Perspectives

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Ecosystem-based management: Its application to forest management in British Columbia

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Abstract

Ecosystem-based management (EBM) has emerged as a means of moving towards sustainable forest management, although its application in British Columbia is limited. One recent example is a high-profile initiative on the Central/North Coast to protect the globally significant temperate rain forest. This paper examines the relationship between sustainable forest management and EBM in the province, and discusses how EBM might be applied to further progress towards sustainability.

KEYWORDS: *ecosystem-based management, forest tenure, strategic planning, sustainability.*

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Introduction

Over the last 35 years, the forest sector has seen an evolution in its approach to planning and land-base management. Forestry activities have progressed from an emphasis on sustained yield (i.e., sustaining timber production) to:

1. multiple land use – an attempt to manage for all resources on every hectare;
2. integrated resource management – the integration of management of all resources over a large land base;
3. sustainable forest management; and, most recently,
4. ecosystem-based management.

Each step in this progression was built on an increased knowledge of ecosystems, changing public values, and the need to meet society's socio-economic goals. In this paper, I examine the relationship between sustainable forest management and ecosystem-based management in British Columbia, and discuss how ecosystem-based management might be applied to further our progress towards sustainability.

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Definitions

Sustainable Forest Management

Currently, the common term and concept applied to the management of Canada's forests is sustainable forest management (SFM), which is defined as:

> *Management to maintain and enhance long term health of forest ecosystems, while providing ecological, economic, social and cultural opportunities for the benefit of present and future generations.* (Natural Resources Canada 2006)

Ecosystem-based Management

The concept of ecosystem-based management (EBM) has been around for decades in the scientific literature. It has received increasing attention in the last 10 years in relation to loss of biodiversity, concerns over resource management practices, and other related issues (Coast Information Team 2004).

The environmental community and many ecologically focussed scientists promote EBM under numerous definitions. The Coast Information Team (CIT) reviewed these and arrived at the following definition for application to the Central/North Coast of British Columbia:

> *An adaptive approach to managing human activities that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities.* (Coast Information Team 2004:12)

The intent here is to: ". . . maintain those spatial and temporal characteristics of ecosystems such that component species and ecological processes can be sustained and human well-being supported and improved" (Coast Information Team 2004:12); that is, to maintain ecosystem services (or ecological integrity[1]) across a large area to provide the habitats and forest-related products and services that will support communities (human well-being) over the long term. When ecological integrity is not maintained, human well-being will be negatively affected (World Resources Institute 2005). If we are to realize the full potential of both components over the long term, then resource management must integrate ecological integrity and human well-being. Although the Central/North Coast initiative views human well-being and ecological integrity as equals, the latter is given primary consideration.

The Ecological Society of America (1996) outlined eight principles for ecosystem management:

1. Intergenerational sustainability
2. Establish measurable goals

[1] In the United States, the National Parks Service (2006) defines ecological integrity as:

> *a concept that expresses the degree to which the physical, chemical, and biological components (including composition, structure, and process) of an ecosystem and their relationships are present, functioning, and capable of self-renewal. Ecological integrity implies the presence of appropriate species, populations and communities and the occurrence of ecological processes at appropriate rates and scales as well as the environmental conditions that support these taxa and processes.*

3. Use sound ecological models and understanding
4. Recognize complexity and connectedness of ecosystems
5. Recognize the dynamic character of ecosystems
6. Management depends on context and scale
7. Humans are part of ecosystems
8. Adaptability and accountability requires research and monitoring

To successfully achieve its desired objectives, EBM must include these principles.

Aboriginal Forestry

First Nations are beginning to take a larger role in influencing resource management, with Aboriginal forestry gaining prominence in British Columbia and Canada. Aboriginal forestry is defined as:

> *. . . sustainable forest land use practices that incorporate the cultural protocols of the past with interactions between the forest ecosystem and today's Aboriginal people for generations unborn.* (Parsons and Prest 2003:779)

I don't pretend to fully understand the First Nations culture as it relates to land protection and management—I'm still on a very steep learning curve. However, what I have learned is that First Nations look at the land in a holistic manner in which it is critical to recognize the interconnections of land, water, air, plants, animals, fish, and humans (Arquette *et al.* 2004; McGregor 2004). Their view sees each component as dependent upon the other; changes to one will necessarily affect another. If a change is too significant, it will disrupt the ability of the others to provide the services originally intended. This view is consistent with the concept of EBM in that integrating ecological integrity and human well-being requires some risk, but the magnitude of these risks cannot prevent any required recovery. Under EBM, ecosystem integrity is paramount in providing the services we have learned to expect from the land. Consequently, this view is consistent with that of First Nations culture relative to land, water, and air. If we disrupt ecosystem integrity to the point where the provision of ecosystem services is impossible, then we will be unable to realize our objectives related to human well-being. It appears to me that the application of EBM has an added potential to address many of the issues before us in building positive working relationships with First Nations.

Sustainable Forest Management in British Columbia

The government of British Columbia is committed to sustainability in one of the five "great goals" identified by the Premier (Government of British Columbia 2006a):

> *Lead the world in sustainable environmental management, with the best air and water quality, and the best fisheries management, bar none.*

The Ministry of Forests and Range supports this view, stating that:

> *British Columbia is managing provincial forests for a range of values, including long-term environmental conservation, stable communities, and the production of high-quality forest products for customers around the globe.* (B.C. Ministry of Forests 2003)

Sustainable forest management is the concept that currently drives legislation, regulation, policy, and practices in British Columbia; it is the cornerstone of the Chief Forester's vision for forestry in the province:

> *British Columbia is widely respected as a leader in the management of natural forest and range landscapes to maintain diverse values and provide an array of products that are valued in the marketplace.* (B.C. Ministry of Forests and Range 2006)

Long-term environmental conservation requires the protection of ecosystem services. If one accepts the view that ecosystems are a mainstay of our future and that there are limitations to their resilience, then we must address ecological integrity. A great debate surrounds the sustainability of ecosystem processes. For example, the CIT (2004) identified these two major questions:

1. What constitutes sustaining ecosystems?
2. What levels of species and processes (and by what means) will allow persistence of ecosystem integrity that in turn will support social and economic systems?

These are difficult questions. A wide range of views and some research data will support either position. However, in the review of land-use plans[2] and criteria and indicators for third-party certification,[3] it is clear that the public wants resource managers and extractors

[2] See, for example, the Integrated Land Management Bureau Web site: *http://ilmbwww.gov.bc.ca/lup/*

[3] See, for example, Canadian Standards Association (2002), Canadian Council of Forest Ministers (2003), Forest Stewardship Council (2004), and Sustainable Forestry Initiative (2004).

to maintain ecosystems for the provision of the desired services and protection of public values.

The original intent of SFM was to integrate ecological, social, and economic values; however, this integration has not been done well in British Columbia. For SFM to be effective, a forest management strategy, including goals, indicators, and performance measures, is critical and must become the basis for policy and operational decisions. If a strategy is in place, then the forest sector will have clear guidance on where to lay its emphasis in strategic, tactical, and operational decisions. Unfortunately, such a strategy does not currently exist; the primary objective remains the maximization of timber extraction at minimum cost while protecting environmental values.

Our current approach to SFM does not ensure sustainability. Although we may be moving towards it, we are unable to adequately demonstrate our progress. Numerous regulations and policies limit ecosystem protection to a specified level of impact on the timber harvesting land base.

Adoption of Ecosystem-based Management in British Columbia

British Columbia's natural resource management sector is divided on whether EBM should be adopted. Mention an option of bringing EBM into the main stream of planning, legislation, regulation, or policy and it either conveys a sense of fear in politicians, resource managers, and extractors, or euphoria to those in the environmental community. As in most cases where special interests are involved, neither the fear nor the euphoria is justified. However, one could argue that EBM, as a means of delivering SFM, is part of SFM and not a separate approach (Bourgeois 2003a).

In British Columbia, these views are based on experiences commonly associated with the Central/North Coast, which was the centre of an environmental campaign that initiated a prolonged planning process. This process resulted in the setting aside of large areas for parks and conservancy areas, and a focus on ecosystems at the expense of socio-economics (i.e., an expectation of a significant reduction in timber harvesting opportunities). Some consider it critical to restrict EBM to the Central/North Coast area. Others view this process as a first step in moving towards sustainability in the rest of the province.

The adoption of EBM is a social choice, and as such it is unlikely we can achieve the ideal balance between ecological integrity and human well-being. Making this choice requires an assessment of the risks deemed acceptable to both ecosystems and human well-being. Depending on the situation, these risks will vary; however, a conceptual level exists below which it is unacceptable to go. You cannot "trash" the ecosystem for the benefit of short-term human well-being, just as you cannot be so precautionary that human well-being is "trashed."

The general adoption of EBM will not entail all the targets and processes applied on the Central/North Coast. This is an area of global significance relative to the remaining natural coastal temperate forests, and therefore many feel that the greater level of precaution and focus on ecology is justified. If we think of British Columbia as the planning unit, then there will be locations where EBM will result in a social choice to take higher ecological risks so that targets for overall human well-being are achieved; locations also exist where the reverse is desired. A similar approach to planning at various scales was proposed by Lautenschlager (2006). If protected areas, conservation areas, and regional land and resource management plans receive a broad review, then the stakeholders involved have essentially provided planning direction from either a socio-economic or ecological perspective. Consequently, guidance exists on where to emphasize recreation and tourism (e.g., Whistler corridor), ecological protection (e.g., Central/North Coast, Muskwa-Kechika), and economic development (e.g., northeastern British Columbia, northern Vancouver Island). Within each of these areas, EBM principles could be applied in different ways that reflect the opinions shared during the review process. It is noted that First Nations were not involved in the

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Some of the current instruments that are expected to deliver on SFM (or potentially EBM) include:

- Acts (e.g., *Forest Act*, *Forest and Range Practices Act*, *Wildlife Act*, *Parks Act*, *Species at Risk Act*, *Federal Fisheries Act*, etc.);
- tenure arrangements (e.g., Tree Farm Licenses, Forest Licenses, Community Forests, Woodlot Licenses, Innovative Forestry Practices Agreements, and pilot projects);
- Timber Supply Reviews (TSRs);
- government programs (e.g., Forests for Tomorrow, Future Forest Ecosystems Initiative, Mountain Pine Beetle Action Plan, etc.);
- land-use plans (Land and Resource Management Plans [LRMPs], Sustainable Resource Management Plans [SRMPs], Regional Land Use Plans [RLUPs]); and
- third-party forest certification.

In all these instances, the focus is currently on timber, with the protection of non-timber resources viewed as constraints on the wood supply. The application of regulations and policy cannot adversely affect the timber supply beyond a stated level.[4] This is a continuation of previous political decisions under the Forest Practices Code, where the effects of maintaining non-timber resources were not to exceed 6% of the allowable annual cut. The primary reason for this constraint was to recognize the short-term socio-economic impacts of these decisions. When thinking short term this rationale is sound, but over the long term it may not be the best strategy, especially given the requirement to maintain ecological integrity. I am not saying that current practices will threaten ecological integrity; however, we must undertake modelling on each management unit to determine whether sufficient precautions have been taken. Consequently, we cannot demonstrate ecological integrity has been protected with the application of the 6% cap.

The principle behind EBM is that you first focus on the maintenance of ecosystem integrity, and then integrate this with human well-being. Under this scenario, the amount of timber available for harvesting becomes an output of planning, not an input as is currently the case with provincial forest management. A move toward EBM would require an updating of the legislative, policy, and program instruments to reflect this change in focus.

A major issue in achieving SFM through EBM is the tenure system. Over 75% of the province's Crown land is under volume-based tenures, for which the Ministry of Forests and Range has management responsibility. As the requirements on these lands are not area-based, licensees have no incentive to practice true SFM or EBM (Bourgeois 2003b). One could argue that the Timber Supply Areas on which allowable annual cuts are determined could meet an area-specific requirement under EBM. However, current practices on these lands do not meet SFM or EBM requirements. A more thorough discussion on tenure is beyond the scope of this paper; however, a shift to area-based management is critical to the delivery of EBM and SFM.

Implementing Ecosystem-based Management under the Current System

Although timber is the driving force behind forest management in British Columbia, some EBM components exist within the current system (e.g., biodiversity guidebooks, riparian management guidelines, protected areas, old-growth management areas, and wildlife habitat area management). Therefore, we are not starting from "square one" in the delivery of EBM in the province. Some examples follow.

Land-use Planning

British Columbia has been a world leader in bringing stakeholder values and interests to the land-use planning table. The province's planning system for resource management and extraction includes:

- broad strategic-level planning (e.g., RLUPs, LRMPs, and SRMPs); and
- operational planning (e.g., Forest Stewardship Plans, oil and gas exploration plans, etc.).

These processes involve interest-based negotiations among stakeholders directly affected by land-use decisions to produce plans that reflect an integration of their values and interests. To date, First Nations have not materially participated in these processes due to concerns related to treaty negotiations. Therefore, First Nations'

[4] See, for example, the *Forest and Range Practices Act* (SBC 2002, Chapter 69): *http://www.for.gov.bc.ca/tasb/legsregs/frpa/frpa/frpatoc.htm*

interests and values may not be incorporated into these plans. This is a major deficiency and must be reconciled.

Generally, land-use plans identify:

- zones for resource management and extraction,
- zones for non-timber resource management,
- zones for conservation,
- general conditions associated with activities in each of these zones, and
- management refinements (i.e., SRMPs).

The land-use zones produced through these planning processes might offer a starting point in the development of human well-being objectives and the identification of ecological areas of concern. These zones reflect a broad level of socio-economic activity for an agreed-upon option. However, if we are to achieve long-term sustainability, these broad zones and conditions will need refinement. We have learned from the recent mountain pine beetle infestation that all good planning can be confounded by agents outside local or provincial control (e.g., climate change). This catastrophe has caused us to think about modifying our land activities to create resiliency in both ecosystems and communities.

Broad, strategic-level planning focusses on the creation of zones and does not project any activities over time and space. In addition, operational planning focusses on site-specific situations, and possibly landscape-level cases (e.g., Forest Stewardship Plans, oil and gas exploration plans, etc.), but it also does not project the results of the activities to identify the spatial and temporal characteristics of the forest stands. In both instances, an assumption is made that we will achieve sustainability if we address the management requirements in each of the zones, and if we use the constraints identified in policies and guidelines associated with ecological integrity. This is quite an assumption and has many opportunities for failure.

In the 1990s, a planning level was discussed called the Sustainable Forest Management Plan (SFMP). These strategic plans were to be both spatially and temporally explicit—they would be developed through the use of scenarios to achieve a set of desired forest conditions both over time (e.g., 100–200 years) and space (Peterson 1999). Scenario planning allows resource managers to demonstrate how targets for ecological integrity and human well-being could be achieved under a particular set of management actions and provides guidance on the development of operational plans (e.g., Forest Stewardship Plans).

However, this level of planning was discounted by the forest industry when the *Forest and Range Practices Act* was developed. Only one level of planning (i.e., Forest Stewardship Plans) was desired; additional costs were expected to be associated with more levels of planning. Government reluctantly accepted this position but, for those who wished to undertake such planning, included the expense of SFMP development as eligible for Forest Investment Account funding (Government of British Columbia 2006b). To date, only a few companies have undertaken versions of this SFMP approach, even though it is considered a critical aspect of a forest manager's education in our university forestry programs (i.e., the production of such a plan is a requirement for forest management graduates).

Environmental non-government organizations (ENGOs) have also discounted SFMPs. Many consider these plans as too logging-oriented. However, this stance is short-sighted, and actually supports those companies who are reluctant to enter into this level of planning. Currently, in the Central/North Coast planning process, ENGOs have supported strategic-level planning for the implementation of EBM called "spatially and temporally explicit strategic level planning." This is essentially an SFMP, but with the emphasis on EBM.

We have the processes and modelling capability to develop spatially and temporally explicit strategic plans. The plans involve identifying the ecological and human well-being objectives and targets, building scenarios relative to achieving the ecological objectives, and evaluating the outcomes relative to meeting the human well-being objectives. Iterative scenarios are developed and social choices are made about when the objectives will be achieved and the transition plan to achieve them. In some instances, a higher level of ecological risk will be accepted in the transition plan in order to move closer to the desired short-term objectives for human well-being. Although we must keep the long-term focus front and centre, in the short term we must also recognize that issues will require resolution to achieve the desired short- and long-term sustainability goals. The product is an agreed-upon scenario that will guide operational planning and serve as the basis for monitoring progress in achieving identified targets and objectives.

We have the technology and funding mechanisms in place that would allow us to use EBM. We know how to do it. All we need is the will to work collaboratively

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Maintaining Ecological Integrity

The current approach to SFM in British Columbia, and the proposed addition of EBM, requires science to inform the decisions. This does not mean that "science rules." Social choices are required about where risks should be taken (e.g., how much area should be protected); however, these decisions should be informed by science.

The application of EBM begins by pinpointing what is needed to maintain ecological integrity. The protection of representative ecosystems is the first step. This is currently done through the identification of protected areas, which are expected to contribute to the biodiversity conservation component of ecological integrity. The selection of protected areas or, more recently, conservation areas, has not always been done with the maintenance of ecological integrity in mind. Frequently, a negotiation takes place between stakeholders and government concerning "my favourite area"; sometimes ecology and biogeography play a role. Given that compromises are involved in arriving at a network of protected areas to meet a wide range of social values, it is probably the best that can be done. However, we must recognize that, to fully capture the ecological integrity of the region, other areas may be required with additional constraints on resource management and extraction. Old-growth management areas are intended to assist in meeting this objective.

Over the last decade, the Range of Natural Variability (RONV) has been used as a measure of the disturbance that can be accepted while still maintaining ecological integrity. Although most conservationists favour the use of RONV, this approach has proven difficult to apply in practical terms. In many cases, especially in coastal ecosystems, RONV does not address the human well-being component of EBM or reflect climate change implications. If it is employed, then it should be used as a principle (not a "rule") in spatially and temporally explicit strategic planning to inform social choices.

Traditionally, conserving ecosystems and biodiversity was imposed through constraints on resource management and extraction. In British Columbia, these constraints currently take the form of:

- legal requirements (e.g., riparian management in the *Forest and Range Practices Act*, species at risk habitat in *Species at Risk Act*, and fish habitat protection in the federal *Fisheries Act*);
- regulation, policy, and guidelines on topics such as biodiversity conservation, wildlife tree patch retention, old-growth management area requirements, coarse woody debris requirements, seral stage distribution, and soil disturbance; and
- third-party certification indicators, targets, and thresholds (Canadian Standards Association 2002; Canadian Council of Forest Ministers 2003; Forest Stewardship Council 2004; Sustainable Forestry Initiative 2004).

Several of these legal, policy, and guideline requirements impose limits on the effect they can have on available timber supplies. This does not fit well with the concept of EBM, where the amount of timber available for harvesting should be an output of the planning and social choice decisions informed by the need to maintain ecological integrity.

Human Well-being

The CIT (2004) recognized that the maintenance of ecological integrity is a fundamental requirement to support and improve the human well-being of coastal communities, where human well-being:

> *. . . is a condition in which all members of society are able to determine and meet their needs and have a large range of choices and opportunities to fulfill their potential.* (Coast Information Team 2004:5)

The CIT struggled with the human well-being component of EBM and the result was less than satisfactory in the Central/North Coast initiative. To

date, the only standards proposed are those through government-to-government protocols and a recent EBM Working Group report (Rubus EcoScience Alliance 2007), all of which relate to trends that will be measured over years. This does not help those who must make social decisions now related EBM.

In British Columbia, "human well-being" is primarily associated with an economic component (i.e., usually employment and population; Morford 2007), although it is intended to reflect the range of social, cultural, and economic conditions necessary to guide social choice decisions. The broader range of human well-being indicators, beyond timber availability, has only recently received attention in the province (Morford 2007; Rubus EcoScience Alliance 2007), but with a continued focus on trends as targets.

Two types of social choices are present in a land-use planning framework:

1. desired future community, and
2. short-term land use planning implications.

Each has its associated indicators, thresholds, and targets. For example, the long-term desired condition of communities includes other influences beyond those related to natural resource management. Considerations of economic diversification, level of education within the community, social services, and individual and community health, are also required. In the short term, social choices involving strategic decisions made during land-use planning can significantly influence the achievement of the community's desired future state. These choices require measures of the magnitude and rate of resource extraction, the protection of cultural values, and the maintenance of resource values and opportunities (e.g., tourism opportunities). It is the combination of these two types of choices that will guide the integration of ecological integrity and human well-being.

Many of the constraints related to ecological integrity (e.g., riparian protection, wildlife habitat areas) are limited so as not to jeopardize the timber supply. In addition, the Chief Forester's timber supply analyses include a limitation on declines in allowable annual cuts (i.e., not to exceed 10% per decade). These "blunt instruments" were useful when the focus was primarily on development and resource extraction; however, if we adopt the EBM concept, their continued relevance can be questioned. Rather than a controlling *input*, timber availability must be an *outcome* of a strategic land-use planning process that integrates ecological integrity and human well-being.

Because of our difficulty in arriving at a practical measure of human well-being, it is possible that its default measure will become timber availability. However, I think this default position avoids our essential responsibility in this matter. In British Columbia, we have generally included socio-economics into our land-use decisions as an afterthought. In the case of Clayoquot Sound, for instance, the government explicitly directed the Scientific Panel *not* to address socio-economics. Nevertheless, it is still a contentious issue after more than a decade. The actions of many conservationists suggest that the ecological integrity component in the Clayoquot Sound case was achieved through tough negotiations and campaigns and that they were not willing to address the human well-being component unless it was minor in scope. In terms of EBM, these types of positional-based negotiations are not productive because they create winners (e.g., ecological integrity) and losers (e.g., human well-being). The only way to effectively deliver on the intent of EBM in Clayoquot Sound, and throughout the province, will be to integrate the ecological integrity and human well-being components in interest-based negotiations.

In numerous debates and campaigns over protected areas and forest management in the northwestern United States and British Columbia, some have argued that people should not worry about job losses (i.e., human well-being) as these will be replaced with other sources of employment. However, in most cases, this has not occurred (e.g., Buttolph *et al*. 2006). This stance makes it easier for social decision-makers because they do not have to integrate ecological integrity *and* human well-being into a single decision. Instead, decisions related to the human well-being component were left to a later time and there was no (or limited) opportunity to balance its targets and thresholds with ecological integrity. In so doing, the public has not been given the option to design

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their future community. Although most communities cope with these decisions, the outcome is not consistent with the principles of EBM. Rather than address the issue after the decision, it should be dealt with during the decision-making process with the trade-offs or risks associated with human well-being discussed along with the requirements and risks associated with ecological integrity. For example: What protection will occur? Where will it occur? What form will the protection take? To what degree will areas be protected? and What land uses will occur between the protected areas?

As mentioned earlier, measures of human well-being have been difficult to develop, especially for short-term social choice decisions. We have tended to consult with professional economists for guidance on indicators, thresholds, and targets. This has not been very satisfying. I think we should use an interest-based questioning approach and go directly to the communities affected by the decisions. In terms of human well-being, I would ask: What do you want your community to look like in both the short and long term? This is equivalent to evaluations of what a desired resilient forest should contain, as the long-term goal, and of how this might assist in the development of the broader social, cultural, and economic components of human well-being. When we have this information, we can use the expertise of economists to identify the best measure for each of the objectives. This combination of top-down and bottom-up input is consistent with most successful case studies (Morford 2007). Developing community vision and goal statements, which include a human well-being component, would help to identify useful measures and to inform social choice decisions involving the integration of human well-being and ecological integrity. To date, these community vision and goal statements are not available in most British Columbia communities.

Building Ecosystem-based Management into Forest Management in British Columbia

The main difference between SFM and EBM in British Columbia is that SFM centres on the management of trees and timber as an input into decisions, while EBM centres on timber as an output of the management of ecosystems.

British Columbia could demonstrate that it is fulfilling its commitments to practicing SFM through the adoption of EBM. The following major actions must be taken for EBM to become a cornerstone of forest management in the province.

1. Government must take a lead by formally adopting EBM and defining how it will be applied across the province (i.e., not necessarily the Central/North Coast model, but a model consistent with EBM principles).
2. British Columbia's Chief Forester must identify the provincial goals, indicators, and performance measures associated with his vision and the adoption of EBM.
3. Government policy should be adjusted to recognize that timber availability is an outcome of spatially and temporally explicit strategic planning and not an input (control) to planning.
4. Government legislation, policy, and program management instruments should be updated, where necessary, to facilitate the implementation of EBM principles.
5. Government must either reform the tenure system or modify the existing system to require area-based management on a TSA or portions of a TSA.
6. Government, First Nations, industry, communities, and ENGOs must accept that the EBM process will continually improve through new data and knowledge, but that it must initially be built on existing instruments (e.g., LRMPs), not by starting from "square one."
7. First Nations' interests must be incorporated into existing Regional Land Use and Land and Resource Management Plans.
8. ENGOs must accept that the principles of EBM will be adopted, but that this does not mean the precautionary principle will be applied in all instances and that it will most likely involve the inclusion of a range of risks into social choices to meet short- and long-term targets for human well-being.

9. Communities must become engaged in the process by identifying realistic vision and goal statements to guide social decisions, especially relative to human well-being.
10. Government, First Nations, ENGOs, communities, and industry must commit to work collaboratively in the social decision making inherent in EBM, but with the common objective of integrating ecological integrity and human well-being over the long term.
11. Forest companies must develop spatially and temporally explicit strategic plans based on the land-use plans, ecological knowledge, and in collaboration with First Nations, communities, and stakeholders.
12. Forest companies must become forest managers rather than forest harvesters.

I am sure other actions are required. The critical aspect is the commitment and willingness to work collaboratively, using adaptive management, over a long time frame. Once this commitment is established, innovation and advancement will follow. Some may view these necessary actions as overwhelming and argue to retain the *status quo*. However, there are major implications of continuing along our current path. We have the responsibility to be innovative and apply what we know to move toward sustainability and avoid a crisis for future generations.

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Test Your Knowledge . . .

Ecosystem-based management: Its application to forest management in British Columbia

How well can you recall some of the main messages in the preceding Perspectives Paper? Test your knowledge by answering the following questions. Answers are at the bottom of the page.

1. Is the concept of ecosystem-based management:
   A) A stand-alone concept that is different from sustainable forest management
   B) A means of delivering sustainable forest management

2. Adopting ecosystem-based management in British Columbia means:
   A) Applying the Central/North Coast model throughout the province
   B) Timber availability is an output of planning
   C) Entirely new policies and practices are required

3. Adopting ecosystem-based management requires:
   A) Accepting that ecological integrity overrides human well-being
   B) Applying consistent levels of risk to ecological integrity across British Columbia
   C) Accepting varying degrees of risk in integrating ecological integrity and human well-being as a social choice

4. Application of ecosystem-based management principles requires:
   A) Utilizing existing land-use plans (i.e., RLUPs, LRMPs, and SRMPs)
   B) Developing spatially and temporally explicit strategic plans
   C) Developing a vision and goals for a defined management area
   D) Applying area-based management
   E) Modifying existing government policies

ANSWERS

1. B 2. B 3. C 4. All