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Including aboriginal issues in forest planning: a case study in central interior British Columbia, Canada

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Abstract

Generic criteria and indicator (C&I) frameworks have been the focus of recent work on sustainable forest management. These templates, however, may not be an appropriate approach for directing landscape-level forest management strategies. Instead, many argue that sustainable management should be determined using "bottom–up" approaches rather than standardized frameworks. This requires engaging local expertise in defining sustainability. Having a culturally distinct form of local knowledge, Aboriginal communities have an important role to play in decision-making processes. However, conventional participatory approaches, such as generic C&I frameworks and multi-stakeholder planning processes, are often inappropriate for engaging Aboriginal involvement. We suggest that landscape-level forest planning should highlight rather than assimilate cultural perspectives on sustainable forest management. Using the co-managed John Prince Research Forest in central interior British Columbia as a case study, this paper presents the results of using C&I and a scenario planning approach to describe an Aboriginal perspective of good forest stewardship. These results demonstrate that, in contrast with existing C&I frameworks, locally-based sustainability criteria provide better guidance for developing and adapting landscape-level forest plans.

Keywords: Criteria and indicators; Indigenous people; Forest planning

1. Introduction

Since the release of Our Common Future (WCED, 1987), and other international initiatives promoting sustainable development, accountability has quickly become a major driver for defining and implementing sustainable forest management. Consequently, national commitments, and international market incentives, have spurred the development of criteria and indicators (C&I)[1] of sustainable forest management. According to the Canadian Council of Forest Ministers (1995), C&I serve as a tool for monitoring sustainable forest management goals and provide a basis for producing innovative forest management approaches.

The most common application of C&I is to assess, monitor, and report on the state of forest sustainability. Recent studies on procedures and methodologies that identify, select, and prioritize local-level C&I, have produced or adopted generic templates and frameworks to monitor sustainability criteria for various countries and ecosystems (e.g. McClain, 1998; Prabhu et al., 1999; LUCID, 2001).

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[1] A criterion is "a category of conditions or processes by which sustainable forest management may be assessed", and an indicator is "a measure (measurement) of an aspect of a criterion" (CCFM, 1995, p. 5).

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A secondary use for C&I is to guide forest management planning and decision-making. This application has the potential to actualize sustainable forest management, particularly for landscape-level forest planning (e.g. JPRF, unpublished; Karjala, 2001). Generic criteria, however, may be inappropriate for this purpose, as they are often developed using "top–down" processes which do not generate information that is specific enough to address local forest management issues.

The identification of locally-generated goals and objectives for forest planning is the impetus behind public involvement in forest management decision-making. Individual worldviews, perceptions, identities, values, and behaviors all influence and are influenced by community, culture, and environment (Tuan, 1990; Sancar, 1994; Kusel, 2001). Just as ecosystems differ between landscapes, so do social, economic, and cultural systems. It follows then, that sustainability criteria would be defined and implemented differently across social, cultural, and ecological boundaries as well. Consequently, in order to be effective, C&I should be developed through public planning processes in order to capture the appropriate context.

Locally-defined C&I can be particularly useful in cross-cultural forest planning exercises. This is important in countries where the rights of indigenous people are prevalent. For instance in Canada's history, colonization has marginalized Aboriginal ("First Nations") influence over land and resource activities (Fisher, 1992; Notzke, 1994; Sherry, 1999). Although First Nations' inherent and legal right to use and manage land and resources are reflected in government policies (e.g. CCFM, 1998), little progress has been made to develop a suitable collaborative framework to incorporate Aboriginal ecological knowledge and social values into forest planning processes. Conventional public participation approaches, such as multi-stakeholder processes, are inadequate for meeting the needs of First Nations communities (NAFA, 1997), and current protocols for consulting these communities on operational level forest plans occur at late stages forcing communities into a reactive, defensive position (Robinson and Ross, 1997; Pinkerton, 1992; Sherry et al., in preparation).

Alternatively, the results of this research suggest that developing local-level Aboriginal criteria of forest management would generate an understanding of their interests in the context of other local "communities"; overcome some challenges related to cross-cultural planning environments; and direct the necessary actions to properly implement Aboriginal ecological knowledge and values into forest management practice.

2. Background

2.1. Forest planning in British Columbia

British Columbia (BC) is Canada's westernmost province. BC's total land area is 93 million hectares (ha), 60.6 million of which is forested (CFS, 2000). Ninety-five percent of BC's forests are provincial crown land (CFS, 2000). The province is divided into 32 regions, which are used as administrative units for land and resource planning and management. BC uses a hierarchical planning structure consisting of a provincial strategy, regional plans, and sub-regional plans. These guide lower level plans, such as forest management (landscape-level), forest development, and access management plans (operational level).

2.2. Challenges of aboriginal forest planning in BC

There are several legal, political, ideological, and cultural barriers that limit First Nations' participation in forest management planning in BC (Sherry et al., in preparation). BC is the only province in Canada that has not settled land claims with most of its Aboriginal population. This presents difficulties when attempting to engage First Nation communities in setting planning goals and objectives. Many Aboriginal groups in BC assert that participating in these processes would acknowledge the provincial government's authority to manage resources on lands where First Nations have a claim. Furthermore, multi-stakeholder processes assume that First Nation communities are stakeholders on equal footing with industrial, recreational and non-timber forest users. First Nations, however, wish to negotiate on a government to government level. Other challenges to cross-cultural forest planning include differences between Aboriginal and western world views on land and resources, as well as

concerns over the control and ownership of Aboriginal knowledge (e.g. Johnson, 1992; Duerden and Kuhn, 1998; Berkes, 1999; Karjala et al., in press).

3. Study area

3.1. The John Prince Research Forest

Established in 1999, the John Prince Research Forest (JPRF) (Fig. 1) is a 13,032 ha forest co-managed by Tl'azt'en Nation (a local indigenous community) and the University of Northern British Columbia (UNBC) for education, research, and training. The management philosophy of the JPRF partnership is to integrate and enhance traditional and scientific approaches to understanding human relationships with the land (JPRF, unpublished). Located approximately 250 km northwest of Prince George, BC, the research forest falls within the Sub-Boreal Spruce (SBS) biogeoclimatic zone of BC (Meidinger and Pojar, 1991). The JPRF is representative of the ecological, historical, and traditional values of the region containing examples of interior Douglas-fir at the northern extent of its range; a 60-year history of commercial logging; and occupying 0.2% of Tl'azt'en traditional territory (JPRF, unpublished).

The JPRF includes portions of three "keyohs", traditional Tl'azt'en family territories that are used for subsistence purposes, and are currently defined by government delineated traplines. The forest also contains culturally sensitive spiritual and archeological sites. A Tl'azt'en traditional use inventory reveals a history of significant subsistence use in the research forest including fishing, hunting, and gathering sites (Tl'azt'en Nation, unpublished). In addition to

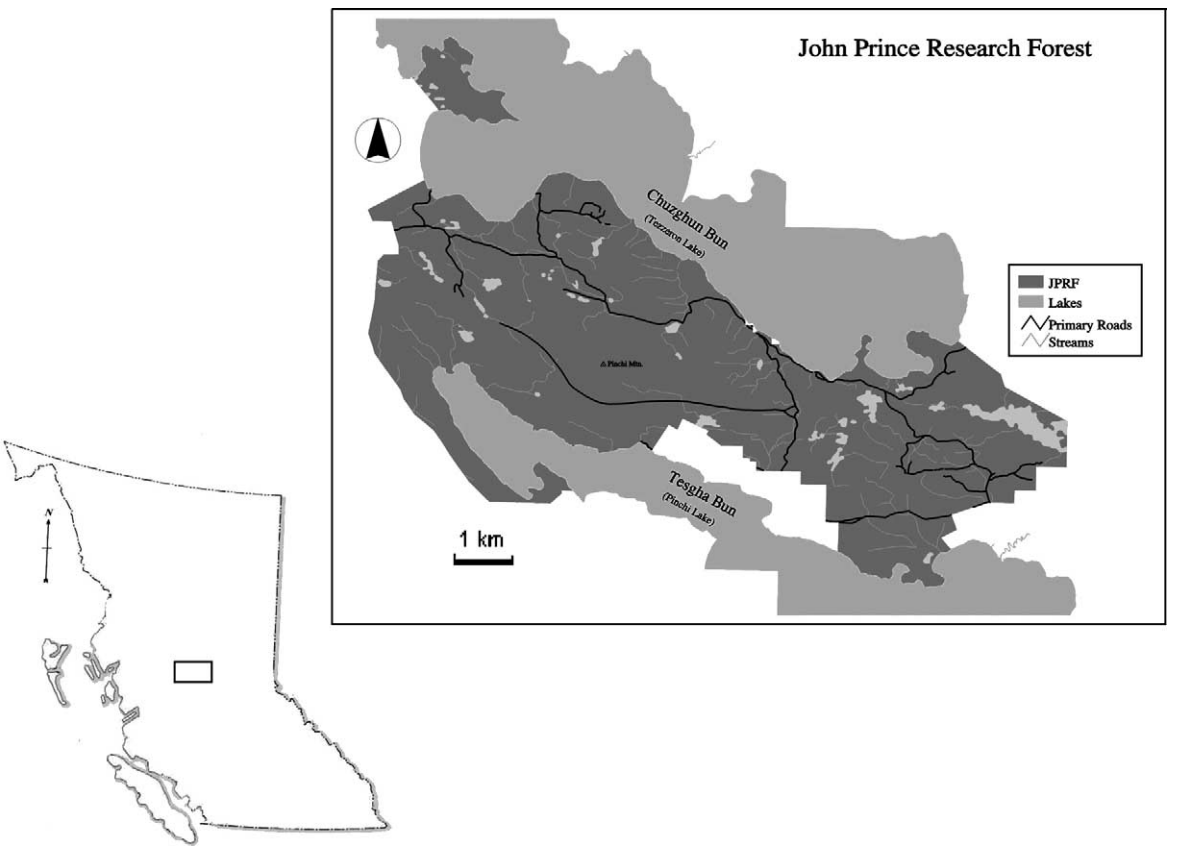

Fig. 1. The John Prince Research Forest.

traditional use, the JPRF currently supports year-round recreational opportunities such as hunting, fishing, hiking, and snowmobiling; commercial timber extraction; and hosts a variety of research activities including wildlife, historical ecology, forestry, and planning. Land uses surrounding this research forest include an inactive mercury mine outside of its southern boundary, agriculture to the east, a lakefront resort and a research facility along the northern boundary, and commercial timber harvesting to the west (Karjala, 2001).

3.2. Tl'azt'en Nation

Tl'azt'en Nation is made up of 1379 members living in five villages (Morris, 1999; INAC, 2001). The twenty-five reserve lands allotted for this community are under federal jurisdiction, and are administered by Tl'azt'en Nation. The non-reserve portions of Tl'azt'en traditional territory and its resources are still under provincial jurisdiction, as land claim settlements between Tl'azt'en Nation, the provincial, and federal governments are currently under negotiation. Consequently, the majority of their traditional territory is still under tenure to industrial forest companies, with the exception of one tree farm licence (TFL) that was granted in 1981 to Tanizul Timber, a Tl'azt'en-owned operation (Booth, 1998).

Despite the opportunity to implement Aboriginal forestry in their own TFL, Tl'azt'en Nation has faced many challenges in successfully incorporating community values into its decision-making (Kosek, 1993). Among other barriers, the strict demands of provincial regulations governing the operations of forest licencees has limited Tl'azt'en's capacity to seek adequate input from their community members (Booth, 1998). Alternatively, the co-management partnership, with JPRF's "special use" permit, provides a flexible alternative where traditional management approaches can be explored and implemented.

4. Research objective

In 1999, UNBC investigators initiated an interdisciplinary, participatory research project with Tl'azt'en Nation to implement and evaluate a model-based scenario planning approach (Dewhurst et al., 1999; Karjala, 2001) as a way to engage Tl'azt'en community members in strategic-level planning on the JPRF. Although the research forest management board has equal representation from each partner, involving the broader Tl'azt'en community in decision-making is an essential part of planning long and short-term forest activities. The scenario planning approach was used to initiate community collaboration, interest, trust, and a sense of ownership of the research forest (Karjala, 2001). The purpose of this paper is to present the results of translating Tl'azt'en forest values into criteria and management scenarios to explore a community perspective of sustainable forest management.

5. Approach

5.1. Scenario planning

Scenario planning is an approach for addressing complex management problems by presenting a range of possible futures as narratives or "stories" (Shoemaker, 1995). In the context of forest management, scenario planning enhances participants' understanding of this complexity by comparing and contrasting scenarios to identify value trade-offs and the impacts of "large-scale forces and actions that most profoundly influence future landscape conditions" (Dewhurst and Kessler, 1999, p. 44). Trade-offs are assessed by selecting key forest management indicators that provide a baseline for scenario comparison (MacLean et al., 1999; Dewhurst and Kessler, 1999). The scenario planning approach promotes learning, profound thought, and creativity with respect to forest management problems and the possible strategies available to solve them; forces participants to explore options they may not otherwise consider; and allows participants to direct the process by identifying the nature and scope of alternatives to be explored (Shoemaker, 1995; Dewhurst and Kessler, 1999; Karjala, 2001). Forest planning models can support this approach by using C&I to simulate scenario implementation and facilitate quantitative, comparative, and interpretative analysis (Dewhurst et al., 1999; MacLean, 1999; Kurz et al., 2000; Karjala, 2001).

5.2. The process

The first step in developing community scenarios requires identifying forest values (MacLean et al., 1999), uses and, local knowledge. This information forms the basis for understanding the forest resource from a cultural perspective; developing planning goals, objectives, and criteria; and identifying issues and solutions based on local experiences (Karjala et al., in press). In the present study, information gathering was accomplished using social science techniques such as content analysis of archival sources (Karjala, 2001; Karjala et al., in press), conducting interviews, facilitating focus groups, and organizing field trips with Tl'azt'en community members. This information was then aggregated into a comprehensive set of spatial, qualitative, and quantitative C&I that broadly outline the essential elements of Tl'azt'en resource and social values (Table 1) (Karjala, 2001; Karjala et al., in press). Qualitative and quantitative criteria provide a general, descriptive account of the community's perception of the forest and its management, and can be aggregated to produce forest management goals and objectives. Spatial criteria describe static, place-specific values on the research forest, and are represented through landscape zoning.

Throughout the investigation, analysis results were summarized and presented to a scenario advisory team (SAT) consisting of 10–15 community members from a cross-section of Tl'azt'en society including men, women, administrators, elders, keyoh-holders, youth, and educators. The SAT provided feedback, comments, and additional information on the interpretation of Tl'azt'en forest values. This group also selected the scenario topics to be analyzed.

Table 1
The final list of Tl'azt'en forest management criteria identified from archival sources and new interviews

Criteria themes	Criteria sub-themes
1. Human factors	1.1. Education
	1.2. Community
	1.3. Employment
2. Economics	2.1. Economic development
	2.2. Bush economy
3. Land management	3.1. Current approach
	3.2. Alternative approach
	3.3. Traditional approach/philosophy
	3.4. Legacy
	3.5. Knowledge/research
	3.6. Communication
4. Resource/environmental concerns	4.1. Wildlife
	4.2. Fish
	4.3. Trees & plants
	4.4. Access
	4.5. Water quality
	4.6. Forest health
	4.7. Climate

6. Results

6.1. Forest management criteria

The final analysis of all information sources resulted in four criteria themes and eighteen sub-themes (Table 1). These outline the spectrum of values, areas of concern, ideologies, and priorities that Tl'azt'en community members associate with the forest. The following sections describe these themes using excerpts from Tl'azt'en interviews.

6.1.1. Human factors

Criteria that address human factors involve the non-economic, social values associated with the JPRF. Opportunities for both traditional and forestry-based education and training are included in this theme. Tl'azt'en members stress the need to provide youth with a land-based education to help them maintain a connection with their culture and history, as well as developing the skills needed to cope with the realities of the world outside of the community which is provided by a modern education. As one community member explains,

> The elders said we have to teach our young generation our way of life, our language, our culture. And also they have to have the formal education. That's the only way that we can be whole again. You can't have one without the other ... Like we're talking Land Claims now, we're talking self-government. We can't do that without our people being educated in management and political science and whatever is out there. In forestry, we need our own RPF's [Registered Professional Foresters], we need our own

biologists, we need our own archaeologists, so that we can become self-sufficient. . . . Education is important. (Tl'azt'en community member).

Forest management is also associated with the community's sense of well-being, encompassing cultural, social, and health issues. This includes both retaining the skills and values that come out of a traditional land-based lifestyle, and the tangible benefits that timber revenues can provide such as enhanced community services and infrastructure, improved living standards, and economic independence.

How [could logging] bring things to the community so our children will have a nice safe play area, so that recreation facilities can be built, so that good culture and traditional learning centres can be built, and meaningful programs be set up. . . . That's when things are going really good for our community (Tl'azt'en Elder).

Forestry-related employment is another avenue through which individuals in the community can become financially autonomous,

We've got a lot of young people that's growing up and we want to see them have something to turn to in terms of jobs (Tl'azt'en community member).

A lot of people got training with the equipment, different kinds of equipment on and off. But it's just a fact that there's not enough jobs for them to fully continue on training and get right into it so that they can, you know, down the road, will own the machine themselves (Tl'azt'en educator).

6.1.2. Economy

Although, the community views timber harvesting as a viable source of employment and financial autonomy, they are also interested in developing non-timber industries, such as ecotourism, and value-added wood products. Therefore, forest management plans must reflect the diverse economic potential of the forest.

We have to get into some other industry with that timber, and we have to find good markets for it (Tl'azt'en administrator).

That's what we need is tourism instead of our logs being chopped down (Tl'azt'en youth).

Tl'azt'en members also assert that the subsistence, or "bush" economy, makes an important contribution to the local community. The availability of resources and development of skills needed to live from the land is a sort of insurance policy that will ensure the survival of the community in difficult times.

. . . if [young people] learn now that they can live off the land . . . like its going to be hard days again coming soon and they all won't be going to the store to buy chips or something like that so they have to go out and see what they have to live on (Tl'azt'en Elder).

. . . my children . . . if I want to teach them culture, and how to live off the land just in case something happens, well it's my duty (Tl'azt'en Elder).

6.1.3. Land management

Land management encompasses a broad range of issues relating to forest practices, ideologies, knowledge, communication and intergenerational responsibility. Many Tl'azt'en members express concern that conventional forest practices are destructive to the ecosystem and to traditional activities,

I've seen some negative things like too much garbage being left out there after harvesting. I've seen too many disruption or disturbance to good producing soil by machines, and also sometimes I think we are getting too close to rivers and lakes . . . (Tl'azt'en community member).

. . . they are clearing out all the traplines, hunting ground, and people have nowhere to trap or go hunting because it's all clear-cutting. They can't go out to hunt or trap in the meadow-like country. In the olden days, people go anywhere to trap or hunt, but not anymore . . . (Tl'azt'en Elder).

The Tl'azt'en value traditional approaches to stewardship and recognize conflicts with the status quo,

The Creator made the trees for everyone. They could not belong to only one person . . . we are not allowed to chop down a tree for nothing (Tl'azt'en Elder).

That's one of the things the First Nations taught, was how to respect a person, animals, the bush,

everything out there. That was a real important part of my teaching . . . (Tl'azt'en community member).

Our people are so protective of the area. . . . Everybody protected their Keyoh. . . . They really had a lot of respect for the land, the water, everything because they knew there was a Creator that made it. So the reason why they respected it so bad was because if they destroyed it, they're going to get destroyed themselves (Tl'azt'en Elder).

Ultimately, the Tl'azt'en seek a balance between traditional and conventional forest management,

The white man [sic] is not going to go away and we're not going to go away so we have to have some kind of system that can be in harmony together and working together, and understand each other. White man has got to respect us, our culture, our language, our way of life, and we have to do the same too. So it's not just one way. . . . We have to share the resources so that our people can grow and so that white man and their people can grow too. We have to share everything, the resources. That is something right now we're trying to hammer out. It's not an easy job (Tl'azt'en community member).

Building harmonious management relationships requires open communication between managers, scientists, and land users such as keyoh-holders and elders. This requires an environment that facilitates community participation, and recognition of experiential knowledge,

We don't have enough say. Local people do not have enough say in how resources are divided up (Tl'azt'en administrator).

. . . I know what's in my trapline. I know how many traps I've got out there and what kinds of fur-bearing animals I have. I know where I can go fishing in my trapline. Those are the things we have to share and start thinking about (Tl'azt'en Elder).

Managing resources for future generations is a necessary focus for the Tl'azt'en community. This requires a long-term, or "legacy forest" management perspective (Wood et al., 1998).

It's up to the leaders now to do these thing[s], to pave the way for the younger generation so that they have something to work with when they grow up (Tl'azt'en community member).

I don't know why they bring in that big machine. And look at the outfit those people have and why do they want to cut it good and fast. Then here we're going to be, not for my generation but in the future, the people will be poor (Tl'azt'en Elder).

6.1.4. Resource and environmental concerns

Tl'azt'en members perceive that forest management has had considerable and wide ranging impacts on the forest ecosystem over the past several decades. Maintaining this ecosystem is the basis for securing opportunities for most other management criteria. Identifying impacted and/or traditionally important wildlife, plant, and fish species, and issues related to climate, water quality and access, provides direction for future management,

A long time ago we used to drink . . . like at that time we had no running water. We drink water from anywhere. But now, you can't do that. You're scared to do that. And in fact, just today I think, I talked to some guy and that guy kills moose. He told me that [the moose] liver was just white and said 'I don't want to eat it'. And lots of times they've seen animals sick like that. Well, [it's] killing all the beaver that's for sure thing. And that's why the salmon too and all the fish (Tl'azt'en Elder).

. . . when Bob and I went up there 4 years ago we noticed the big wide area, we seen three moose and they sure didn't look very good. They didn't look good at all and it was late fall and they were pretty skinny and not much left for them to eat (Tl'azt'en Elder).

We must protect the watersheds, the river, the environment, and the fish. The survival of the fish and the survival of the Indians are one. (Tl'azt'en Elder).

The clear-cutting . . . one of the things my Dad left me with is he said 'you know what son, one of these days you're going to see a big wind, a real big wind. You think the wind down at the ocean is bad, you're going to see it up here when the wind starts blowing the trees holding it back slows it down' (Tl'azt'en Elder).

6.2. Spatial values

Many of the criteria listed above can be associated with place-values on the JPRF landscape. One way to address these values is to define resource management zones (RMZs). For planning purposes, RMZs encompass both human places (e.g. hunting areas and spiritual sites) and natural features (e.g. wildlife habitat, unique geological features, waterbodies) which are partitioned into zones and are assigned appropriate management strategies. These strategies are designed to realize forest management objectives associated both with human and ecological uses, functions, and values.

Karjala et al. (in press) described how place-values on the JPRF were identified and zoned from Tl'azt'en mapping projects, interviews, and community meetings. Using these community-defined attributes, the investigators allotted each RMZ into one of five designations.

(1) *Cultural reserve zones* are places on the landscape that are associated with a community or economic (non-timber) criterion. These areas are sensitive to disturbance, and are given a 'no harvest' management strategy.
(2) *Cultural zones* are also associated with the economic criterion, but can tolerate some disturbance. These zones are assigned a 'sensitive management' strategy where selection cutting is used to minimize visual and physical disturbance.
(3) *Traditional use zones* outline areas of historical and current subsistence activities. These are also assigned a sensitive management strategy to minimize the impact of harvesting on wildlife and food plants.
(4) The *integrated resource management* (*IRM*) *zone* is an area where several land uses overlap, and is also where most historical logging has taken place on the JPRF. Consequently, this zone is associated with wildlife and tree/plants criteria, where the objective is to restore habitats to more 'natural' conditions using silvicultural treatments (MacGregor and Dewhurst, in preparation).
(5) *Harvest zones* represent the remaining areas in the forest where community place-values were not identified. These zones are designated for economic development, and are assigned an 'intensive management' treatment that emphasizes timber harvesting.

Fig. 2 shows these RMZs and their designated treatments. Table 2 outlines a management description of each zone. The resulting zoning scheme excluded large areas of the forest from timber harvesting, revealing that the protection of ecologically and culturally sensitive areas is an important management criterion for the Tl'azt'en community.

Protecting riparian areas is also an important spatial criterion. Although, Tl'azt'en elders acknowledge that the current provincial standards for riparian management are an improvement over past practices (e.g. MOF, 1995), many would like to increase the protective "buffer" on streams, lakes, swamps, and cultural sites.

> ... they could log, but I want about, 100, or 50–100 m around every little pond, without logging. I mean, just leave it (JPRF Keyoh-holder).

Riparian management suggestions from the Tl'azt'en archival analysis indicated a range of possible buffer widths. Field excursions with elders to various sites revealed that appropriate buffer size is dependent on site-specific factors such as terrain features, and vegetation type and distribution. Given this variability, and lacking information on such specific stream characteristics on the JPRF, the SAT suggested that scenarios based on generalized riparian management options would assist the community with understanding the effect of increased stream protection on various management criteria. The SAT also indicated that an additional scenario based on provincial standards would provide an interesting contrast to the community scenarios. Based on this feedback, five scenarios were developed (Figs. 3–7):

(1) Forest Practices Code of B.C. (FPCBC) scenario;
(2) Minimum Protection community scenario;
(3) Moderate Protection scenario;
(4) Enhanced Moderate Protection scenario; and
(5) Maximum Protection community scenario.

The "minimum protection" scenario is based on the smallest riparian buffer width identified from the archives, and the "maximum protection" scenario is the largest buffer width identified during the

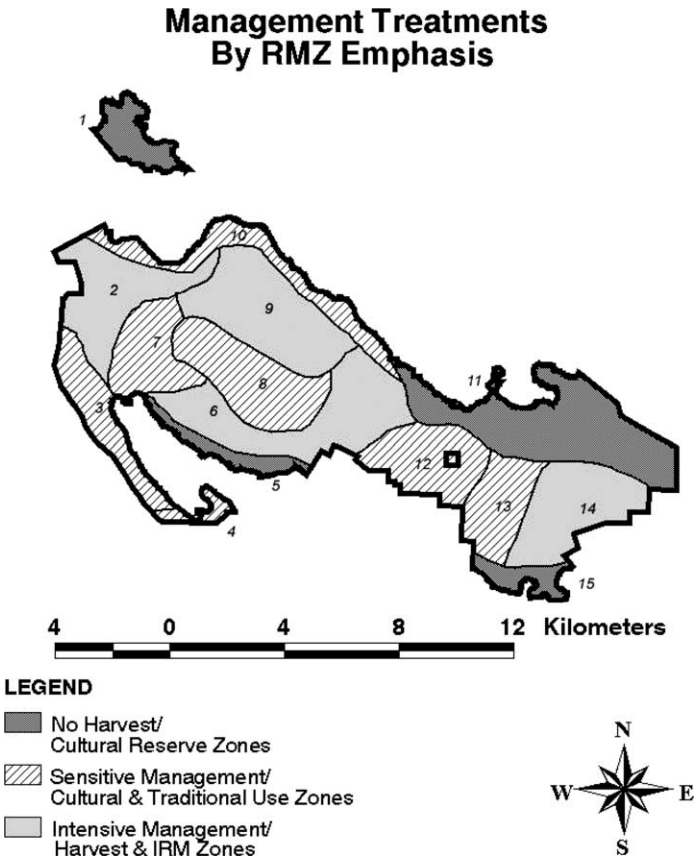

Fig. 2. Resource management zone emphases and treatments based on Tl'azt'en spatial criteria applied to the John Prince Research Forest.

Table 2
Description of resource management zones and emphases

RMZ #	RMZ theme	Criterion emphasis	Treatment
1	Cultural reserve zone	Community	No harvest
2	Harvest zone—west	Employment/economic development (forest operations)	Intensive management
3	Traditional use zone	Wildlife	Sensitive management (selection cutting)
4	Traditional use zone	Trees and plants	Sensitive management (selection cutting)
5	Cultural reserve zone	Economic development (tourism)	No harvest
6	Harvest zone—central	Employment/economic development (forest operations)	Intensive management
7	Traditional use zone	Wildlife/fish	Sensitive management (selection cutting)
8	Traditional use zone	Wildlife	Sensitive management (selection cutting)
9	IRM zone	Wildlife/trees and plants (restoration)	Intensive management/sensitive management (selection cutting)
10	Cultural zone	Economic development (recreation)	Sensitive management (selection cutting)
11	Cultural reserve zone	Community	No harvest
12	Cultural zone	Economic development (tourism)	Sensitive management (selection cutting)
13	Traditional use zone	Wildlife	Sensitive management (selection cutting)
14	Harvest zone—east	Economic development (forest operations)	Intensive management
15	Cultural reserve zone	Economic development (recreation)	No harvest

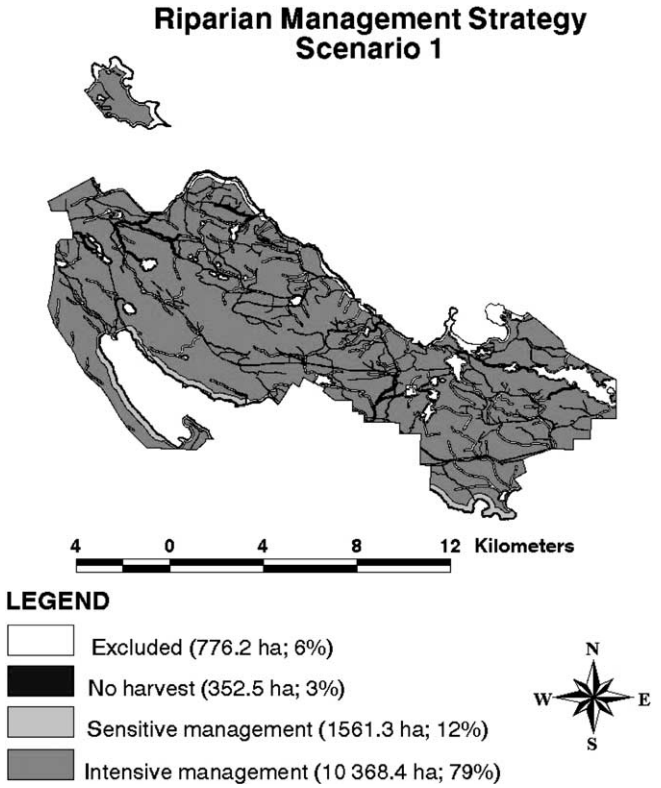

Fig. 3. A riparian management strategy based on the Forest Practices Code of BC Riparian Area Management Guidelines (MOF, 1995).

field excursions. The remaining three scenarios were generated by the investigators as possible alternatives.

7. Discussion

7.1. Generic criteria versus community criteria

The Tl'azt'en criteria show that at the local-level, forest values take on a culturally unique meaning when they are used to describe a First Nation's perspective on sustainable forest management. If criteria represent a set of values that define the essential elements for good forest stewardship, then implementing those criteria on a particular land base requires a familiarity with those values, why they are relevant, and where and how they are impacted.

It is important, therefore, to compare the Tl'azt'en results with generic landscape-level C&I frameworks. Some might argue against this comparison on the premise that the existing C&I templates are intended only for assessment, monitoring, and reporting (e.g. Prabhu et al., 1999). However, in the present study, criteria are used, not only for monitoring, but also for *implementing* sustainable forest management.

Currently, with some C&I frameworks, there is more emphasis and concern over methods of data collection and aggregation for reporting on sustainability, rather than interpreting this information (e.g. Working Group on Criteria and Indicators, 1997; Hall, 2000). In other words, little attention is paid to identifying "threshold" (the point at which an indicator has reached a desirable or acceptable state) levels of sustainability. This demonstrates a possible weakness in the top–down approach to developing and using these generic criteria.

Exploring and understanding thresholds is important for directing strategic-level planning. In a situation where achieving or maintaining a criterion on a managed landscape is problematic, it follows that

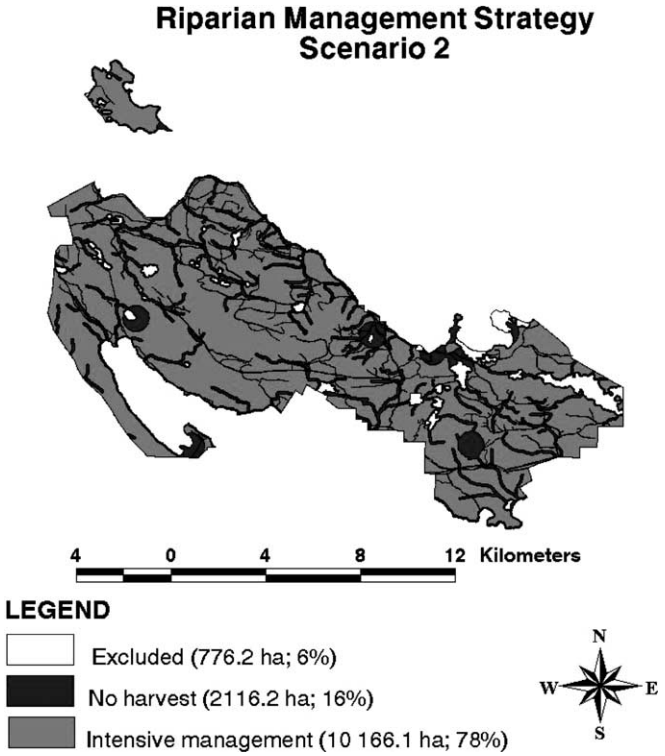

Fig. 4. A riparian management strategy representing the smallest buffer widths identified from the Tl'azt'en community.

management must adapt existing strategies, practices or objectives to ensure sustainability. Therefore, C&I play an important role in directing decisions, and keeping forest management plans "on track" with regard to sustainability.

Two sets of existing sustainable forest management criteria are examined. The first originates from the Canadian Council of Forest Ministers' national level C&I (CCFM, 1995). The CCFM C&I are broad by design, and are used to guide the identification of local-level indicators for Canada's Model Forests (e.g. McClain, 1998). The second set of criteria is from a United States Forest Service initiative called the Land Unit Criteria and Indicators Development (LUCID) Project (LUCID, 2001). This project is conducting six test cases to refine local-level C&I to link sustainability measures with national C&I, and to implement them nationwide (LUCID, 2001).

Table 3 shows these two sets of generic criteria and the Tl'azt'en criteria, arranged such that the categories are matched as closely as possible. It is apparent that the levels of detail differ between them. For instance, the existing frameworks use "inclusive terminology" such as "function", "diversity", and "values" which provide limited guidance to forest managers and land use planners (Wilson et al., 1996; Holling et al., 1998; Lautenschlager et al., 2000).

To be effective for planning, these criteria need further interpretation at the landscape-level. This means a more specific examination of forest values (Lautenschlager et al., 2000), resulting in another level of criteria developed from the bottom-up. For example, in the LUCID framework, criteria 2.5 (population function) and 2.6 (population structure) need to be further qualified by identifying locally important wildlife, fish, and plant species which then become landscape-level criteria measured using indicators of health, abundance, and habitat. In contrast, the Tl'azt'en wildlife, fish, and trees/plants criteria were based on culturally important species. In other planning contexts, locally and regionally endangered or

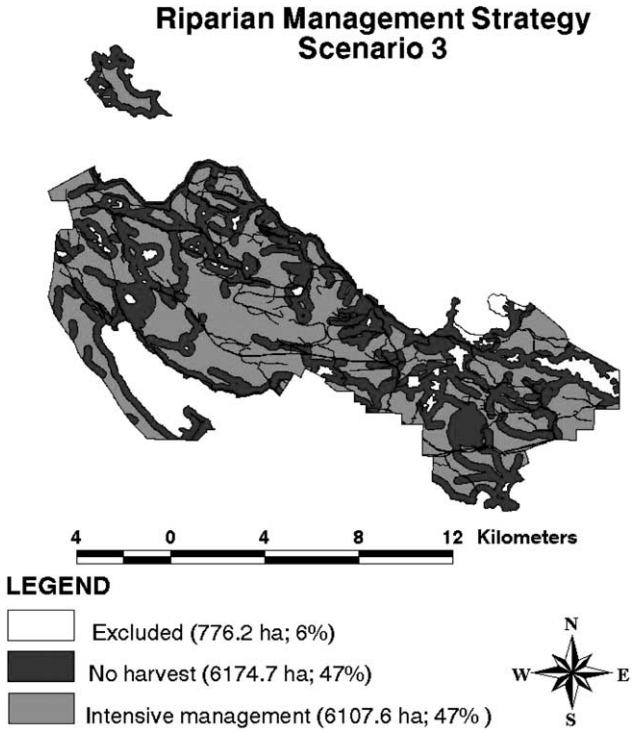

Fig. 5. A moderate riparian management strategy.

threatened species could also form these criteria (e.g. Lautenschlager et al., 2000).

Another characteristic of community-defined criteria is their close relationship to each other. Local criteria are not mutually exclusive, and although the CCFM and LUCID frameworks acknowledge this fact, the connections become extremely apparent in a local Aboriginal context. There is such a strong interdependence between Tl'azt'en criteria, that at times it presented difficulties for grouping them into themes. For example, in order to implement traditional management approaches in the future, opportunities must be available for traditional education and for an active bush economy. These opportunities require the maintenance of wildlife, fish, and plant populations, and contribute to overall community well-being and self-sufficiency.

Community-defined criteria also encompass unique interpretations of how forest management affects local values. For example, the Tl'azt'en criterion 4.7 (climate) is not the same as CCFM's criteria 4.1 (contributions to global carbon budget) or 4.3 (forest sector CO_2 conversion). Instead, local climate concerns expressed by some Tl'azt'en members relate to either the direct relationship between timber harvest block size and wind intensity, or the impact of global climate change on the local ecosystem.

Other criteria relating to production, yield, capital, and trade found in the CCFM and LUCID frameworks are not found in the Tl'azt'en criteria. This is because community members did not express yield and production of timber resources as a major concern. Although labor intensive silvicultural treatments are implemented and encouraged by community members, their main objective is to generate local employment, rather than to improve timber yield. Improving yield and production of natural resources that contribute to the bush economy could fit into this category, but community members did not exhibit a desire to increase the yield of traditional plants and wildlife through management. Instead, elders emphasized imposing harvest limits through traditional land ethics.

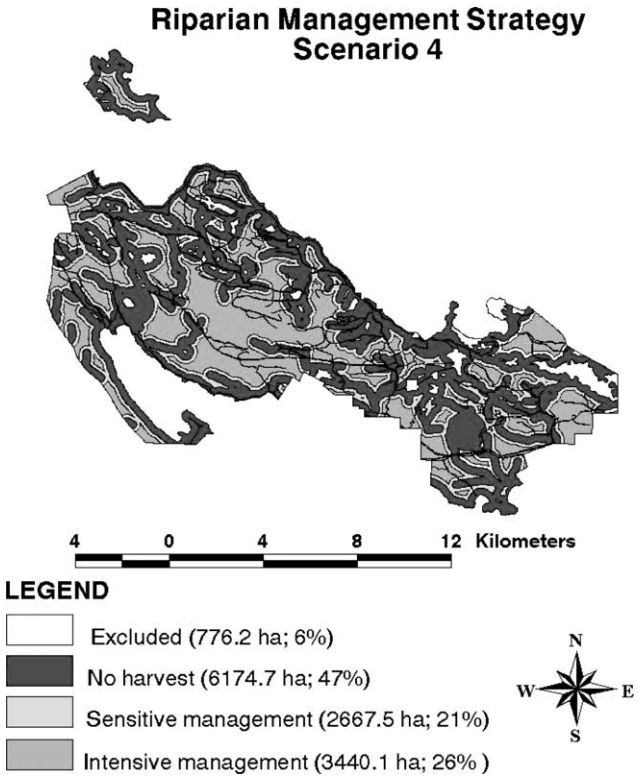

Fig. 6. A moderate riparian management strategy enhanced by an additional sensitive management zone.

Finally, community-defined criteria can bridge the gap between ground-level activities and processes, and higher-level planning and monitoring initiatives. As Westley (1995) suggested, adaptive management systems must be able to incorporate new knowledge and types of information in order to implement plans and to effectively respond to change. Locally-defined C&I, that are communicated in appropriate terms and sufficient level of detail, may facilitate bottom–up information exchange between Aboriginal land users (e.g. keyoh-holders) and forest managers. Through this interaction, the land users could also contribute to generating baselines for acceptable criteria thresholds, and provide an effective mechanism for monitoring ecological change.

7.2. Criteria similarities

Some of the criteria in Table 3 suggest that there are elements of sustainability that are truly generic, crossing natural, cultural, and hierarchical boundaries. For instance, the importance of public involvement, particularly Aboriginal involvement, in decision-making is inherent in all three frameworks, as are the notions of intergenerational equity and information sharing. This implies that such values are currently the greatest barrier to sustainability and require attention at all management levels.

7.3. Place management versus resource management

Viewing the forest landscape as a “place” is important for management because identifying place-specific values has technical implications for planning and implementing sustainability at strategic and operational levels. Place is not only associated with physical evidence of human use or personal attachment (e.g. Eisenhauer et al., 2000), but is also associated with key components of the ecosystem (riparian areas)

Table 3
Comparison of generic criteria with Tl'azt'en criteria

National criteria (CCFM, 1995)		LUCID principles and criteria (LUCID, 2001)		Tl'azt'en criteria	
Criteria	Critical elements	Principles	Criteria	Themes	Sub-themes
1. Conservation of biological diversity	Ecosystem diversity	P2. Maintenance of ecosystem integrity	C.2.1. Landscape function	4. Resource and environmental concerns	4.1. Wildlife (health, abundance, habitat)
	Species diversity		C.2.2. Landscape structure		4.2. Fish (health, abundance, habitat)
	Genetic diversity		C.2.3. Ecosystem function		4.3. Trees & plants (abundance, habitat)
			C.2.4. Ecosystem structure		4.4. Forest health (pests)
			C.2.5. Population function		4.5. Water quality
			C.2.6. Population structure		4.6. Soil
			C.2.7. Genetic function		4.7. Climate
			C.2.8. Genetic structure		
2. Maintenance and enhancement of forest ecosystem condition and productivity	2.1. Incidence of disturbance and stress				
	2.2. Ecosystem resilience				
	2.3. Extant biomass				
3. Conservation of soil and water resources	3.1. Physical environmental factors				
	3.2. Policy and protection				
4. Forest ecosystem contributions to global ecological cycles	4.1. Contribution to global carbon budget				
	4.2. Forest land conversion				
	4.3. Forest sector CO_2 conversion				
	4.4. Forest sector policy factors				
	4.5. Contribution to hydrological cycles				
5. Multiple benefits to society	5.1. Productive capacity	P3. Yield and production of goods and services	C3.1. Wealth and capital accumulation	None identified	
	5.2. Competitiveness of resource industries		C3.2. Production and consumption considerations		
	5.3. Contribution to the national economy		C3.3. Trade and distribution considerations		
	5.4. Non-timber values	P1. Social values related to the forest are maintained	C1.1. Spiritual and cultural values	1. Human factors	1.1. Education
			C1.2. Aesthetic values		1.2. Community
			C1.3. Recreational values		1.3. Employment
			C1.4. Access		
			C1.7. Gathering (non-economic) forest values		
				2. Economics	2.1. Economic development
					2.2. Bush economy
6. Accepting society's responsibility for sustainable development	6.1. Aboriginal and treaty rights	P1. Social values related to the forest are maintained	C1.5. Involvement values	3. Land management	3.1. Current management
	6.2. Participation of aboriginal communities in sustainable development				3.2. Traditional management
	6.3. Sustainability of forest communities				3.3. Alternative management
	6.4. Fair and effective decision-making				3.4. Communication
	6.5. Informed decision-making				3.5. Legacy
					3.6. Knowledge & research

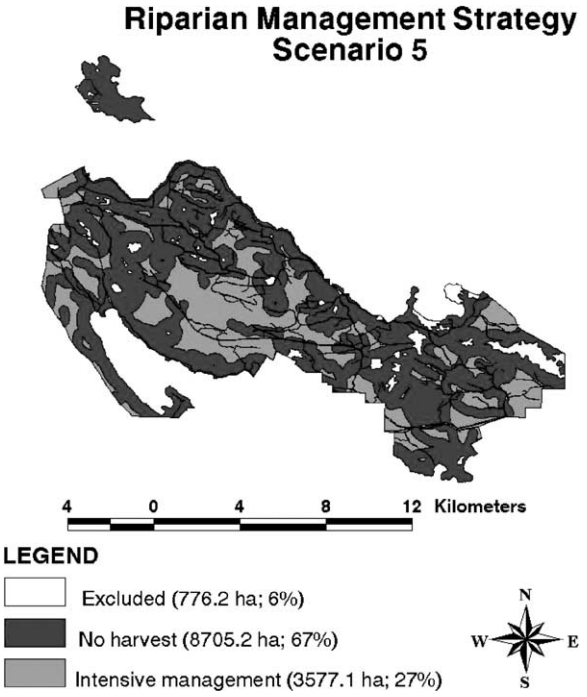

Fig. 7. A riparian management strategy representing the maximum buffer width identified from the Tl'azt'en community.

that contribute to its function. Spatial criteria ensure that these place-values are adequately addressed in forest management plans. The Tl'azt'en scenarios in particular reveal that the Tl'azt'en perspective of good riparian management is significantly different from the approach that is currently legislated and implemented in the region.

8. Conclusion

Involving Aboriginal communities in forest management decision-making is a necessity—not an option (Sherry and Johnson, 1999). To do so effectively, a culture of collaboration, trust, and transparency must be developed (Karjala, 2001). The number of resource management and business arrangements between First Nation communities and government, non-governmental organizations, and industry in Canada are increasing in number and scope (e.g. Sherry, 1999; Treseder and Krogman, 1999; Karjala, 2001) and may reflect the future of forest management planning on traditional lands. Developing appropriate planning processes and protocols that promote cross-cultural understanding are essential to the success and longevity of these partnerships.

Current processes that are used to engage public participation may benefit from delineating between the values of western and Aboriginal societies. Through, the use of criteria and indicators and a scenario planning approach, this research reveals the breadth and complexity of the Aboriginal perspective on sustainable forest management. While generic C&I frameworks facilitate general comparisons on progress toward forest sustainability between nation states, additional local information, particularly spatial information, is needed to bridge the gap between these and local definitions of good forest stewardship.

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