, 2008 the graduate student presented the listing of concerns and the resulting factor array that were documented throughout the work with the Adams Lake Indian Band. A primary objective of the presentation to the Chief and Council, Band leaders, managers and key contacts from ALIB was to present the primary factor and divergent viewpoints and provide context to their decision making. From the perspective of the research team, an evaluation of the usefulness was designed to be initiated at that time and solicited a written response from the Chief and Council after the presentation. The presentation of the results constituted a feedback loop into the community from the researchers that facilitated decision making for ALIB fulfilling one of the deliverables for the project. The meeting was an opportunity for the Chief and Council to validate the resulting factor array and factor interpretation that the research assistant put forth in the inventory and ranking of values held among the membership.

The author of this thesis fielded queries relating to the statistical methods employed in the Q sorts, research design and sample construction in addition to documenting potential concerns that the Aboriginal partners expressed. As far as statistical methods and sample frame construction were concerned, the members from the Chief and Council noted that special care should have been given to consider that all of the families from ALIB were given equal representation in the sample frame construction. The representative factor and divergent individualized viewpoints represented the perspectives of the on-reserve populations in Chase and Salmon Arm, British Columbia. Given that the sample frame from this study interviewed 50 people, the Councillors expressed concern that some of the viewpoints from the entire membership may have been omitted. In a normative sense, the direction was to conduct interviews with each member from ALIB, both on and off-reserve; this nomination was put forth towards a subsequent study that is outlined in the next section. It was during this discussion that a more complete understanding of the divergent sampling needs became evident to the councillors. The literature on Q emphasizes that the sample size be adequate enough to represent a sufficient enough diversity of ways of relating to the concourse. Brown (1992) writes that the interest of Q is the nature of the segments and the extent to which they are similar or dissimilar with respect to the topic of investigation. In fact, one individual Q sort can be the basis of significant data analysis.

A request was made of the Chief and Council to reflect on the results and provide insight as to whether they and the process were useful for their decision-making. Their reaction was that the inventory and ranking of the membership's land management preferences for the traditional territory and its land use was a beneficial input of knowledge for the Band government.

Several of the preferences and values were relevant for contemporary management considerations and the information presented from this project informed their objectives with additional data from their estimation. Taken in the context of the historical interaction with the land and waters of the traditional ALIB territory, councillors noted that the results on the extent to which the membership was currently involved in fishing raised a flag in their understanding of the traditional activity and what the data suggested. Revisiting the statement that concerns fishing as a traditional practice, this issue was selected as a defining statement for the first extracted factor on which the majority of members loaded negatively. For decision-makers in the ALIB government, this negative association raised a significant concern for how involved the membership is currently in practicing of traditional Secwempe activities and in retaining their culture. In addition, the statement regarding mining on which the membership loaded significantly and negatively was a point of interest given that their territory has been surveyed to explore various mineral deposits. The information containing the broad views of the membership about mining are relevant for the administration's planning purposes. Council members agreed that the resulting factor served as a representation at that point in time of the management preferences held broadly among the ALIB membership. This community-specific data is, from the perspective of the leadership, valuable in providing insight into that decision-making process.

When the research project was proposed to the same group in 2007, the Chief and Councillors indicated an interest in utilizing a social science research tool that extended outside the bounds of the approach found with traditional surveys. The development of a research process that adequately represented the membership's preferred use of the land base and waters was a crucial characteristic for the Aboriginal partners and their data collection needs for development of their LUP. The Chief and Council saw the Q sorting technique as an additional

tool that they and various departments could employ to evaluate perceptions of individuals across the membership. Having participated in this study with UBC, training and local human capital was created such that future studies could be pursued, if there were a desire on their behalf. This is a substantive element in that it contributes towards the current understanding of the land use preferences represented among members and equips leaders with an appropriate mechanism to document what they may be at a future point in time. Documenting these values in a systematic and quantitative manner assigns high reliability and validity values in an academic context as well as baseline data for the Band government and in their relationship with external institutions and governmental agencies. The choice in research design acknowledges that Aboriginal communities have local expert knowledge concerning the resources and planning challenges that are in a study community. The results are valid because the method was transparent, relied on input from the people who were being studied and was adaptive through multiple stages of statement generation and revision. Putting forth a listing of the concerns that were expressed by the compositional base of the Band government is an acknowledgement that the people who live in the study community and developed a network of complexity in their relationship to the land is greater than those who seek to regulate or permit activities on the land remotely. That four of five on-reserve members who were involved in this project are of one dominant mode of thinking about management of the traditional territory is a considerable result that gives greater credence to the perception held among ALIB members.

## **Conclusions**

The case for development of a mechanism that appropriately represents the values and land use preferences of Aboriginal peoples in British Columbia and Canada was argued for in Chapter One of this thesis. The review of the literature on Criteria and Indicators presented the inherent structural flaws of representing a compartmentalized scope of resource and land management preferences at the interface of a holistic cosmology that composes the perspectives of Aboriginal peoples. The approach undertaken in this project respects the validity of the indigenous perspectives and serves to incorporate them, using their own words, into a framework articulating the array of values in a systematic rank ordered fashion.

Presenting the disconnect between contemporary management paradigms and Aboriginal resource use preferences, this research presents an alternative mode for capturing the existing land use values within an Aboriginal community in British Columbia. The Q Sampling Technique strove to address what traditional social science research approaches have lacked: a quantitative evaluation of qualitative data in First Nation communities with minimal imposition of the bias of the researcher. This facet of the research strategy that informed the process was a critical component in the selection of methodologies proposed in preliminary stages for this work. Q allowed for the values and land use preferences commonly held among the membership and leaders from the Adams Lake Indian Band to emerge with minimal investigator presupposition. Taking these two characteristics of the methodological choices into context, the validity and reliability of the resulting factor and ancillary information can be considered as speaking on behalf of the membership of the Adams Lake Indian Band in language of the respondents' choosing.

The results presented in Chapter Three have been corroborated by observations made during presentations with the Aboriginal partners and in other research that ALIB has initiated for various other projects. The report on the usefulness of the Q Methodology is an evaluation from the Chief and Council of the Adams Lake Indian Band that assesses whether the research process and outputs were pertinent to their planning endeavors with the traditional territory. The data analysis, emergent paradigm and its prescriptive direction of land management values that are strongly supported or disapproved of serve as an input—a decision support mechanism—into the government of the Adams Lake Indian Band. Taking the management item of mining as an example, the effort to survey and measure the extent to which a type of mining in the traditional territory is supported by the membership is illuminating from the perspective of the Band government. The membership loaded significantly and negatively on a statement that concerned mineral development in the traditional territory as territory in question has been surveyed for various mineral deposits exploration. Taking the information containing the broad views of the membership towards mining is clearly relevant for the administration in their planning purposes of how best to represent the views and preferences of their membership while balancing the need for job growth and livelihood development. In short, the tool and ranked inventory of values that were developed throughout the process of this research will assist in decision-making for the ALIB Chief and Council and in crafting the Land Use Plan for the traditional territory.

### **Future Research Application**

In ways that are relevant for Aboriginal partners, the conclusion of this research project is a starting point for future work to be completed with respect to documenting and evaluating land use preferences among their members. The community-specific information containing land use

values at this point in time is a starting point for continuous measurement of those values at different stages for ALIB. The results presented in Chapter Three serve as the baseline from which alterations or fluctuations from the resultant factor can be monitored, if they do so all.

Development of a framework that integrates separate land use cosmologies between regulators from the Provincial and Federal governments and those articulated preferences is a sensible extension to these results, if support exists to pursue this. While there was little appetite for such an undertaking with Adams Lake Indian Band, other First Nations within BC or Canada may find that documenting natural resource management objectives in a systematic and statistically rigorous manner might be a natural progression towards that end. Providing an analytical inventory and evaluation of management direction within the Aboriginal community would provide sufficient baseline data for bridging disparate regulatory paradigms. An obvious extension of the Q sampling technique in the interests of measuring perceptions of human experience would be to repeat a similar study with a community of non-Aboriginal heritage. The comparison between the results presented in this thesis and those of the residents of Chase who are not ALIB members would illuminate the differences and similarities with how people in the area consider management of their local natural resources.

The results of this research with ALIB could be the basis from which other participatory research approaches could be built upon. Structured decision making and multiple accounts analysis put forth by Gregory, McDaniels, Trousdale and others are alternative strategies that would serve to achieve the a similar ranking and weighting of values and objectives in multiple stakeholder contexts. Like the Q method, the SDM approach is a participatory process that relies upon input from the community and assists in identifying which objectives and alternatives are most important across study populations.

A second iteration of the Q method could be developed to better operationalize the thematic value categories that were presented in this thesis. That is, the alternatives for the Land Use Plan could be transformed into statements and input into a subsequent Q study. For instance, mining was heavily loaded upon negatively in this study. A subsequent set of statements could be developed that pertain directly to mining: which types are not supported; for whom and which demographic cohorts does this activity pose irreconcilable land management objections; what strategies exist that attenuate the deleterious effects of mineral extraction while establishing employment opportunities and revenue generation for the Band? Subsequent iterations such as this example would serve to enhance the understanding of specific issues that research subjects expressed in the interviews for this project.

An evaluative framework and monitoring programs could be established within ongoing projects with which ALIB is already involved that contain data on costs and required procedures. Ostensibly, feedback mechanisms could be built into the Comprehensive Community Plan (CCP) and Land Use Plan (LUP) for the traditional territory that reflect the direction given in the results of this research project.

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## Appendix I – Raw Q Statement Template

1. Cattle are an important source of income that feeds my family all year.
2. Agriculture in Adams Lake traditional territories should be ecologically sustainable.
3. Cattle should have should have restricted access to riparian areas.
4. There are too many cows that are allowed to graze on our traditional harvesting sites.
5. Clear cutting permanently destroys non-timber values.
6. Give priority to indigenous food economies over industrial interests.
7. Not enough land has been set aside for indigenous food systems.
8. An indigenous land and food system is the forest, waterways, plants, animals and their interaction that sustain our people.
9. Indigenous land and food systems are relationships between the people, animals, air, water, land and the forests.
10. Any forestry practice should be ecologically and culturally sustainable.
11. Secwepemc ecological knowledge values and wisdom combined with a scientific approach is critical to sustainable land management.
12. Forestry and land management should result in diverse and resilient ecosystems.
13. Forest land management should take into account the effects of climate change on ecosystems.
14. Clear cutting is an overused harvesting system.
15. To address catastrophic forest health issues (like mountain pine beetle), those areas should be harvested.
16. Traditional Secwepemc use of fire on the land is an acceptable management tool.
17. Fire is a natural part of the ecological landscape.
18. Noxious weeds and other invasive species need to be eradicated even if doing so requires using pesticides.
19. Land use plans must be determined by naturally occurring boundaries, like watersheds, instead of political ones.
20. Hunting is important to my family.
21. Fishing is important to my family.
22. Preserving sacred areas for spiritual and ceremonial uses are important to me.
23. Sharing of the excess in seasonal salmon runs with neighboring communities is important for sustaining the secwepemc nation.
24. It is important that a localized model of land use planning must benefit the community by providing realistic and diverse regional economic opportunities.
25. Land use planning should balance short term with long-term management goals.
26. Land use decisions need to be made by consensus, not by majority.
27. The "us vs. them" mentality should not be used to manage natural resources.
28. Water quality has degraded over the past ten years.
29. I would drink water from any stream in the traditional territory.
30. Water is a significant part of my cultural heritage.
31. Cultural strategies and practices (e.g. how to dig roots and prune trees) are important ways to participate in the management of our traditional harvesting sites.
32. To eliminate the Us vs. Them mentality, we should educate the general public about the ALIB land use plan.
33. There needs to be adequate financial resource allocated for educating the general public about traditional land use values and management practices.
34. Having healthy interdependent ecosystems is important for my spiritual, physical, emotional and physical health.
35. The people are part of the natural systems; they are not separate from nature.
36. We have an obligation to see ecosystems are healthy and functioning for present and future generations.
37. Regulated mining is an employment opportunity for our community.
38. Natural resource management is maintaining relationships between humans and the natural systems, as

opposed to simply using resources.
39. Resource extraction should not negatively impact water quality or quantity.
40. Privatization of water limits our access to clean healthy drinking water.
41. Privatization is a threat to water quality and quantity.
42. Excess Irrigation can impair water quantity for surrounding areas.
43. Access to adequate amounts of drinking water and irrigation is a basic human right.
44. Inappropriate Hydro (power generation) projects damage the ecosystem.
45. Certain types of mining (like gold panning) are acceptable in the traditional secwepemc territory.
46. Underground mining for copper should be allowed in the traditional territory.
47. All activities that impact the ecological and cultural integrity in the traditional territory should be decided by a consensus.
48. Social harmony can be achieved by avoiding taking advantage of intertribal differences within the community.
49. Mining is the most important aspect of land use planning.
50. Agriculture is the most important component of land use planning.
51. Hunting is the most important component of land use planning.
52. From my perspective, fisheries are the most important aspect of land use planning.
53. Plant gathering is the most important aspect of land use planning, in my view.
54. The existing land base of ALIB is insufficient to sustain present and future generations.
55. Managing forested ecosystems must place equal emphasis on ecosystem services (like providing clean water) as they do with revenue from felling timber.
56. Land use planning should follow ecological boundaries and not political-defined ones.
57. Active political lobbying is necessary to influence governmental policy and implement ecologically and culturally sustainable land use plans.
58. There needs to be adequate financial resources allocated to ALIB for ecosystem and community based land use plan.
59. Traditional resource management emphasized community health and resilience; contemporary forested land management focuses on individuals.
60. Like the coyote who placed a boulder in the river to damn the salmon from swimming further upstream, our stories tell us of ways to manage the land that are in harmony with nature.
61. Traditional aboriginal values paid respect to all of the resources because they have a spirit and were created for a purpose.
62. I thank 'The Creator' every time I use a resource from the land and only take that which I need – nothing more.
63. Our language embraces our traditional ecological values, allows us to communicate them to each other and is the key in teaching traditional land use.
64. Traditionally, the plants and animals were respected; we were stewards of the land and that was our purpose.
65. Our traditional way of life allowed us to maintain relationships with the land, air, animals and water. The way we manage our lands today doesn't emphasize that relationship, but interests itself instead with usage off the land.
66. In our heritage the leader of our community would know which resources we would need and direct us to extract it from the land. This isn't the case today.
67. No community member goes without food because it is a communal effort to take care of <i>all</i> .
68. Contemporary management allows for us to trade with neighboring communities. We trade fish for access to good hunting areas, for example.
69. Ceremonies that show our respect for an aspect of our resources are a part of our way of thinking about modern management of the land.
70. The smoke of sage is used in our traditional ceremonies that cleanses us, rids of bad or distracting thoughts. Using sage and other resources off the land shows our inseparable spiritual connection to it.
71. The political process creates awareness about aboriginal Title and Rights and is a lobbying power that can be used by the band.

72. We need to remember our lost social values: pride, self-esteem, our language, and parenting.
73. Adams Lake Indian Band needs to provide learning opportunities to the band membership so they may develop a self-sustaining way of life.
74. The boundaries to our traditional territories need to be redrawn by our traditional elders.
75. Traditional values must be recognized and used in contemporary land management.
76. Clear cutting destroys the environment so that we can't practice our traditional values.
77. ALIB must become active in lobbying at all levels of government to make changes to forestry, fisheries and water legislation.
78. Secwepemc First Nation needs to create resilient ecosystems, not woodlots.
79. Short and long term planning is essential in managing our natural resources.
80. Respect wildlife and interconnectedness.
81. ALIB needs to develop an information package to educate the general public. This packet would include our history in addition to the current goals and aspirations held among community members.
82. The local economy should include global economic opportunities.
83. There is a need to identify specific cutblocks.
84. There is a need to re-learn Secwepemc traditional values, norms and laws.

## Appendix II – Normalized Factor Scores: Factors Two through Eight

Normalized Factor Score - Factor 2:

No.	Statement	No.	Z-SCORES
23	23. Excess Irrigation can impair water quantity for surround	23	3.743
29	29. Certain types of mining (like gold panning) are acceptab	29	3.649
33	33. Traditional resource management emphasized community hea	33	1.286
15	15. The "us vs. them" mentality should not be used to manage	15	1.039
31	31. The existing land base of ALIB is insufficient to sustai	31	0.974
10	10. To address catastrophic forest health issues (like mount	10	0.795
43	43. Global demand for ALIB's resources impact the local econ	43	0.749
11	11. Traditional Secwepemc use of fire on the land is an acce	11	0.746
1	Livestock are important to my family.	1	0.690
22	22. Resource extraction should not negatively impact water q	22	0.502
30	30. Forest industry is important to my family.	30	0.207
14	14. Land use planning should balance short term with long-te	14	0.060
6	6. Any forestry practice should be ecologically and cultural	6	-0.047
2	Agriculture in Adams Lake traditional territories should be	2	-0.051
13	13. It is important that a localized model of land use plann	13	-0.082
8	8. Forestry and land management should result in diverse and	8	-0.082
38	38. Contemporary management allows for us to trade with neig	38	-0.082
18	18. Cultural strategies and practices (e.g. how to dig roots	18	-0.087
12	12. Preserving sacred areas for spiritual and ceremonial use	12	-0.116
25	26. Fishing is important to my family.	25	-0.180
36	36. I believe in taking only take that which I need - nothin	36	-0.195
28	28. Hunting is important to my family.	28	-0.262
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	-0.334
24	24. Inappropriate Hydro (power generation) projects damage t	24	-0.334
37	37. Our language embraces our traditional ecological values,	37	-0.338
26	25. Tourism is important to my family.	26	-0.342
16	16. Water quality has degraded over the past ten years.	16	-0.342
39	39. The political process creates awareness about aboriginal	39	-0.477
34	34. Our stories and oral history tell us of ways to manage t	34	-0.481
3	3. Cattle should have should have restricted access to ripar	3	-0.485
17	17. Water is a significant part of my cultural heritage.	17	-0.488
41	41. Short and long term planning is essential in managing ou	41	-0.488
42	42. ALIB needs to develop an information package to educate	42	-0.488
4	4. Clear cutting permanently destroys non-timber values.	4	-0.519
9	9. Forest land management should take into account the effec	9	-0.519
19	19. The people are part of the natural systems; they are not	19	-0.631
32	32. Active political lobbying is necessary to influence gove	32	-0.631
40	40. We need to remember our lost social values: pride, self-	40	-0.778
35	35. Traditional aboriginal values paid respect to all of the	35	-0.778
7	7. Secwepemc ecological knowledge values and wisdom combined	7	-0.778
5	5. An indigenous land and food system is the forest, waterwa	5	-0.849
44	44. There is a need to re-learn Secwepemc traditional values	44	-0.849
21	21. Natural resource management is maintaining relationships	21	-1.119
20	20. We have an obligation to see ecosystems are healthy and	20	-1.207

Normalized Factor Score - Factor 3:

No.	Statement	No.	Z-SCORES
30	30. Forest industry is important to my family.	30	2.895
1	Livestock are important to my family.	1	2.885
25	26. Fishing is important to my family.	25	2.061
39	39. The political process creates awareness about aboriginal	39	1.167
18	18. Cultural strategies and practices (e.g. how to dig roots	18	1.115
43	43. Global demand for ALIB's resources impact the local econ	43	1.108
42	42. ALIB needs to develop an information package to educate	42	0.685
29	29. Certain types of mining (like gold panning) are acceptab	29	0.540
11	11. Traditional Secwepemc use of fire on the land is an acce	11	0.378
21	21. Natural resource management is maintaining relationships	21	0.357
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	0.357
28	28. Hunting is important to my family.	28	0.200
36	36. I believe in taking only take that which I need - nothin	36	0.200
40	40. We need to remember our lost social values: pride, self-	40	0.200
44	44. There is a need to re-learn Secwepemc traditional values	44	0.200
6	6. Any forestry practice should be ecologically and cultural	6	0.103
10	10. To address catastrophic forest health issues (like mount	10	0.099
34	34. Our stories and oral history tell us of ways to manage t	34	0.099
26	25. Tourism is important to my family.	26	0.089
12	12. Preserving sacred areas for spiritual and ceremonial use	12	0.078
32	32. Active political lobbying is necessary to influence gove	32	0.041
20	20. We have an obligation to see ecosystems are healthy and	20	-0.079
41	41. Short and long term planning is essential in managing ou	41	-0.079
16	16. Water quality has degraded over the past ten years.	16	-0.079
19	19. The people are part of the natural systems; they are not	19	-0.090
17	17. Water is a significant part of my cultural heritage.	17	-0.090
5	5. An indigenous land and food system is the forest, waterwa	5	-0.090
33	33. Traditional resource management emphasized community hea	33	-0.200
37	37. Our language embraces our traditional ecological values,	37	-0.369
14	14. Land use planning should balance short term with long-te	14	-0.369
7	7. Secwepemc ecological knowledge values and wisdom combined	7	-0.369
9	9. Forest land management should take into account the effec	9	-0.648
2	2. Agriculture in Adams Lake traditional territories should be	2	-0.648
24	24. Inappropriate Hydro (power generation) projects damage t	24	-0.648
13	13. It is important that a localized model of land use plann	13	-0.658
38	38. Contemporary management allows for us to trade with neig	38	-0.658
15	15. The "us vs. them" mentality should not be used to manage	15	-0.658
22	22. Resource extraction should not negatively impact water q	22	-0.927
4	4. Clear cutting permanently destroys non-timber values.	4	-0.937
8	8. Forestry and land management should result in diverse and	8	-0.937
35	35. Traditional aboriginal values paid respect to all of the	35	-0.948
23	23. Excess Irrigation can impair water quantity for surround	23	-1.216
3	3. Cattle should have should have restricted access to ripar	3	-1.795
31	31. The existing land base of ALIB is insufficient to sustai	31	-2.363

Normalized Factor Score - Factor 4:

No.	Statement	No.	Z-SCORES
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	2.729
11	11. Traditional Secwepemc use of fire on the land is an acce	11	1.927
24	24. Inappropriate Hydro (power generation) projects damage t	24	1.867
29	29. Certain types of mining (like gold panning) are acceptab	29	1.835
4	4. Clear cutting permanently destroys non-timber values.	4	1.464
33	33. Traditional resource management emphasized community hea	33	1.151
43	43. Global demand for ALIB's resources impact the local econ	43	0.997
44	44. There is a need to re-learn Secwepemc traditional values	44	0.889
16	16. Water quality has degraded over the past ten years.	16	0.859
26	25. Tourism is important to my family.	26	0.657
38	38. Contemporary management allows for us to trade with neig	38	0.477
1	Livestock are important to my family.	1	0.449
39	39. The political process creates awareness about aboriginal	39	0.374
18	18. Cultural strategies and practices (e.g. how to dig roots	18	0.293
10	10. To address catastrophic forest health issues (like mount	10	0.257
37	37. Our language embraces our traditional ecological values,	37	0.140
28	28. Hunting is important to my family.	28	0.109
8	8. Forestry and land management should result in diverse and	8	0.108
2	Agriculture in Adams Lake traditional territories should be	2	0.089
36	36. I believe in taking only take that which I need - nothin	36	-0.009
23	23. Excess Irrigation can impair water quantity for surround	23	-0.028
5	5. An indigenous land and food system is the forest, waterwa	5	-0.059
25	26. Fishing is important to my family.	25	-0.107
30	30. Forest industry is important to my family.	30	-0.157
32	32. Active political lobbying is necessary to influence gove	32	-0.174
12	12. Preserving sacred areas for spiritual and ceremonial use	12	-0.228
17	17. Water is a significant part of my cultural heritage.	17	-0.228
14	14. Land use planning should balance short term with long-te	14	-0.279
19	19. The people are part of the natural systems; they are not	19	-0.346
42	42. ALIB needs to develop an information package to educate	42	-0.428
6	6. Any forestry practice should be ecologically and cultural	6	-0.447
34	34. Our stories and oral history tell us of ways to manage t	34	-0.463
22	22. Resource extraction should not negatively impact water q	22	-0.682
13	13. It is important that a localized model of land use plann	13	-0.911
41	41. Short and long term planning is essential in managing ou	41	-0.917
9	9. Forest land management should take into account the effec	9	-0.952
40	40. We need to remember our lost social values: pride, self-	40	-1.035
35	35. Traditional aboriginal values paid respect to all of the	35	-1.035
21	21. Natural resource management is maintaining relationships	21	-1.137
20	20. We have an obligation to see ecosystems are healthy and	20	-1.137
15	15. The "us vs. them" mentality should not be used to manage	15	-1.172
7	7. Secwepemc ecological knowledge values and wisdom combin	7	-1.352
31	31. The existing land base of ALIB is insufficient to sustai	31	-1.451
3	3. Cattle should have should have restricted access to ripar	3	-1.937

Normalized Factor Score - Factor 5:

No.	Statement	No.	Z-SCORES
1	Livestock are important to my family.	1	3.289
11	11. Traditional Secwepemc use of fire on the land is an acceptab	11	2.143
24	24. Inappropriate Hydro (power generation) projects damage t	24	2.143
31	31. The existing land base of ALIB is insufficient to sustai	31	2.143
25	26. Fishing is important to my family.	25	1.513
13	13. It is important that a localized model of land use plann	13	0.997
18	18. Cultural strategies and practices (e.g. how to dig roots	18	0.997
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	0.424
29	29. Certain types of mining (like gold panning) are acceptab	29	0.424
19	19. The people are part of the natural systems; they are not	19	0.367
4	4. Clear cutting permanently destroys non-timber values.	4	0.367
12	12. Preserving sacred areas for spiritual and ceremonial use	12	0.109
21	21. Natural resource management is maintaining relationships	21	0.109
14	14. Land use planning should balance short term with long-te	14	-0.149
15	15. The "us vs. them" mentality should not be used to manage	15	-0.149
16	16. Water quality has degraded over the past ten years.	16	-0.149
17	17. Water is a significant part of my cultural heritage.	17	-0.149
10	10. To address catastrophic forest health issues (like mount	10	-0.149
22	22. Resource extraction should not negatively impact water q	22	-0.149
28	28. Hunting is important to my family.	28	-0.149
35	35. Traditional aboriginal values paid respect to all of the	35	-0.149
36	36. I believe in taking only take that which I need - nothin	36	-0.149
40	40. We need to remember our lost social values: pride, self-	40	-0.149
41	41. Short and long term planning is essential in managing ou	41	-0.149
42	42. ALIB needs to develop an information package to educate	42	-0.149
44	44. There is a need to re-learn Secwepemc traditional values	44	-0.149
32	32. Active political lobbying is necessary to influence gove	32	-0.206
39	39. The political process creates awareness about aboriginal	39	-0.206
43	43. Global demand for ALIB's resources impact the local econ	43	-0.206
26	25. Tourism is important to my family.	26	-0.206
8	8. Forestry and land management should result in diverse and	8	-0.464
34	34. Our stories and oral history tell us of ways to manage t	34	-0.464
20	20. We have an obligation to see ecosystems are healthy and	20	-0.464
2	Agriculture in Adams Lake traditional territories should be	2	-0.779
38	38. Contemporary management allows for us to trade with neig	38	-0.779
23	23. Excess Irrigation can impair water quantity for surround	23	-0.779
5	5. An indigenous land and food system is the forest, waterwa	5	-0.779
9	9. Forest land management should take into account the effec	9	-0.779
30	30. Forest industry is important to my family.	30	-0.779
37	37. Our language embraces our traditional ecological values,	37	-0.836
6	6. Any forestry practice should be ecologically and cultural	6	-0.836
33	33. Traditional resource management emphasized community hea	33	-1.094
7	7. Secwepemc ecological knowledge values and wisdom combined	7	-1.409
3	3. Cattle should have should have restricted access to ripar	3	-2.039

Normalized Factor Score - Factor 6:

No.	Statement	No.	Z-SCORES
1	Livestock are important to my family.	1	2.811
29	29. Certain types of mining (like gold panning) are acceptab	29	2.811
30	30. Forest industry is important to my family.	30	2.811
8	8. Forestry and land management should result in diverse and	8	1.052
11	11. Traditional Secwepemc use of fire on the land is an acce	11	1.052
14	14. Land use planning should balance short term with long-te	14	1.052
15	15. The "us vs. them" mentality should not be used to manage	15	1.052
33	33. Traditional resource management emphasized community hea	33	1.052
39	39. The political process creates awareness about aboriginal	39	1.052
7	7. Secwepemc ecological knowledge values and wisdom combined	7	0.466
23	23. Excess Irrigation can impair water quantity for surround	23	0.466
25	26. Fishing is important to my family.	25	0.466
28	28. Hunting is important to my family.	28	0.466
38	38. Contemporary management allows for us to trade with neig	38	0.466
10	10. To address catastrophic forest health issues (like mount	10	-0.120
5	5. An indigenous land and food system is the forest, waterwa	5	-0.120
34	34. Our stories and oral history tell us of ways to manage t	34	-0.120
35	35. Traditional aboriginal values paid respect to all of the	35	-0.120
41	41. Short and long term planning is essential in managing ou	41	-0.120
42	42. ALIB needs to develop an information package to educate	42	-0.120
44	44. There is a need to re-learn Secwepemc traditional values	44	-0.120
22	22. Resource extraction should not negatively impact water q	22	-0.706
16	16. Water quality has degraded over the past ten years.	16	-0.706
24	24. Inappropriate Hydro (power generation) projects damage t	24	-0.706
12	12. Preserving sacred areas for spiritual and ceremonial use	12	-0.706
26	25. Tourism is important to my family.	26	-0.706
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	-0.706
13	13. It is important that a localized model of land use plann	13	-0.706
2	Agriculture in Adams Lake traditional territories should be	2	-0.706
3	3. Cattle should have should have restricted access to ripar	3	-0.706
31	31. The existing land base of ALIB is insufficient to sustai	31	-0.706
32	32. Active political lobbying is necessary to influence gove	32	-0.706
4	4. Clear cutting permanently destroys non-timber values.	4	-0.706
17	17. Water is a significant part of my cultural heritage.	17	-0.706
18	18. Cultural strategies and practices (e.g. how to dig roots	18	-0.706
36	36. I believe in taking only take that which I need - nothin	36	-0.706
37	37. Our language embraces our traditional ecological values,	37	-0.706
6	6. Any forestry practice should be ecologically and cultural	6	-0.706
9	9. Forest land management should take into account the effec	9	-0.706
40	40. We need to remember our lost social values: pride, self-	40	-0.706
19	19. The people are part of the natural systems; they are not	19	-0.706
20	20. We have an obligation to see ecosystems are healthy and	20	-0.706
43	43. Global demand for ALIB's resources impact the local econ	43	-0.706
21	21. Natural resource management is maintaining relationships	21	-0.706

Normalized Factor Score - Factor 7:

No.	Statement	No.	Z-SCORES
19	19. The people are part of the natural systems; they are not	19	2.117
30	30. Forest industry is important to my family.	30	2.117
39	39. The political process creates awareness about aboriginal	39	2.117
4	4. Clear cutting permanently destroys non-timber values.	4	1.569
8	8. Forestry and land management should result in diverse and	8	1.569
1	1. Livestock are important to my family.	1	1.569
33	33. Traditional resource management emphasized community hea	33	1.569
43	43. Global demand for ALIB's resources impact the local econ	43	1.021
10	10. To address catastrophic forest health issues (like mount	10	0.473
11	11. Traditional Secwepemc use of fire on the land is an acce	11	0.473
13	13. It is important that a localized model of land use plann	13	0.473
21	21. Natural resource management is maintaining relationships	21	0.473
25	26. Fishing is important to my family.	25	0.473
29	29. Certain types of mining (like gold panning) are acceptab	29	0.473
7	7. Secwepemc ecological knowledge values and wisdom combined	7	0.473
35	35. Traditional aboriginal values paid respect to all of the	35	0.473
18	18. Cultural strategies and practices (e.g. how to dig roots	18	-0.075
23	23. Excess Irrigation can impair water quantity for surround	23	-0.075
9	9. Forest land management should take into account the effec	9	-0.075
14	14. Land use planning should balance short term with long-te	14	-0.075
2	2. Agriculture in Adams Lake traditional territories should be	2	-0.075
32	32. Active political lobbying is necessary to influence gove	32	-0.075
15	15. The "us vs. them" mentality should not be used to manage	15	-0.075
3	3. Cattle should have should have restricted access to ripar	3	-0.075
41	41. Short and long term planning is essential in managing ou	41	-0.075
5	5. An indigenous land and food system is the forest, waterwa	5	-0.075
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	-0.623
31	31. The existing land base of ALIB is insufficient to sustai	31	-0.623
34	34. Our stories and oral history tell us of ways to manage t	34	-0.623
36	36. I believe in taking only take that which I need - nothin	36	-0.623
37	37. Our language embraces our traditional ecological values,	37	-0.623
38	38. Contemporary management allows for us to trade with neig	38	-0.623
40	40. We need to remember our lost social values: pride, self-	40	-0.623
6	6. Any forestry practice should be ecologically and cultural	6	-0.623
16	16. Water quality has degraded over the past ten years.	16	-1.171
12	12. Preserving sacred areas for spiritual and ceremonial use	12	-1.171
28	28. Hunting is important to my family.	28	-1.171
22	22. Resource extraction should not negatively impact water q	22	-1.171
24	24. Inappropriate Hydro (power generation) projects damage t	24	-1.171
17	17. Water is a significant part of my cultural heritage.	17	-1.171
20	20. We have an obligation to see ecosystems are healthy and	20	-1.171
42	42. ALIB needs to develop an information package to educate	42	-1.171
26	25. Tourism is important to my family.	26	-1.171
44	44. There is a need to re-learn Secwepemc traditional values	44	-1.171

Normalized Factor Score - Factor 8:

No.	Statement	No.	Z-SCORES
23	23. Excess Irrigation can impair water quantity for surround	23	3.415
3	3. Cattle should have should have restricted access to ripar	3	2.113
43	43. Global demand for ALIB's resources impact the local econ	43	1.415
6	6. Any forestry practice should be ecologically and cultural	6	1.264
7	7. Secwepemc ecological knowledge values and wisdom combined	7	1.264
38	38. Contemporary management allows for us to trade with neig	38	0.915
25	26. Fishing is important to my family.	25	0.837
33	33. Traditional resource management emphasized community hea	33	0.762
37	37. Our language embraces our traditional ecological values,	37	0.687
9	9. Forest land management should take into account the effec	9	0.626
24	24. Inappropriate Hydro (power generation) projects damage t	24	0.566
19	19. The people are part of the natural systems; they are not	19	0.415
26	25. Tourism is important to my family.	26	0.415
4	4. Clear cutting permanently destroys non-timber values.	4	0.338
15	15. The "us vs. them" mentality should not be used to manage	15	0.277
11	11. Traditional Secwepemc use of fire on the land is an acce	11	0.277
8	8. Forestry and land management should result in diverse and	8	0.202
2	2. Agriculture in Adams Lake traditional territories should be	2	0.126
30	30. Forest industry is important to my family.	30	0.049
20	20. We have an obligation to see ecosystems are healthy and	20	-0.009
34	34. Our stories and oral history tell us of ways to manage t	34	-0.009
1	1. Livestock are important to my family.	1	-0.011
5	5. An indigenous land and food system is the forest, waterwa	5	-0.162
22	22. Resource extraction should not negatively impact water q	22	-0.223
10	10. To address catastrophic forest health issues (like mount	10	-0.223
14	14. Land use planning should balance short term with long-te	14	-0.223
21	21. Natural resource management is maintaining relationships	21	-0.298
31	31. The existing land base of ALIB is insufficient to sustai	31	-0.434
16	16. Water quality has degraded over the past ten years.	16	-0.434
41	41. Short and long term planning is essential in managing ou	41	-0.434
44	44. There is a need to re-learn Secwepemc traditional values	44	-0.434
32	32. Active political lobbying is necessary to influence gove	32	-0.451
13	13. It is important that a localized model of land use plann	13	-0.511
18	18. Cultural strategies and practices (e.g. how to dig roots	18	-0.511
12	12. Preserving sacred areas for spiritual and ceremonial use	12	-0.587
17	17. Water is a significant part of my cultural heritage.	17	-0.723
42	42. ALIB needs to develop an information package to educate	42	-0.723
28	28. Hunting is important to my family.	28	-0.723
40	40. We need to remember our lost social values: pride, self-	40	-1.011
27	27. Plant gathering (birch bark, root digging, medicinal pla	27	-1.011
36	36. I believe in taking only take that which I need - nothin	36	-1.300
39	39. The political process creates awareness about aboriginal	39	-1.606
29	29. Certain types of mining (like gold panning) are acceptab	29	-1.744
35	35. Traditional aboriginal values paid respect to all of the	35	-2.166

### **Appendix III – Discussion of Factors Two through Eight**

The discussion of viewpoints among the membership in the Adams Lake Indian Band has concerned the two thematic characteristics of those individuals who comprised factor one: Traditional aboriginal worldview, and prescriptive direction for ALIB traditional resources. The result of the factor analytic exercise that examined fifty individual Q-Sorts in this research produced one primary factor on which 80% of the sample loaded significantly. While this factor was heavily loaded on, there are divergent viewpoints among the ALIB membership whose land use preferences are not fully captured by the distinguishing statements outlined above. The individuals whose sorting of the statements were not included in factor one were identified in the statistical software as subsequent factors.

Table 3.2 shows the eight extracted factors that PQMethod extracted across the horizontal axis against the respondents on the vertical. “X’s” are indicative of defining sorts in each of the factors. We see that the number of defining sorts—those whose loadings are greater than 0.35 or less than -0.35 follow the following pattern: Factor 2, 6 loadings; factor 3, 4 loadings; factor 4, 5 loadings; factor 5, 2 loadings; factor 6, 1 loading; factor 7, 1 loading; factor 8, 3 loadings. The number of individuals who load significantly on the resultant “factors” are in essence, highlighted in the software as a different factor, when in fact, their viewpoints are significantly divergent from factor one such that they are highlighted as a different vector, even though their loading relative to the entire 50 interviews seems insignificant.

This is a mistake inherent in the open-source statistical software that was utilized in this research process. In actuality, what we observe from the incidence of factor loadings of subsequent factors is that these perspectives are highly individualized, yet completely valid in terms of contributing to the variance in the study community. The following sections sketch the

contours of each of the varying viewpoints that researchers conclude compliment the significance of the first extracted factor. As explained below, each subsequent factor loading is negative and demonstrates high correspondence with the distinguishing statements of factor one, albeit in a different way. Because of this, PQMethod has extracted these cases as individualized where there is disagreement with the group as a whole and identified these individuals as factors.

The most significant viewpoint not fully expressed by factor one was loaded on by six of the fifty respondents to this study; 12% of the sample frame. Four of them are male, which includes two elders. There is little distinction across age cohorts of the six individuals who comprise this land use preference; though three are between ages 31 and 55.

**Table A1 – Distinguishing statements: *Second factor.***

Statement	Z-Score
23. Excess Irrigation can impair water quantity for surrounding areas.	+3.74
29. Certain types of mining (like gold panning) are acceptable in the traditional Secwepemc territory.	+3.65
20. We have an obligation to see ecosystems are healthy and functioning for present and future generations.	-1.21

The views of this group contrast with factor one in a specific context: There is opposition to development in the reserve territory that is expressed in an inverted approach through negative loadings on this factor, rather than the positive loadings that individuals on factor one demonstrated. The negative loadings mean that five of the six individuals who comprise this factor actually disagree with statements with positive Z-Scores. Because of the negative loading on factor two, the statistical software extracted their views as an additional factor, when in fact, their perspectives toward resource development (mining) were similar with those of factor one. The normalized factor score for statement 29 “Certain types of mining are acceptable on the ALIB reserve territory” is 3.65. This highly positive score, when inverted, shows that the people

who share this perspective agree strongly with the other members. Additionally, these individuals ranked statement 23, “Excess Irrigation can impair water quantity for surrounding areas.” negatively and significantly; the z-score is 3.74.

The demographic information for this subgrouping is this viewpoint is predominantly male; four of six were men of all age groups. The two females whose sorts are represented by this perspective were between ages 31 and 55.

The third factor provides another group of people who did not load heavily on the first extracted factor. These individuals ranked statements 30, 1, and 26 as the three most significant and positive loadings relative to the remaining 41. The statements are outlined above in Appendix 1, and are reprinted here with the corresponding normalized factor score:

**Table A2 – Distinguishing statements: *Third factor.***

Statement	Z-Score
30. Forest industry is important to my family.	+2.90
1. Livestock are important to my family.	+2.89
26. Fishing is important to my family	+2.06
3. Cattle should have should have restricted access to riparian areas.	-1.80
31. The existing land base of ALIB is insufficient to sustain present and future generations.	-2.36

The significant positive and negative loadings on these statements indicate that the four defining sorts that compose this vector are different than the worldview espoused in the extracted factor from factor analysis. Based on the loadings above, two of the four positively loaded individuals appear to be involved in forest industry, rangeland production and fishing activities to a greater extent than ALIB’s membership as a whole is. However, the statements that were

loaded negatively provide insight into the operational aspect of ranching. Statement 3 is descriptive of this point: These four cases describe disallowed rangeland practices with respect to livestock access to riparian areas. What is captured in this variable is a sense of the present and future availability of local resources. Men between ages 31 and 55 heavily dominated this view. This perspective characterizes only one female's sort. She was an elder in the community.

**Table A3 – Distinguishing statements: *Fourth factor.***

Statement	Z-Score
27. Plant gathering (birch bark, root digging, medicinal plants, berry picking) is important to my family.	+2.73
11. Traditional Secwepemc use of fire on the land is an acceptable management tool.	+1.93
3. Cattle should have should have restricted access to riparian areas.	-1.93

Five individuals loaded significantly on the third divergent viewpoint that lies outside the descriptive bounds of the extracted factor. Similar to factor two, three of the five significant loadings on this factor are negative, meaning that their z scores are to be inverted (see Table 3.2). Also, those three that have loaded negatively are loaded positively and significantly on factor 1. Individual 40 is a puzzle, positive on both. These members indicated through their Q-Sort statement rankings that they are not involved to a greater degree than the majority of ALIB members in traditional cultural activities like birch bark gathering and collection of local flora for medicinal applications. The normalized factor scores of the statements listed above shows little support using fire as a management tool. These individuals also indicate an aversion to allowing livestock access to riparian areas in the reserve territory. Two of the five individuals on this outlay are youth; one male, the other female. Two further members are female between ages 31 and 55. The sort of one male elder is aligned with this outlay.

**Table A4 – Distinguishing statements: *Fifth factor.***

<b>Statement</b>	<b>Z-Score</b>
1. Livestock are important to my family.	+3.29
31. The existing land base of ALIB is insufficient to sustain present and future generations.	+2.14
11. Traditional Secwepemc use of fire on the land is an acceptable management tool.	+2.14
26. Fishing is important to my family.	+1.51
3. Cattle should have should have restricted access to riparian areas.	-2.04

The fourth divergent group from the extracted factor from the factor analysis is quite similar in the statement ranking of with the previous grouping titled ‘Third factor outlay’.

Again, one of two individuals who loaded on this factor indicated a negative loading, inverting the values of the z scores above. Table 3.2 shows that two of the respondents in the research sample were highlighted as defining sorts of this particular ranking. Examining the defining statements, we see that there is significant weighting for livestock production between these two respondents who are both male; one an elder, the other between 31 and 55. One significant loading agreed to the third outlay that cattle should not have access to riparian areas and that fire is an acceptable management tool; the other significant loading disagreed with these statements.

Where these two subgroups differ is in the weighting of fishing as a mode of economic rent production. This emergent value ranking is significant for two reasons. It indicates that while the majority of ALIB members do not participate in fishing for monetary outcomes, there are individuals who do. Also, the operational practices among ranchers in this viewpoint corroborate the earlier grouping to exclude cattle from riparian areas in the reserve territory.

**Table A5 – Distinguishing statements: *Sixth factor.***

1. Livestock are important to my family.	+2.81
29. Certain types of mining (like gold panning) are acceptable in the traditional Secwepemc territory.	+2.81
30. Forest industry is important to my family.	+2.81

One individual loaded negatively on the statements in this research concourse in a manner that was significant among the rest of the forty-nine respondents who participated in this study. Their ranking indicates that not only are they not ranchers or foresters, this individual does not support mining exploration in the ALIB reserve territory. Factors 7 and 8 are the most individualized among the seven clusters of perceptions of forestland management in the Adams Lake Indian Band. What is more, they each correspond to individuals who are heavily loaded on factor one. While this ranking of the statements show a valid weighting of these statements, the incidence and extent of this individual’s loading provides little to decision makers and resource managers in ALIB. This view is of a male between 18 and 30 years of age.

**Table A6 – Distinguishing statements: *Seventh factor.***

<b>Statement</b>	<b>Z-Score</b>
19. The people are part of the natural systems; they are not separate from nature.	+2.12
30. Forest industry is important to my family.	+2.12
4. Clear cutting permanently destroys non-timber values.	+1.57
8. Forestry and land management should result in diverse and resilient ecosystems.	+1.57
1. Livestock are important to my family.	+1.57

As seen above in Table A6 and subsequent discussion, the Q Sort of one individual constituted the sixth factor outlay among fifty total respondents. Because the factor loading was

negative, this male between 31 and 55 agreed broadly with prior factor outlays in that rangeland production is a significant component of his or her income base, however differences of opinion ensue with respect to forestry and forest practices. As statements four and eight indicate, perceptions of the forest industry exist in contrasting objectives with those who are affiliated in forestry activities. That one individual of fifty weighted the statements above in this order and is involved in the forestry industry in the Adams Lake Indian Band is indicative of the holistic approach towards forestland management. This approach towards valuation of ecosystem services that acknowledges the human-environment connection values and a preference for variable retention cutting suggests that this individual is involved significantly in forestland management. This perception is clearly not captured through the extracted factor, and is shared by a small number of the Adams Lake Indian Band membership.

**Table A7 – Distinguishing statements: *Eighth factor.***

Statement	Z-Score
23. Excess Irrigation can impair water quantity for surrounding areas.	+3.41
3. Cattle should have restricted access to riparian areas.	+2.11
43. Global demand for ALIB's resources impact the local economy and land base.	+1.42

Two of three individuals Q-Sorts resulted in a negative and significant loading for this particular grouping. They are male and between ages 31 and 55, with one of the male elders also contributing to this viewpoint. As evidenced in the table above, the statements that characterize this view towards land use planning in the ALIB reserve territory reveals three independent variables that were significant vis-à-vis the respondent rankings.

The rankings of these three individuals suggest that they are not involved in rangeland production in the study area. Statement three contrasts the views espoused above by other

members who are active ranchers in that cattle should be granted access to riparian areas. Access to water was assigned a stronger ranking among the same three individuals with respect to irrigation. Statement 23 emerged as a significant area of concurrence that addresses water quantity in the ALIB reserve territory. Another independent variable that was prioritized among these individuals is an acknowledgement of a link between local resources stocks and distant markets that exist outside the region.

## Appendix IV – Sample Survey

eID: \_\_\_\_\_

### **SURVEY OF FIRST NATIONS NATURAL RESOURCE MANAGEMENT VALUES**

#### Introduction:

At the outset of this survey, we would like to thank you for your time in choosing to participate in our study on First Nations values in connection to natural resource management. The answers you provide us with by completing the following questions will help us identify indigenous land use priorities held in the Adams Lake Indian Band. You should be aware that we will not publish your name with the answers you provide on this questionnaire. By completing this survey you are acknowledging that you are under no obligation to answer the following questions; your collaboration is entirely voluntary.

Once we have collected and analyzed the data that represent the management priorities that are most important to your community, our research team will lead an open forum discussion to inform you and your neighbors of the ranked order of management objectives you and other members of the Adams Lake Indian Band indicated throughout this research.

This project has been reviewed and approved by the University of British Columbia's Research Ethics Board. Please contact their office at 604-822-8595 if you have any questions or comments concerning the treatment of participants in this study.

**Please DO NOT write your name on this questionnaire.**

Instructions:

1. This survey is not designed to take a long amount of time to complete. Please return your completed copy to the person who distributed it to you originally.
2. Please be sure not to accidentally skip any questions; they are printed on both sides of the page.
3. You will also be asked to sort around 45 of statements about forests, traditional values, water and other topics into stacks that indicate your interpretation of how important each of these areas are to you. This process will take between 45 and 90 minutes to complete.
4. If you have any questions, comments or problems, please contact Justin Barnes at (540) 250-5973 or at [jgbarnes@interchange.ubc.ca](mailto:jgbarnes@interchange.ubc.ca).

RESPONDENT INFORMATION.

Please **check the box(es)** that best represents your answers to the questions below.

1. What is the name and place of the town/village/community that you are being currently interviewed in? (Write below)

---

2. What is your gender?

- Male  Female

3. What is your age?

- 18 – 30 years old  55+ years old  
 31 – 55 years old

4. Before taxes, how much was your *combined household income* last year?

- |  |   |
|--|---|
| <input type="checkbox"/> None                | <input type="checkbox"/> \$40,000 – \$49,999  |
| <input type="checkbox"/> Under \$5,000       | <input type="checkbox"/> \$50,000 – \$59,999  |
| <input type="checkbox"/> \$5,000 – \$9,999   | <input type="checkbox"/> \$60,000 – \$69,999  |
| <input type="checkbox"/> \$10,000 – \$19,999 | <input type="checkbox"/> \$70,000 – \$79,999  |
| <input type="checkbox"/> \$20,000 – \$29,999 | <input type="checkbox"/> \$80,000 – \$100,000 |
| <input type="checkbox"/> \$30,000 – \$39,999 | <input type="checkbox"/> More than \$100,000  |

5. Please indicate your highest level of completed education:

- Some High School  
 High School  
 Some College (one or two years)  
 Undergraduate degree (Bachelor's of Arts or Sciences)  
 Some Graduate Level  
 Graduate Level (Master's or Ph.D)

6. Please indicate which of the following traditional activities you participate in:

- Hunting
- Fishing
- Berry Collection or Food Gathering
- Other Spiritual Activities
- Other: Please list \_\_\_\_\_.

7. From your perspective, what are the most important problems the Adams Lake Indian Band faces? What can be done to remedy this/these?

---

8. If you have not already chosen a career path, can you identify your future career orientation?

- Trades
- Government
- Academics
- Other: Please list \_\_\_\_\_.

9. Health Concerns: When you are sick do you use traditional medicines?

- Yes, I use only traditional medicines.
- No, I use only western "Over the Counter" medicines.
- I use a combination of both.
- Other: Please list \_\_\_\_\_.

**Section 2: Ranking of statements**

-4	-3	-2	-1	0	1	2	3	4
Completely Disagree	Disagree Most	Moderately Disagree	Disagree a bit	Indifferent	Agree a bit	Moderately agree	Strongly agree	Completely Agree

Please check a box on the right side of the table that corresponds to whether you most disagree with (-4), are indifferent to (0), or most agree with (+4) each of the following statements.

**Appendix V – UBC Behavioural Ethics Review Certificate**



*The University of British Columbia  
Office of Research Services  
**Behavioural Research Ethics Board**  
Suite 102, 6190 Agronomy Road,  
Vancouver, B.C. V6T 1Z3*

**CERTIFICATE OF APPROVAL- MINIMAL  
RISK RENEWAL**

<b>PRINCIPAL INVESTIGATOR:</b>  Ron Trospen	<b>DEPARTMENT:</b>  UBC/Forestry/Forest Resources Mgt	<b>UBC BREB NUMBER:</b>  H07-00997
<b>INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:</b>		
<b>Institution</b>	<b>Site</b>	
UBC	Vancouver (excludes UBC Hospital)	
<b>Other locations where the research will be conducted:</b>		
<p>The community centre or offices of the Sliammon First Nation and Adams Lake Indian Band. In some cases, the subject's home may be the location for the interview. As mentioned in the proposal, we began with partner support from the Office of the Wet'swet'en and the North Thompson Band. Changes in the employment of our contact persons required that we change plans. We subsequently established contact with the Sliammon First Nation and Adams Lake Indian Band. The Sliammon First Nation has showed considerable interest and the Chief and council have approved the study. The study will not be carried out in all the eleven communities as mentioned in the proposal some may agree later. In the original proposal, it is stated that four communities will be taken for the</p>		

study. This remains our intent; however given current resources we are starting with two communities, since, we have received approval from Chief Nelson Leon of the Adams Lake Indian Band.

**CO-INVESTIGATOR(S):**

Ajith Chandran  
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**SPONSORING AGENCIES:**

British Columbia Ministry of Forests

**PROJECT TITLE:**

Common knowledge, values and perceptions of sustainable forest management held by First Nations communities

**EXPIRY DATE OF THIS APPROVAL: July 22, 2009**

**APPROVAL DATE: July 22, 2008**

The Annual Renewal for Study have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.

*Approval is issued on behalf of the Behavioural Research Ethics Board*

Dr. M. Judith Lynam, Chair  
Dr. Ken Craig, Chair  
Dr. Jim Rupert, Associate Chair  
Dr. Laurie Ford, Associate Chair  
Dr. Daniel Salhani, Associate Chair  
Dr. Anita Ho, Associate Chair