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# Criteria and indicators for sustainable forest planning: a framework for recording Aboriginal resource and social values

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## Abstract

The Aboriginal Forest Planning Process (AFPP) was developed to integrate indigenous and western forest management approaches. The AFPP is a participatory decision-making tool designed to enhance co-management of the John Prince Research Forest (JPRF) in central interior British Columbia, Canada and to elicit goals, objectives, criteria, and indicators of sustainable forest management from the JPRFs Aboriginal partners. Analysis of community interview transcripts, traditional land use documentation, and secondary sources resulted in a three-stage approach to information elicitation, management, and application. Resource and social values, concerns, and traditional knowledge are summarized and compiled according to criteria themes and sub-themes. This condensed information is further divided into spatial, quantitative, and qualitative criteria and indicator categories. The AFPP was a useful method for developing forest management goals, objectives and criteria; however, further interviews were required to identify appropriate management indicators.

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## 1. Introduction

Resource managers world-wide are finding that conservation and management are more effective when they include local interests (Borrini-Feyerabend, 1996; Warren, 1998). Indigenous societies form a distinct group among local resource users (Western and Wright, 1994). In Canada, indigenous peoples have inherent and legal rights to use

and manage land and resources, based on an extensive history of building cultures, religions, and resource management systems founded on an intimate relationship with the land (Notzke, 1994; NAFA, 1995). This way of life, based on what is commonly known as traditional environmental knowledge (TEK), is founded on a distinct view of the world, culture, language, and value system. TEK is developed through experience, observation, trial-and-error experiments, and the oral tradition (Berkes, 1999), and forms an integrated complex of knowledge, practice, and belief. TEK is local

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or regional in scale, and is based on a detailed understanding of the environment, customary authority, and communal management principles (Grenier, 1998; Berkes, 1999). Compliance is based on unwritten rules, ethics, community sanctions, and extensive teaching to reinforce expectations about wise resource use (Sherry and Myers, 2001).

Since the mid-19th century, Aboriginal societies in Canada have experienced the erosion and marginalization of their influence over land and resources (Fisher, 1992; Notzke, 1994; Sherry, 1999). Moreover, the potential of TEK to provide information for resource development has typically been considered inferior to western, scientific approaches (Duerden and Kuhn, 1998). Over the past decade, international policies (e.g. WCED, 1987; CFS and NRC, 1995), national agreements (e.g. Province of Quebec, 1976; Sherry and Johnson, 1999), and court decisions (e.g. Calder [1973], Sparrow [1990] and Delgammukw [1997]) (Asch, 1997), have renewed interest in TEK as a source of expert knowledge, and have altered former perceptions of Aboriginal people as peripheral players in natural resource decision-making (Bombay, 1992; Smith, 1998; Treseder et al., 1999).

It is now suggested that western and Aboriginal systems of knowledge acquisition and application are complementary, and in combination could lead to a superior approach to natural resource management (Taiepa et al., 1997; Duerden and Kuhn, 1998; Berkes, 1999). Indigenous groups anticipate several benefits from enhancing this relationship (NAFA, 1997): the meaningful participation of Aboriginal people in resource management could confirm the legitimacy of Aboriginal title and rights to land and resources; having influence over management decisions could help to counteract the social and environmental degradation that plagues Aboriginal communities and to reduce conflict; opportunities could arise to maintain and implement traditional knowledge through resource management; and, incorporating TEK into management could provide alternative ecological interpretations, and could complement gaps in scientific knowledge of ecosystems (Fast and Berkes, 1994).

The resulting challenge for sustainable forest management is to link broad international and national initiatives and policies with community-based efforts, and to put them into practice at the local level (Sarin, 1993; Wolfe-Keddie, 1994; Treseder and Krogman, 1999). In western Canada, government-funded traditional use studies (TUS) have enabled indigenous communities to develop technical and research capacity for collecting and documenting local culture, language, values, and skills related to land and resource use (Robinson et al., 1994; Robinson and Ross, 1997). These efforts are driven, in part, by the loss of TEK resulting from western influences on Aboriginal society (Robinson et al., 1994). Indigenous groups in British Columbia are also faced with providing evidence of historical land occupation to support ongoing treaty negotiations. Although TUS can provide a foundation for integrating Aboriginal values into land and resource management, most communities are reluctant to share this information with 'outsiders' who could exploit or misuse it for profit or political gain. Until recently, TEK was considered public information, and was commonly used by scientists with no consideration for, or validation from, Aboriginal people (Berkes, 1999). Moreover, attempts to translate and filter TEK through western cultural biases and standards have, in some cases, compromised its integrity (Duerden and Kuhn, 1998). Alternatively, community-led documentation of TEK has allowed Aboriginal groups to retain ownership of local information, and to record it in a culturally appropriate form (Berkes, 1999; Sherry, 2002).

In order to develop a 'new' system of forest management, one that combines indigenous and western approaches, a common framework for information sharing is necessary to overcome trust, ideological, cultural, and communication barriers. These barriers have often prevented western and indigenous societies from building constructive resource management relationships (Pálsson, 1998; Sherry, 2002). Successfully overcoming these barriers to cooperation is essential to implementing current national forest policies aimed at sustainable forest management (e.g. CCFM, 1998). Further investigation is needed to identify planning processes and tools that:

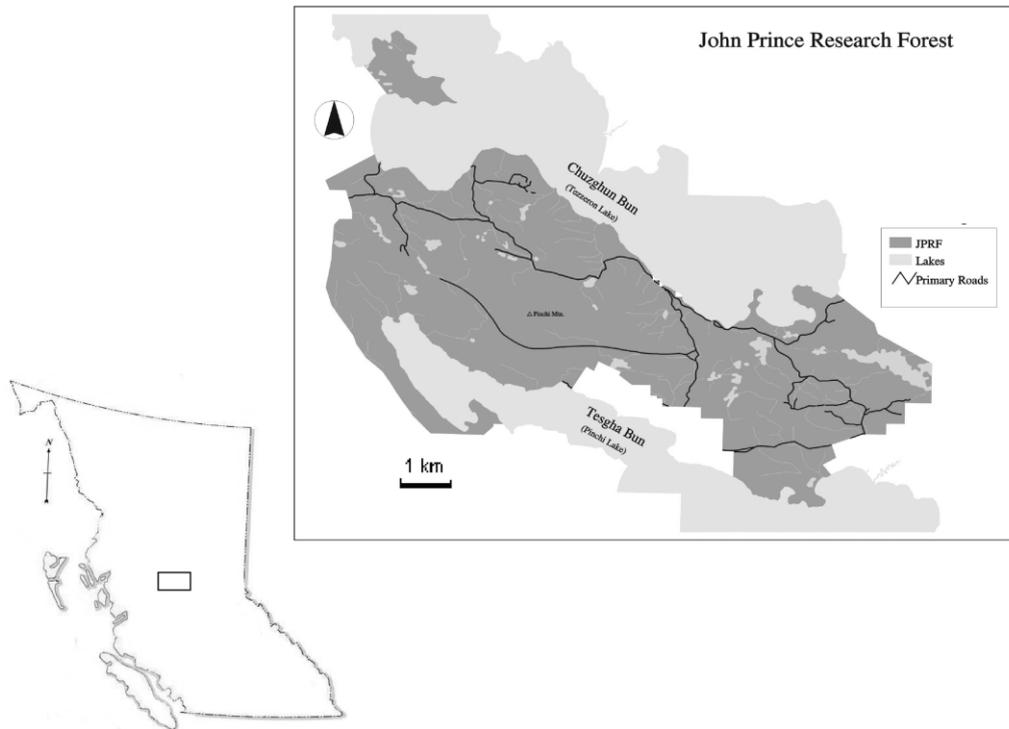


Fig. 1. The JPRF is located in central interior British Columbia.

1. Meaningfully involve Aboriginals as participants in the decision-making process at the community level (Borrini-Feyerabend et al., 2000);
2. Draw upon the strengths of both western and Aboriginal management approaches (Western and Wright, 1994);
3. Protect sensitive and confidential information (Sherry, 2002);
4. Preserve the integrity of TEK (Johnson, 1992); and
5. Are adaptable to a diversity of cultures, ecosystems, and resource management situations (Murphree, 1993).

The objective of this research was to address these needs by developing a framework for integrating Aboriginal values and management approaches with forest management science. This study used the co-managed John Prince Research Forest (JPRF) in British Columbia, Canada, as a case study.

## 2. Study area

Established in 1999, the JPRF is a 13 032 hectare working forest jointly managed by TI'azt'en Nation (a local indigenous group) and the University of Northern British Columbia (UNBC). The JPRF is located approximately 250 km northwest of Prince George, British Columbia (Fig. 1) and occupies 0.2% of the TI'azt'en traditional territory (Morris and Fondahl, 2002). The JPRF provided an ideal case study for this research for several reasons. The co-management arrangement had already achieved a considerable level of trust between TI'azt'en Nation and UNBC. This facilitated acceptance of the project principles and objectives by community leaders, elders, and traditional land users. The JPRF is also a landscape with diverse forest values, providing an interesting and challenging land base for natural resource planning and policy research. It is located in the Sub-Boreal Spruce biogeoclimatic zone of British

Columbia (Meidinger and Pojar, 1991), and is representative of the ecological, historical, and cultural characteristics of the region. For instance, the JPRF contains natural stands of interior Douglas-fir (*Psuedotsuga menszii*) at the northern extent of its range, a range of forest types representative of the region, and a 60-year history of commercial forest management activities. The management approach of the JPRF is also consistent with the study objectives. Through research, training, and education, the management philosophy of the JPRF is to combine Aboriginal and scientific methods of knowledge acquisition and application (JPRF, unpublished). Finally, the research forest provided logistical support to the research project by recruiting assistants from the Tl'azt'en community. These individuals provided research, extension, and liaison services such as the identification of research participants, arranging meetings, and brought a local perspective when reviewing and disseminating research results.

### 3. The Aboriginal Forest Planning Process

The Aboriginal Forest Planning Process (AFPP) emerged from ongoing research projects on the JPRF, which had the overarching goal of evaluating an analytical approach to scenario planning (Shoemaker, 1995; Dewhurst et al., 1999) for participatory forest management decision-making. One of the objectives of these projects was to engage community members in co-operative management by generating scenarios for the JPRF based on Tl'azt'en values, using forest planning models to simulate various management alternatives. To establish parameters for the analysis, a Tl'azt'en forest management perspective had to be characterized; however, before conducting interviews and focus groups, the authors sought preliminary information from existing community archives. The AFPP is the method developed for selecting, classifying and organizing this archival information into forest management criteria and indicators (C&I) for strategic-level forest planning.

The AFPP approach was based on the idea that local land uses, priorities, issues, and concerns provide a foundation for developing appropriate sustainability indicators, and for directing planning

processes (Williams and Matejko, 1985). Sancar (1994) and Lautenschlager et al. (2000) argued that decisions based on these 'bottom-up' methods are the most relevant for achieving sustainable management.

#### 3.1. Secondary information sources

Tl'azt'en Nation allowed the investigators extraordinary access to community archives under strict conditions of confidentiality. These archives contained a number of secondary information sources.

1. *Research interviews* consisting of transcripts from a research project conducted with UNBC in 1998 and 1999. Interviews were semi-structured involving a range of participants such as Tl'azt'en youth, elders, forestry workers, and administrators.
2. *TUS documentation* consisting of traditional land use maps that were coded and cross-referenced with a database containing source information, an explanation of each site usage or significance, and, if applicable, flora and fauna used for subsistence purposes.
3. *Elders' interviews* including transcripts of individual interviews and focus groups with elders conducted between 1978 and 1995. These semi-structured, open-ended interviews explored Tl'azt'en life before 1950.
4. *Secondary materials* including reports and publications on local Aboriginal history, culture, and ethnobotany.

Analysis of this secondary information was conducted in three stages: summarization, compilation, and categorization.

#### 3.2. Stage 1: summarization

This stage involved reviewing primary material (e.g. interview transcripts or translations) and secondary material (e.g. books, reports, journals, databases) to identify information related to forest management. For each document, source information was recorded. For primary material, this included: an interview number; the date, time, and place of the interview; identification of the corre-

Table 1  
AFPP criteria themes and sub-themes

Themes <sup>a</sup>	Sub-themes
Human factors	Education Community Employment
Economics	Economic development Bush/subsistence economy
Land management	Current approaches Alternative approaches Traditional approaches and philosophies Knowledge and research Communication
Resource/environmental concerns	Wildlife Fish Trees and plants Water quality Access

<sup>a</sup> Criteria themes adapted from Kearney et al., (1998).

sponding interview recording; and names of the interviewer(s), interviewee(s), and the transcriber. For secondary material, a full citation and archival location were recorded. Recording source information facilitated subsequent validation and data management.

Secondary information was condensed into direct quotations and/or point form notes. These summaries were necessary because source information was collected for purposes other than the identification of forest management C&I. In the process of reviewing primary and secondary materials, investigators sought information that could be equated with forest management objectives and criteria. Three questions were used to guide the analysis: What is important to people in this community? What are their concerns? What ideas emerge as solutions to some of their resource and social problems? This analysis was broad in scope, so as to capture a complete picture of Tl'azt'en values that may be directly or indirectly related to forest management. The information obtained included subsistence resource uses and lifestyles, ecological and social changes resulting from past forest management, and recommendations or expectations for local forest, community, and economic development. Traditional knowledge,

including management practices, oral histories, legends, and ideologies, was also found.

At the end of each summary, the information was condensed further into a table according to four criteria themes (after Kearney et al., 1998) and 15 sub-themes (Table 1). For each sub-theme, a statement or description of the value, concern, or priority expressed in the interview was included. These descriptions provided additional information on the context, perspective, or in the case of a specific resource, function of the criterion. An example of the summary format is provided in Table 2.

### 3.3. Stage 2: compilation

For each information source, summaries were compiled into tables according to criteria themes, sub-themes, and descriptions (Table 3). Each entry was labeled with the interviewee's name and transcript number, and entries with the same or similar descriptions were grouped together. These tables provided a comprehensive list of local needs, issues, and concerns; an indication of common values held within the community; and the different perspectives among community cohorts.

Table 2  
Sample interview summary

Source	Tl'azt'en Nation Elder Files		
Type	Tape 11-A		
Date	June 6, 1978		
Location	Lions River, BC <sup>a</sup>		
Interviewers	S. McMahon		
Interviewee	M. Hindman		
Transcriber	M. Johnson		
<p>'Long ago there were no stores to buy food from. We planted our gardens and dried fish and meat for winter use. This is what our children and ourselves lived on. Now-a-days it is all different... We used to eat wild rhubarb and fireweed. We ate the rhubarb before it gets hard, because when it gets hard it is no more good to eat. We also ate sap from <i>chundo</i>. Women used to go out in large groups to get these saps. Wherever there was pine trees they used to dry this sap for the winter use.'</p> <p>'They used moss (for diapers for babies) that grows only in the swamps. The babies are wrapped in this along with their cloths. This is what they used for diapers. It was very good because they didn't have to wash the diaper.'</p> <p>'The way we lived long time ago was good. That is why we lived long. Now, everyone dying at very young ages.'</p> <p>'When someone had a sore back they would place rocks in the ground and heat them until they were real hot. Then, they would place red willows over it. Person would lie down and be covered with blankets. It was real good cure for sore back... The people used to make sticks—some small, some big. The sticks they used in different games they played. Now-a-days they don't play these games.'</p>			
Criteria themes/sub-themes		Description	Management indicators/actions
Resource/environmental concerns	Trees/plants	Wild rhubarb, swamp moss Fireweed Pine Red willow	<i>Area protected in riparian buffers<sup>b</sup></i> <i>Amount of area in early or young forest</i> <i>Amount of area in pine-leading stands</i> <i>To be identified</i>
Human factors	Community	Community health/life expectancy Traditional games	<i>Proportion of diet acquired from traditional/'wild' foods</i> <i>To be identified</i>

<sup>a</sup> Names of places and people were changed to maintain confidentiality.

<sup>b</sup> Italicized entries refer to information derived from sources other than the archives.

Table 3

Compilation table: A sample reference guide to criteria identified in the Tl'azt'en Elders' transcripts

Criteria themes/sub-themes		Description	Source
Human factors	Education	Younger generations need to understand proper relationship with the environment. Must teach language to the youth	J. Adams (2) <sup>a</sup> A. Mathews (18),
	Community	Self-sufficiency; clans controlled political and social life; traditional lifestyle was healthy	J. Adams(2) M. Hinman(9),
	Bush economy	Self-sufficiency; lived on animals from the bush; made own clothes/tools Made money trapping before government allowances started	F. Denny (6), M. Hank (9), P. Johnson (13) B. Robson (24)
Land management	Current approach	Cannot replace the resources that we exhaust. Trapline boundaries are compromised because of too many roads	J. Adams (2) Z. Walter (30),
	Alternative approach	Need government that recognizes native history and beliefs	J. Adams (2)
	Traditional approach	Logging should respect trapline boundaries Hunting areas had clear boundaries; members agreed on who hunted where Don't kill/cut trees needlessly; leave something behind	A. Sam (21) J. Adams (2) F. Denny (5), M. Jack (14), P. Johnson (15)
Resource/environmental concerns	Wildlife	More wolves now than before; due to access; affecting deer	M. Johnson (12), A. Sam (29)
	Trees/plants	Berries are scarce because of logging and herbicide	P. Johnson (17)

<sup>a</sup> Names of places and people were changed to maintain confidentiality.

TUS map data was also assembled at this stage. This information provided the basis for developing location-specific objectives on the JPRF. Four map themes were generated on mylar overlays: wildlife, hunting, and trapping areas; fishing sites; cultural, spiritual, and archeological sites; and plant gathering areas.

### 3.4. Stage 3: categorization

To facilitate data management, summary information was divided into three C&I categories: spatial, quantitative, and qualitative.

#### 3.4.1. Spatial

In this study, spatial C&I were found to be important tools for assessing plan sustainability. The ability to propose forest management activities spatially, developed in response to community

input, proved invaluable in facilitating meaningful involvement and participation. This approach allowed the Tl'azt'en participants to relate planned forest activities with what participants knew about the land base (Table 4). This made the material more meaningful to the community, and gave them some confidence that their input and perspectives were being substantively recognized.

Additionally, with the recent trend toward spatially explicit analytical forest planning tools (e.g. McCarter et al., 1998; Dewhurst et al., 1999; Kurz et al., 2000; Varma et al., 2000), the need to present C&I in spatial form has implications for natural resource information management. In this research, values associated with static locations were addressed by segmenting the landscape into emphasis areas and, in each area, developing appropriate forest management options for achieving particular resource objectives. Consequently, it

Table 4  
Spatial criteria and indicators: a sample reference guide to the research interviews<sup>a</sup>

Criteria themes/sub-themes	Feature	Description	Management indicator/action	Source	
Resource/environmental concerns	Wildlife	Corridors and reserves	Habitat: need to provide diversity	Should be at least 0.5 mile wide	A. Daniels (15) <sup>b</sup>
	Fish	Rivers, lakes and creeks	Protection: high quality habitat; inadequate buffers have negative effects on rainbow trout	Larger buffers	J. Price (1); A. Daniels(15); L. Dunns (17); women elders (43) <sup>c</sup>

<sup>a</sup> Refers to the archival source.

<sup>b</sup> Refers to interviewee and summary source number (names were changed to maintain confidentiality).

<sup>c</sup> Refers to a focus group.

was necessary to isolate criteria associated with a particular place or feature. Spatial criteria were addressed through zoning and buffering.

Zoning involved partitioning the landscape into units based upon differences in management emphasis. Using the four TUS mylars, and maps showing topographic and hydrologic features on the JPRF, resource management zones (RMZs) were delineated based on a combination of traditional use and natural boundaries (e.g. contour lines, streams, etc.) (Fig. 2). Each zone was assigned a management emphasis based on information revealed during the summarization stage. The percentage of forest zoned with a traditional use emphasis, such as hunting or plant gathering, were presented to community members as indicators that the subsistence economy and traditional education criteria were being addressed. Buffer areas were also designated to separate sensitive, location-specific values from potentially damaging activities. Spiritual and archeological sites, and water features such as streams, lakes, and wetlands that required protection from forest management activities were assigned protective buffers (Karjala and Dewhurst, in press). For plan assessment, the amount of area protected in riparian buffers was used as one indication that a scenario addressed the water quality criterion.

### 3.4.2. Quantitative

Quantitative indicators are related to biophysical forest conditions, practices, or yields. Examples include leading tree species and age class distri-

butions, habitat types, silvicultural systems, and harvest volumes. These were used to monitor or set targets for particular resource values. A broad range of community criteria were addressed through tracking forest conditions including habitat for key wildlife and plant species; yields such as forestry-related employment and training opportunities; or practices such as the use of lower impact silvicultural systems (Table 5).

### 3.4.3. Qualitative

Selecting streamlined, quantitative, objective, scientifically-based indicators has been emphasized in recent work on C&I development (e.g. Prabhu et al., 1999; Smith et al., 1999). Throughout the development of the AFPP approach, however, it was apparent that qualitative assessments based on subjective, experiential knowledge are essential to the community's view of sustainable forest management. As with other research (Beckley et al., 1999), the present study found qualitative C&I are based on held values embedded in traditional worldviews, philosophies, ethics, beliefs, and rules of proper conduct on the land. Other qualitative C&I identified included policies, operational level guidelines, and programs to ensure that the Tl'azt'en community can benefit from JPRF co-management (Table 6). Subjecting the results of analytical forest planning to a qualitative assessment by Aboriginal participants was found to be critical to the development of a management system that truly integrates TEK with western forest management.

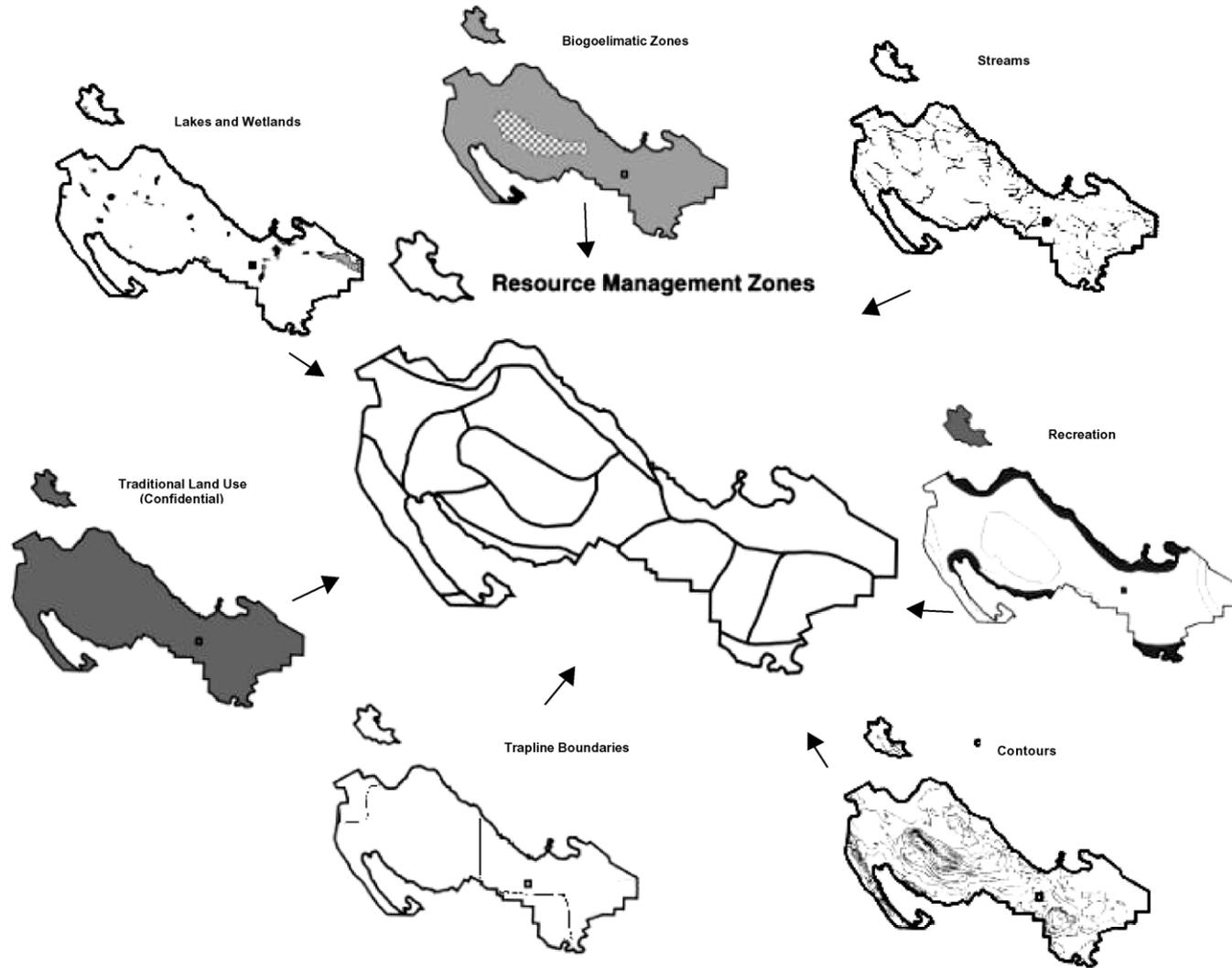


Fig. 2. The AFPP involves using multiple map-based information sources to generate RMZs.

Table 5

Quantitative Criteria and Indicators: A sample reference guide to the Tl'azt'en Elders' interviews

Criteria themes/sub-themes	Attribute	Description	Management indicator	Source	
Resource/environmental concerns	Trees/plants	Cottonwood	Transportation: canoes oral history	Amount of area in cottonwood stands <sup>a</sup>	H. Jenson (10) <sup>b</sup> ; R. Stuart (25); M. Dunns (32)
		Blueberries	Bush economy: food	Found in pine stands (Amount of area in young pine stands)	J. Price (1); A. Daniels (15); L. Dunns (17); women elders (43) <sup>c</sup>

A sample reference guide to the Tl'azt'en Elders' interviews.

<sup>a</sup> Italicized entries refer to information derived from sources other than the archives.

<sup>b</sup> Refers to interviewee and summary source number (names were changed to maintain confidentiality).

<sup>c</sup> Refers to a focus group.

C&I were categorized in four tables (summary, spatial, quantitative and qualitative) (Tables 4–6) based on the analysis of 66 interview transcripts, 37 TUS database entries, and 7 secondary sources.

#### 4. Discussion

The AFPP was developed as a response to the need for a bottom-up approach to generating C&I for landscape level analytical forest planning (Fig. 3). A variety of community information was aggregated to generate criteria, objectives, and goals, and to guide the identification of management indicators and actions. This study found that the AFPP is a good approach to incorporating TEK into forest management planning. The following discussion outlines the key features contributing to the efficacy of this planning approach, namely: information elicitation, information management, and the application of local information. Potential limitations of the AFPP are also discussed.

##### 4.1. Information elicitation

The AFPP approach to eliciting Aboriginal information using archival sources varies considerably from conventional processes such as public meetings and workshops, where participants engage in discourse and negotiation (e.g. Renn et al., 1995). The AFPP does share similarities with aspects of the nominal group technique (NGT) as described by Delbecq et al. (1975). We found the

AFPP assisted problem solving by identifying and combining individual perspectives and ideas to produce a satisfactory course of action. As with the NGT, the AFPP approach enhanced the development of creative solutions, ensured that all participants contribute equally to establishing the frame of reference, and avoided the risk of prematurely prioritizing issues (Delbecq et al., 1975).

AFPP differs from NGT and other participation processes in that it avoids quantitatively prioritizing issues (e.g. Prabhu et al., 1999; Mendoza and Prabhu, 2000). The AFPP avoids this prioritizing stage for three reasons.

1. The AFPP focuses on strategic-level planning rather than monitoring. Consequently, the Tl'azt'en C&I were indirect measures of forest values (e.g. moose habitat, as opposed to moose populations) and comprise a coarse-filter approach to management. As a result, fewer C&I were used, and thus there was less need to prioritize values.
2. AFPP identifies C&I that are inclusive and representative, rather than those that are most efficient. Prioritizing one value or issue over another was inconsistent with the Tl'azt'en view that everything is integrated and important across the entire landscape.
3. The AFPP is the initial phase of planning, when developing a comprehensive community perspective is the necessary task. For the JPRF case study, prioritizing issues would occur dur-

Table 6  
Qualitative Criteria and Indicators: A sample reference guide to the Tl'azt'en Elders' interviews

Criteria themes/sub-themes	Issue	Description	Management indicator/action	Source	
Human factors	Employment	Sheep grazing and spraying of herbicides and pesticides	Takes away jobs	Replace with manual brushing	W. Quinn (40) <sup>a</sup>
Land management	Current management approach	Logging/Access	Logging has affected trapping species	To be identified	C. Richard (25)
Resource/environmental concerns	Wildlife	Spraying of herbicides and pesticides	Displaces moose and deer-herbicide kills their preferred browse; destroys berries, and other food and medicine plants	Replace with selective, manual brushing around trees-leaving browse, food and medicinal plants	H. Price (11); L. Price (7); R. Stuart (25); W. Quinn (40).; M. Jared (10);
	Trees/plants	Sheep grazing	Domestic animals in forest may introduce diseases	Replace with manual brushing	W. Quinn (40)

<sup>a</sup> Refers to interviewee and summary source number (names were changed to maintain confidentiality).

ing later stages of the planning process, after the initial scenarios were produced, reviewed, and assessed by community members.

In addition to establishing a foundation for strategic forest planning, eliciting information from archival sources using the AFPP provides several other benefits. With Tl'azt'en Nation, the investigators were able to incorporate perspectives from a larger sample of community members with less time and cost than by relying solely on individual interviews. Archival analysis also provided important background information, enhancing investigators' sensitivity, awareness, and appreciation for the Tl'azt'en people, their culture, history, and lifestyles. Familiarization enabled investigators to better understand and interpret the community's primary concerns, needs, values, and underlying reasoning. Reviewing primary and secondary materials also allowed investigators to identify key community members for future interviews, to discern information gaps, and to develop research methodology to elicit additional information. For example, researchers established that TUS maps and transcripts were excellent sources for the development of broad forest management criteria,

but were poor sources for identifying local, quantitative indicators. Consequently, quantitative indicator identification was the focus of subsequent interviews.

#### 4.2. Information management

Public participation processes must demonstrate the connection between public concerns and planning decisions (Renn et al., 1995), and therefore the AFPP is designed with transparency as a primary concern. Providing this link builds social capital, or the level of trust and confidence that exists between community members and those who are representing their interests. Salamon et al. (1998) indicated that strong social capital within small communities is an essential component of successful locally-led planning initiatives. Enabling participants to track the outcomes of a planning process is particularly important when cultural information is being interpreted and re-organized from archival sources. In the AFPP, there was explicit emphasis on recording source information and criteria descriptions (Tables 3–6) so that community members had confidence in the

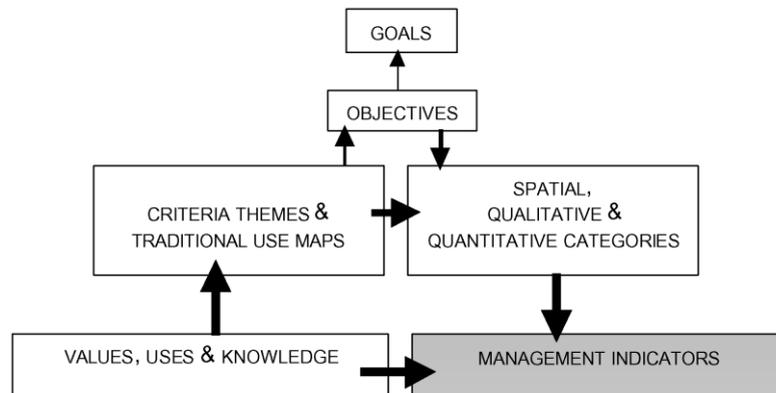


Fig. 3. The AFPP as an information management process. The criteria, indicators and maps generated from the process can be used as local, value-based information to develop broad forest management goals and objectives. The box representing management indicators is shaded because the use of archival sources in the JPRF case study revealed few indicators.

origin of the information, and so that misinterpretations could be easily identified and corrected.

The AFPP does not use existing hierarchical formats for organizing C&I. Examples of these formats include work by the Centre for International Forestry Research, and the Land Unit C&I Development (LUCID) project initiated by the US Forest Service. Both use a principle-criteria-indicator structure, which involves dividing criteria into socio-economic and ecological principles (e.g. Prabhu et al., 1999; LUCID, 2001) or categories (e.g. CCFM, 1995; CFS and NRC, 1995). In contrast, the AFPP criteria themes and sub-themes represent community-specific values that need to be addressed in scenario plan development. Rather than adopting or modifying an existing C&I framework, an attempt was made in the AFPP to organize secondary information according to the way that community members expressed values and concerns. For instance, sub-themes such as education, traditional management, and subsistence economy (Table 1) reflected specific Tl'azt'en values that do not appear in generic C&I frameworks (Karjala and Dewhurst, in press). Some criteria sub-themes were also interpreted differently than would be expected from a mainstream western point of view. For example, Tl'azt'en interviewees frequently cited education as an important community value. However, their education criterion encompassed two types of learn-

ing: traditional (subsistence, spiritual, cultural); and formal (secondary and post-secondary) (Ibid).

#### 4.3. Information application

In addition to linking Aboriginal and western forms of forest management, the AFPP's C&I format contributes to broader forest sustainability initiatives such as forest certification, national-level monitoring, and international reporting, which may allow for continual improvement in Aboriginal influence over resource development (Smith, 1998). Therefore, identifying, monitoring, and managing for locally-defined C&I is a valuable exercise at all levels of forest management.

The AFPP produces C&I which are more location-specific than some existing templates (Prabhu et al., 1999; LUCID, 2001), but which are generalized enough to protect sensitive information. In this context, the criteria serve an important function within the AFPP framework. When used with appropriate landscape zoning, they 'codify' Aboriginal knowledge and values such that details regarding 'who', 'what', and 'where' remain confidential. For instance, JPRF management guidelines associated with zones on a map were shared without providing specific information on the nature or location of specific forest resource values.

For strategic forest planning, the AFPP provides a general framework for use in defining a desired future condition for the forest. Compiled criteria themes and sub-themes presented a synthesis of local forest needs, concerns, and knowledge, which can be further aggregated to generate broad goals and objectives (Fig. 3). For example, based on the descriptions of community, education, and bush economy sub-themes in Table 3, one goal of the Tl'azt'en community might be to have a self-sufficient society, while maintaining subsistence and spiritual uses of the land (Karjala et al., unpublished).

Likewise, spatial, quantitative, and qualitative forest management indicators can be used for the development of management targets and strategies to achieve landscape-level objectives. For instance, to maintain subsistence and spiritual uses of the land, a forest manager might designate a specific amount of area on the landscape to protect locally important cultural heritage values (spatial); designate a target percentage range of suitable habitat for subsistence plant species (quantitative); and establish regular meetings with traditional land users to gauge their level of satisfaction with management outcomes (qualitative). When integrated into spatially explicit analytical planning tools (e.g. McCarter et al., 1998; Dewhurst et al., 1999; Kurz et al., 2000; Varma et al., 2000), spatial and quantitative indicators can be used to assess if these management decisions result in a desirable future outcome; to assess their impact on other management indicators; and, if necessary, to adjust forest management strategies accordingly to achieve a desired future condition (Karjala, 2001).

C&I identified through the AFPP may also provide a common template where forest management values and concerns can be examined for similarities and differences across spatial, temporal, and cultural boundaries. Given these benefits, it becomes evident that C&I might have utility, not only in Aboriginal forest planning, but also for improving non-Aboriginal involvement in local forest management decision-making.

#### 4.4. Limitations of the AFPP

The AFPP has some potential disadvantages related to the use of secondary information.

Archives contain 'old information', which may no longer be relevant. Although it may reveal changes in intergenerational values, secondary information may be incompatible with current community realities. Despite extensive training, non-Aboriginal investigators' cultural biases might influence data analysis, since the process, by necessity, involves creativity and interpretation. Biases may present themselves through information selection (e.g. deciding what is important), information interpretation (e.g. potential for loss or distortion of meaning), and information organization (e.g. the placement of RMZ boundaries). Archival sources often include information from deceased or absent community members, which cannot be properly verified since the respondents may be unavailable to elaborate on or clarify their comments. The quality of secondary information may also vary. It may contain deliberate or unintentional misinterpretations, or it may have been developed for specific political, ideological, or economic purposes and must be evaluated carefully. A mechanism for validating AFPP data analysis should be included before implementing the findings. In this research, the AFPP results were presented to a Tl'azt'en Nation advisory team for review and feedback.

Preliminary findings from research aimed at evaluating the AFPP suggest that the approach, while generally desirable and feasible, may have some limitations (Sherry et al., in preparation). Indigenous communities may lack the necessary human, financial, technical, and information resources to apply the AFPP. Participation barriers such as community apathy, mistrust, and learned dependency could impede execution. The process may be vulnerable to community power dynamics, as people with status, authority, and information could abuse the process to serve personal or private interests. AFPP reviewers were concerned that information sharing may result in misinterpretation or misuse of local information, which could negatively impact treaty negotiations, traditional land use, or community development.

Several obstacles to the effective implementation of AFPP results were also identified. Achieving the identified values and goals through appropriate management actions on a particular

land base can be challenging, and without legal and policy provisions for this type of planning, the AFPP use could be restricted or precluded. Also, the identification of explicit, testable indicators can be difficult or impossible in some situations, particularly if information and community participation are limited. Finally, where the management setting is complex (e.g. there are competing resource uses or users) and the indigenous groups lack decision-making power, the outcomes of the AFPP may have little influence on resource management.

## 5. Conclusion

The AFPP is a method for eliciting and managing community information in developing a set of C&I used to link local Aboriginal knowledge and values with western analytical approaches. Placing community values into a C&I framework may address involvement, integration, and confidentiality issues, although further investigation is being undertaken to evaluate if the AFPP approach is in fact a culturally suitable and effective tool for forest planning on Aboriginal traditional land (Sherry et al., in preparation). As a result of the co-management arrangement on the JPRF, access to community resources for the purposes of this research was open and accountable, the resulting C&I framework was subjected to local validation and revision, and the ownership of the information was controlled. The AFPP is not intended as a tool for researchers and non-Aboriginal decision-makers to gain access to community information, nor is it certain to improve relationships between indigenous and other resource users. Rather, it is a starting point from which Aboriginal communities might engage their own members in participatory, analytical decision-making about locally-controlled forests (e.g. on reservation lands, land claim settlement areas, co-managed areas, or community forests) or to constructively collaborate with outside managers in developing commercial forests on traditional lands.

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