



Background Report



Assessing Social and Economic Considerations in Ecosystem-Based Management for the North Coast LRMP

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This report was prepared by Diane Wilson, a graduate student in Simon Fraser University's School of Resource and Environmental Management, as background information for incorporating social and economic considerations into ecosystem-based management plans for the North Coast LRMP area. The information in this report was collected from a wide range of sources and was reviewed by faculty in the School of Resource and Environmental Management, and government staff for accuracy and completeness. The final product is presented as the professional judgement of the author and does not necessarily reflect the view of the Province.

Executive Summary

Humans and their social and economic systems are key (if sometimes problematic) components of the ecosystem management debate (Grumbine, 1994). While much of the ecosystem-based management literature is focused on achieving ecological integrity and maintaining (or restoring) ecosystem functions, understanding and accommodating societal values is integral to forming and implementing a successful, sustainable land and resource management plan.

Social and economic considerations in ecosystem-based management relate to two main themes: social wellbeing, and economic health. Social wellbeing refers to a community's social resiliency, capacity, quality of life, and empowerment with responsibility. Economic health refers to a community's level of self-reliance, economic resiliency, and equity. A community is economically healthy when it has a variety of sources of economic wealth which are all environmentally sound and financially viable, and where members are empowered to make decisions regarding their economic future, as well as the equitable distribution of related benefits and costs (Kline, 1997).

A framework to integrate social and economic considerations into an ecosystem-based management plan includes the following components:

1. Interaction with all stakeholders and decision makers to develop their awareness of the key components of (and relationships between) economic, social, and ecological systems;
2. Analysis of current levels of social wellbeing, economic health, and ecological integrity within communities and the management area;
3. Development of a set of strong social and economic goals which reflect the diverse values held by all stakeholders, and are directed toward social wellbeing, economic health, and ecological integrity;
4. Identification of discrepancies between the current social, economic, and ecological conditions, and the stakeholders' goals, and development of a plan to address these discrepancies;
5. Creation of social, economic, and ecological indicators to measure progress towards the goals and objectives; and,
6. Implementation, monitoring and adaptation of the management plan in an ongoing learning process.

These steps will help to ensure an ecosystem-based management plan that strives for social wellbeing and economic health while operating within safe ecosystem limits. Achieving an appropriate mix of these three factors will help to achieve a long-term, sustainable land and resource management plan for British Columbia's North Coast.

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1.0 Terms of Reference

The purpose of this report is to provide a framework for integrating social and economic considerations into ecosystem-based management principles and strategies associated with the North Coast LRMP process. It is designed to provide participants in this LRMP process with a working appreciation of the concepts, social and economic components, and challenges associated with integrating such dimensions into ecosystem-based management strategies within LRMPs.

This report includes the following main components:

1. Definitions of important terms and key social and economic considerations in ecosystem-based management.
2. A discussion of selected examples of recent leading initiatives to integrate social and economic considerations in ecosystem-based management plans in Canada and the United States.
3. A framework for integrating social and economic considerations with ecological components in ecosystem-based management strategies associated with the North Coast LRMP.
4. A summary of the risks, uncertainties and barriers involved in incorporating social and economic considerations in ecosystem-based management strategies.

2.0 Definitions

Several definitions and concepts are integral to understanding how social and economic considerations can be incorporated into ecosystem-based management. The following list describes several of the concepts and definitions, used to develop the social and economic framework proposed in this report.

1. Ecosystem-Based Management

The concept of ecosystem-based management refers to an holistic approach to natural resource planning at the ecosystem level. Ecosystem-based management considers humans as part of the ecosystem and strives to maintain ecological integrity within that system. Grumbine (1994, 1997) identified the following working definition:

Ecosystem management integrates scientific knowledge of ecological relationships within a complex socio-political and values framework toward the goal of protecting native ecosystem integrity over the long term.

LRMP participants in the Central Coast adopted the following definition for ecosystem-based management to guide their decision making (Prince Rupert Interagency Management Committee, 2001):

Ecosystem-based management refers to a strategic approach to managing human activities that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities.

While there is not full consensus on a complete definition of ecosystem-based management, most agree that the approach involves the following components (Slocombe, 1993; Grumbine, 1994; Yaffee, 1999): a deep understanding of ecological and social systems; full consideration of different spatial and temporal scales; ecologically derived boundaries and limits; adaptive management (continuously incorporating new information into a flexible resource management process) ; and, collaborative decision making.

2. Sustainable Development

Inherent in ecosystem-based management are concepts of sustainability and sustainable development. The World Commission on Environment and Development (1987) defined the term sustainable development as development which “meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainable economic development depends on sound environmental management (World Bank, 1985). McCormick (1999), states that sustainable development in ecosystem-based management integrates economic, environmental and social values at the planning level, distributes benefits equitably across socio-economic strata and gender, and ensures that opportunities for continuing development remain for future generations. Brown et al. (1987) suggest that sustainability involves several essential elements, including the continued support of human life on Earth; the long term maintenance of biological resources; stable human populations; and, environmental and ecosystem quality.

3. Social Sustainability

Social sustainability is the continued satisfaction of basic human needs, including food, water, and shelter, as well as higher-level social and cultural necessities such as security, freedom, education, employment, and recreation (Maslow, 1970; Brown et. al, 1987). While there are many descriptions of these needs, the British Columbia Round Table on the Environment and the Economy (1993) offers a useful perspective on the concept of social sustainability. It suggests that social sustainability is achieved when all members of the community are able to do the following: act as responsible citizens; achieve and maintain personal health (physical, mental, and psychological); feed themselves adequately; provide adequate and appropriate shelter for themselves; attain gainful and meaningful employment; improve their knowledge and understanding of the world around them; find opportunities to express their creativity and enjoy recreation; express a sense of identity through heritage, art, and culture; enjoy a sense of belonging; be assured of mutual social support from their community; enjoy freedom from discrimination; and move about a barrier-free community.

4. Sustainable Community

Sustainable communities are those which have four overriding characteristics. These are: economic security, ecological integrity, quality of life, and empowerment with responsibility (Kline, 1997). Hart (1995) views sustainable communities as those which “seek to maintain and improve the economic, environmental, and social characteristics of an area so its members can continue to lead healthy, productive, enjoyable lives”. Sustainable communities supporting ecosystem-based management work towards growth that can be supported by both the physical and social environments.

5. Community Capacity

Community capacity is an aggregate measure of the ability of residents to respond to external and internal pressures, to create their own and take advantage of new opportunities, and to meet the physical and social needs of all residents (Beckley and Burkoski, 1999; Kusel, 1996). Kusel (1996) suggests that community capacity is determined by the community’s physical and financial capital (including natural resources); human capital (including the skills, education and general abilities of the residents); and social capital (including the ability and willingness of residents to work together for community goals).

6. Social Indicators

Social indicators for ecosystem-based management are a set of measures that can be used to monitor, compare, and evaluate social conditions and responses to different management decisions over time (Force and Machlis, 1997). For example, a list of social indicators could include incidence of low income, unemployment rate, and levels of education attainment (Beckley and Burkoski, 1999).

3.0 The Role of Social and Economic Considerations

While there is a lack of full consensus on the meaning of ecosystem-based management, many definitions have included a human dimension (Grumbine, 1994, 1997). For example, McCormick (1999) sees it as an holistic approach to management which acknowledges humans, and the habitats of humanity, as being integral components of ecological systems. Yaffee (1999) believes that an ecosystem-based management approach fosters the development of diversified economic systems designed to avoid unsustainable boom and bust cycles.

Yaffee (1999) identifies “three faces” of ecosystem-based management, which he places along a continuum from an anthropocentric focus (emphasis on human systems) to a biocentric focus (emphasis on ecological systems), (Figure 1).

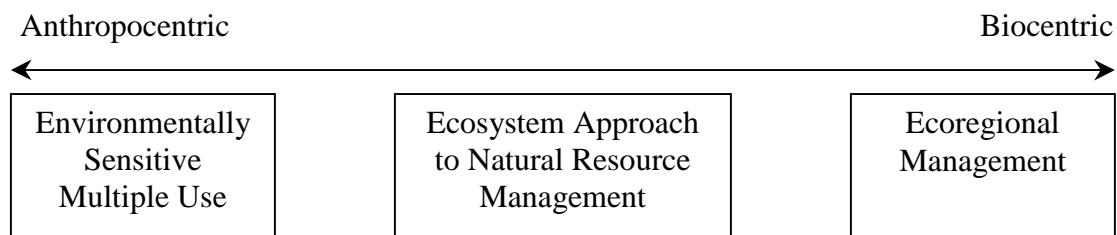


Figure 1: The three faces of ecosystem based management (Yaffee, 1999)

Anthropocentric ecosystem-based management (environmentally sensitive multiple use) regards human needs as equally important to ecological integrity. Goals for this form of management include human use and outputs, which are subject to environmental constraints. This view supports the idea that only when there are healthy communities and industries will humans begin to achieve ecological and environmental goals.

Biocentric management (ecoregional management) regards the maintenance (or restoration) of ecosystem integrity at the landscape-scale as the overarching goal of ecosystem-based management, while allowing human use on a sustainable scale. This view supports the notion that a healthy ecosystem is first required in order to support human communities.

Regardless of where one sits along Yaffee’s continuum, social and economic considerations must be included in an ecosystem-based management plan. Human communities are a part of ecosystems and depend heavily on the environment for their physical, economic, and social wellbeing. It is also important that decision-makers incorporate the socio-economic needs and political realities of local communities into land and resource management plans.

Holling and Meffe (1996) provide a useful definition of an ecosystem-based approach to management. It links ecological, social and economic considerations:

At its most fundamental level, an ecosystem approach maintains diversity as a means of building resilience against catastrophic events in biological, economic, organizational and political systems.

Humans need sustainable ecosystems to support local economies and communities. “We have not ventured too far down the path toward explaining how ecological variation affects community wellbeing or the implications of community variables for ecological wellbeing” (Beckley and Burkowski, 1999). It is important to recognize that strong communities and economies must protect ecosystems (USDA, 1999). Communities must understand their reliance upon healthy ecosystems for sustainable, high quality lives. Conversely, land and resource managers and planners must increase their understanding of those community economic and social needs that are necessary for sound ecosystem-based management.

3.1 Recent Initiatives to Integrate Social and Economic Components in Ecosystem-Based Management

Some of the most comprehensive examples of ecosystem-based management applications have been developed by the United States Department of Agriculture and the Canadian Model Forests network. In addition to the academic literature on ecosystem-based management, the framework recommended in this report for the North Coast was drawn from the following leading initiatives in which social and economic components were integrated into an ecosystem-based management plan.

1. U.S. Department of Agriculture: Forest Ecosystem Management Team (USDA, 1999)

One of the critical functions of the national forests and grasslands in the United States is to promote social and economic stability. The Forest Ecosystem Management Team (FEMAT) plays an important role in facilitating that function. The FEMAT initiative was undertaken for several reasons. It was developed to describe the social and economic context in which land and resource management plans are developed in the Pacific Northwest, and to assess methods which can be used to achieve social and economic stability in communities dependent upon resources from federal (U.S.) lands. The socio-economic component of FEMAT examined the effects of alternative forest-management plans on three hundred small, rural communities in the northwest coastal states of the United States. An expert panel of social and natural scientists estimated the capacity of communities to adapt to large, sudden reductions in federal timber-harvest levels. These estimations were based on population and employment statistics, as well as a social-scientist expert-panel assessment of community capacity. FEMAT then analysed each community's historical range of variation in timber-harvest levels, and their ability to respond to such changes. This was done in order to assess the risk to rural communities associated with implementing an array of ecosystem management options. FEMAT findings were used as criteria to determine which of the proposed management options to accept, and to design several strategies to ease the resulting social and economic impacts. These strategies included job retraining programs, and new community economic development offices to identify and work with communities at risk (USDA, 1999).

2. U.S. Department of Agriculture: Interior Columbia Basin Ecosystem Management Project (USDA, 1999)

The Interior Columbia Basin Ecosystem Management Project (ICBMP) assessed social and economic resiliency in the northwest United States by measuring the dependency of communities in the region upon different employment sectors. The ICBMP research was based on the assumption that areas with high economic resiliency would offer a range of employment opportunities when specific firms or economic sectors experience downturns in their operations. Economic resiliency was measured by the diversity among employment sectors found in the community. For example, having several employers in different industrial sectors would provide employment diversity, which would increase a community's economic resiliency.

Social resiliency was measured using the following factors: leadership, population size, mix of skills and education levels found in the community, and amenity infrastructure. The ICBMP then developed a composite measure of socio-economic resiliency by combining results from both social and economic factors. Results showed that while much of the study area land base had low levels of socio-economic resiliency, a majority of the study area residents lived in areas with high resiliency. These results suggest that resiliency is dependent upon a sufficient population to sustain and develop necessary community services and infrastructure, such as schools and hospitals (USDA, 1999).

3. Canadian Model Forests (Natural Resources Canada, 2000)

The Canadian Model Forest network has been monitoring local level indicators of sustainable forest management since 1997. While not specifically addressing social and economic considerations in ecosystem-based management, their indicator framework includes monitoring categories relevant to social and economic issues. Sample indicators for these categories include: employment in specific timber and non-timber sectors, satisfaction of users with forest recreation opportunities, degree of involvement of First Nations in the sustainable forest management process, and an “index of diversity” which measures the local industrial base. A list of indicators used by Model Forests throughout Canada is provided in Appendix 1.

4.0 Key Social and Economic Considerations

From the above studies and the academic and professional literature, two main themes of social and economic considerations in EBM emerge: *social wellbeing* and *economic health*. The two themes are linked to a third major consideration in ecosystem-based management, namely ecological integrity (Holt, 2001).

4.1 Social Wellbeing

Social wellbeing involves the following key components: *social resiliency*, *community capacity*, *quality of life*, and *empowerment with responsibility*.

- **Social Resiliency**

Social resiliency represents the ability of the community to recognize the need for change and to mobilize its members to collectively respond to that need. It also reflects the community’s ability to develop the leadership, organizational tools and skills, and the resources needed to carry out common goals. The health and vitality of social systems depend on their diversity and their ability to adapt and evolve as conditions and needs change. Adaptive capacity reflects the community’s collective ability to be socially resilient. Human systems change through time, and social resiliency is based on the capacity of human systems to adapt and evolve in response to internal and external changes. Social resiliency can be measured by

population density, cultural and lifestyle diversity, and the number and combination of different skills that are found in the community (USDA, 1999).

- **Community Capacity**

Community capacity measures the ability of residents, communities, institutions and organizations to meet local needs and expectations (USDA, 1999). This measure includes physical infrastructure within the community, human capital, and leadership. Social wellbeing is achieved, in part, when a community has the local infrastructure and capacity to meet the day-to-day needs as well as the long term expectations of its members.

- **Quality of Life**

Indicators of an individual's and community's quality of life include: a sense of belonging, self-worth, safety, the provision of basic needs, adequate and appropriate housing, health care, transportation, education, employment, access to training, availability of recreational opportunities, as well as healthy and clean physical environments (Norris, 1993).

- **Empowerment with Responsibility**

Sustainable communities are characterized as having residents with empowerment and responsibility. This means they have the capacity to affect the outcomes of decisions which affect them (Kline, 1997). Residents of sustainable communities have the opportunity and capacity for meaningful and effective participation in decision making. This capacity will ultimately result in a higher level of self-determination.

4.2 Economic Health

An economically healthy community is one which has a variety of businesses, industries and institutions which are all environmentally sound and economically viable (Kline, 1997). Such communities provide ongoing training and education opportunities for residents. They also generate revenues from diverse, stable markets, benefiting all local citizens (Kline, 1997). Economic health can be measured by indicators related to *economic resiliency*, *self-reliancy* and *equity*.

- **Economic Resiliency**

Economic resiliency refers to the community's ability to recover from different economic stresses over time, including market price and exchange rate fluctuations, and recession. Resiliency is a result of economic diversity (USDA, 1999). A resilient community has diverse sources of revenue and numerous training and education opportunities for employment. A high level of economic resiliency implies that a community's industries and economic systems are highly adaptable to internal and external changes in an ever-changing financial environment (USDA, 1999).

- **Self-Reliancy**

More economically sustainable communities are those that have the internal ability to adapt and evolve during phases of financial change and uncertainty. This includes a community's capacity to self organize and further their own economic wellbeing within a context of change and opportunity (BCRTEE, 1993; Maclaren, 1996; USDA, 1999). Self-reliance is dependent on the community's ability to support their own local physical and financial infrastructure and services, and their ability to choose and be responsible for what economic activity takes place within the community boundaries (USDA, 1999).

- **Equity**

Benefits and costs of meeting the needs of communities should be enjoyed and born equitably by all (Brown et. al, 1987). Both gender and sub-group equity must be considered if a community is to be healthy over the long term. Special attention should be focused upon specific groups experiencing economic hardship, such as single parent or single income families (Beckley and Burkoski, 1999). Intergenerational equity must also be considered. This concept supports the notion that the needs of future generations are as important as those of the current generation (Maclaren, 1996). For example, costs of meeting the present generation's needs and expectations should not be born by future generations who will not realize any of the benefits. Ecosystem-based management should involve sustaining natural ecosystems for the benefit of future generations, while providing goods and services for each generation (USDA, 1993).

5.0 A Framework to Integrate Social and Economic Considerations in Ecosystem-Based Management

In order for decision makers to develop a long-term ecosystem-based management strategy, a framework to integrate social and economic considerations is needed. The following recommended framework focuses on the development of social wellbeing and economic health within ecological limits to sustain ecosystem functions over the long term. The framework involves the following six steps:

1. Build ecosystem-based management awareness
2. Analyse the current social, economic, and ecological situation in the planning area
3. Develop community goals and objectives
4. Identify discrepancies between current situation and community goals, and develop plan to address these issues
5. Develop Indicators

6. Implement, Monitor and Manage Adaptively

A visual representation of the above framework is provided in Appendix 2.

5.1 Building Awareness

Land and resource management decisions are complex and involve a high degree of uncertainty. To address these challenges, all stakeholders and decision makers should have a good understanding of the key social, economic, and ecological considerations which are integral to ecosystem-based management planning, including goals of social wellbeing, economic health, and ecological integrity. If all stakeholders and decision makers have a solid understanding of these concepts and the relationships between them, the process of developing goals and objectives for an ecosystem-based management plan, and its eventual implementation are more likely to be effective. Ongoing evaluation to assess new information which will affect the management plan is necessary. It ensures that the plan, as designed by the stakeholders and decision makers, continues to progress towards its goals and objectives.

5.2 Analysis of Present Situation

Stakeholders and decision-makers need to analyse the social, economic, and ecological systems present in the planning area. The analysis should focus upon factors influencing social wellbeing, economic health, and ecological integrity. Special attention should be given to areas of conflict between the social, economic, and ecological components which are impeding the balance between sustainable communities and healthy ecosystems. An analysis of the present situation will help decision-makers identify areas and issues where gaps exist between current management practices, sound ecosystem-based management standards, and desired future conditions.

5.3 Community Goals, Objectives, and Targets

Goals are broad, normative statements of desired conditions which are generally agreed upon by decision-makers. Objectives outline the end results that will achieve the broader goals. These may also be described as desired future conditions, but are specific to individual resources or resource uses. Targets are easily observable events or characteristics that can be aimed for as part of a goal or objective (Slocombe, 1998). Goals for ecosystem-based management should be diverse, covering a broad spectrum of topics. They must also be connected with specific, related objectives which are measurable (Slocombe, 1998). Goals should be clearly stated, and easily understood by all. Examples of broad social and economic goals for ecosystem-based management could include social and economic equity, community self-reliance, and long term viability of a community's economy. Objectives could include job creation, and increased training opportunities for residents in different

sectors. Targets for a community-based ecosystem-based management plan could include specific levels of employment, and minimum median resident incomes.

Goals should reflect the ethics, principles, and underlying values of the community at a particular place in time, including the community's commitment to social wellbeing, economic health, and ecological integrity. These goals should be pursued through an ongoing, adaptive process which is continuously updated to reflect new information and changing community values. Community goals for ecosystem-based management should be set within the broader context of larger scale management processes and societal values.

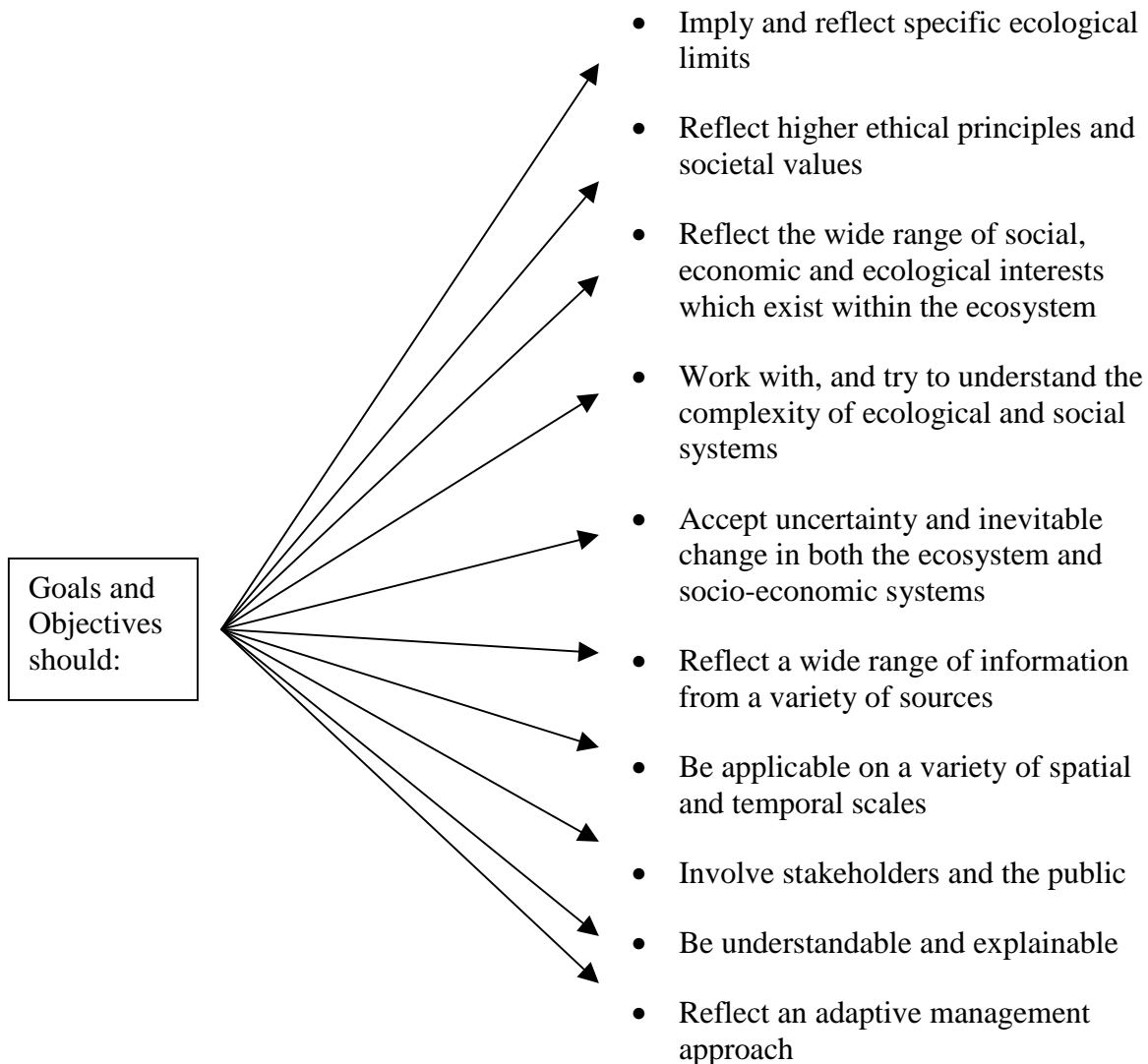


Figure 2: Characteristics of ecosystem-based management goals and objectives (Slocombe, 1998)

Selected goals and objectives must be able to guide the development of an ecosystem-based management plan. Weak objectives are one of the greatest barriers to ecosystem-based management processes (Slocombe, 1998). Strong and well defined objectives will help communities make difficult land and resource management decisions, while ensuring movement towards more economically, ecologically and socially sustainable systems.

5.4 Plan Development

Once community goals, objectives and targets have been identified, stakeholders should revisit step two of this framework (Analysis of Present Situation). Stakeholders should analyse the areas and issues where gaps exist between current management practices and sound ecosystem-based management standards, and develop strategies to move towards desired future conditions. These strategies will then form the basis of the stakeholder's strategic land and resource management plan.

5.5 Indicator Framework

An indicator framework is a group of social, economic, and ecological indicators which will be used to assess a management plan's progress towards the community's goals and objectives. "Our understanding of causal relationships and interactions between community well-being and environmental variables needs to be strengthened" (Beckley and Burkowski, 1999). An indicator framework will help to increase this understanding, while also measuring the management plan's ability to meet community goals.

Social and economic indicators are useful for a variety of management purposes. These include: monitoring current social conditions and trends over time; conducting comparative analyses with other communities/regions; evaluating social responses to managerial decisions; and increasing the information base available for collaborative decision-making (Force and Machlis, 1997). Short term impacts of natural resource management decisions are often felt most strongly at the community level (Force and Machlis, 1997). However, selected indicators should also reflect individual, family and regional wellbeing.

Selecting social and economic indicators involves many considerations. Indicators will be used to monitor the success of the management program which is implemented. Therefore, they must reflect the diverse range of goals and objectives present in ecosystem-based management plans. It is also important to remember that the selected indicators will reflect the needs and interests of the group that chooses them (Beckley and Burkowski, 1999). For this reason, indicators should be chosen by a representative group of stakeholders to reflect the diverse values and interests found in the region.

At least two types of indicators can be used to monitor social wellbeing and economic health in an ecosystem-based management context. Objective indicators are drawn primarily from secondary sets of data (such as existing statistics), while subjective indicators often entail some form of human self-assessment, typically conducted via a social survey. While there

are advantages and disadvantages to each type, the best approach is likely to use both (Beckley and Burkowski, 1999). A useful method for creating an indicator framework was developed by Maclaren (1996). She proposed the following six-step process:

1. Define and conceptualise the goals and objectives for which indicators are needed. Social and economic indicators will be required to measure progress towards or away from these identified goals and objectives.
2. Identify the target audience and the associated purpose for which the indicators will be used, and the relative number of indicators needed. The format for presenting the indicators will vary according to the target audience. In the case of ecosystem-based management for land-use decisions, the target audience will probably be policy-makers, the general public, and a mix of scientists.
3. Choose an appropriate preliminary framework. This framework should outline the relationship between the following variables: goals, objectives, baselines, targets and indicators. For example, a community could identify a goal of appropriate housing for all residents. Their objective could be to increase the availability of low-income family housing from their current baseline of fifty housing units. The community's target could be a maximum occupancy rate of such housing units, which could also be used as an indicator of social wellbeing. This step should begin the process of defining how goals and objectives will manifest themselves, and how the community will be able to measure progress towards their established targets.
4. Define the indicator selection criteria. Indicators should be (Maclaren, 1996):
 - Representative (indicator should monitor and measure progress over a broad range of conditions)
 - Responsive (indicator must signal only important changes which measure movement away from normal/historical patterns)
 - Relevant to users
 - Based on sound and objective data (which can be compared over time, space)
 - Understandable by all potential users
 - Comparable to targets (will show movement towards/ away from goals and objectives)
 - Comparable with other indicators (in other jurisdictions)
 - Cost-effective
 - Unambiguous (what is being measured should be clear, as well as the direction to pursue)

5. Identify a potential set of indicators and evaluate them against the selection criteria. It is important to choose both subjective and objective indicators, and to identify and try to work with their relative strengths and weaknesses. Examples of possible social wellbeing and economic health indicators are provided in Appendices 3 and 4.
6. Choose a final set of indicators and test their effectiveness. Indicators must measure progress towards goals and objectives. Once the final indicators are chosen, they will be ready for use. However, it is important to realize that any set of selected socio-economic indicators must be used in conjunction with indicators of ecological integrity, and will require updating to account for new changes in available information, values, goals, and/or the environment.

Because “healthy human communities are dependent upon and synergistic with healthy natural communities” (Walter, 1997), assessing social and economic considerations in ecosystem-based management involves indicators of human interactions with the ecosystem. Indicators that measure whether a given human action enhances or undermines the functioning of natural ecosystems and their dependent human communities should be included. Examples of such indicators include recycling rates, as well as water and energy consumption per capita.

5.6 Implementation, Monitoring and Adaptive Management

Once a suitable indicator framework has been chosen, the land and resource management plan should be implemented, followed by monitoring and adaptive management. A commitment must be made to long-term monitoring (using the selected set of targets and indicators) of social wellbeing, economic health, and ecological integrity within the ecosystems being managed. Ecological, social and economic conditions will change over time, and regular monitoring will allow stakeholders to identify progress towards (or away from) the community’s goals and objectives. However, a commitment to monitoring alone will not be sufficient to ensure long-term social wellbeing, economic health or ecological integrity. All monitoring results should subsequently be used to inform and support an adaptive management strategy (Force and Machlis, 1997).

“Adaptive management assumes that scientific knowledge is provisional and focuses on management as a learning process or continuous experiment where incorporating the results of previous actions allows managers to remain flexible and adapt to uncertainty” (Grumbine, 1994). Managers and stakeholders should treat new information, derived from monitoring programs, as inputs into decision making processes for current and future projects on a regular basis. This means that land and resource management plans should remain flexible. Social, economic, and ecological conditions will change, and a successful management plan will adapt when necessary.

6.0 Challenges to Integrating Social and Economic Considerations in Ecosystem-Based Management

Societal Expectations of Ecosystems

Societal expectations must be defined and integrated within the sustainable capabilities of ecosystems (USDA, 1993). Two fundamental challenges of ecosystem-based management involve increasing society's awareness of the capacity limits of ecosystems, and identifying what those limits imply for the management of economic and social systems (Grumbine, 1994). Ecological integrity is linked directly to the concepts of social well-being and economic health. These concepts should not be treated, analysed, or monitored as separate entities, but must be considered as part of a dynamic, interrelated system.

Diversity of Goals and Objectives

Defining community goals and objectives involves many diverse viewpoints (Slocombe, 1998; Noss and Cooperrider, 1994). It entails addressing the underlying values of individuals, while trying to develop an aggregate set of goals and related objectives for the management plan. Decision makers must aim to take all values into account, including those that are not directly represented in the decision-making process. It is important to identify common interests amongst stakeholders, rather than the special interests advanced by individuals or groups who may attempt to service their own needs at the expense of the broader community. Stakeholders should focus on common ground and shared values in a collaborative decision-making process to identify a list of suitable expectations for social and economic considerations in an ecosystem-based management plan (Yaffee, 1996).

Traditional Focus on Short Term Benefits

Ecosystem-based management plans should focus on attaining long-term sustainable development and community health, rather than short-term financial benefits. Economic health is important for sustainability, but must be considered within ecological limits (Yaffee, 1999). Projects which increase short-term financial benefits but involve unsustainable social and environmental costs should be avoided. Full cost accounting methods should be used in all economic analyses to ensure that environmental and social costs are fully acknowledged (Lee, 2001). For example, job losses and community displacement associated with natural resource management decisions should be included in project evaluations as costs to both social wellbeing and economic health.

Commitment to Long-term Monitoring

Collecting valid and reliable data over the long-term can be costly. However, because social, economic and environmental systems are dynamic and uncertain, success in ecosystem-based management depends upon an ongoing monitoring and adaptive management system. Necessary resources must be allocated to ensure that this important component of ecosystem-

based management is implemented properly, including the establishment of institutions to ensure monitoring and response (Machlis and Force, 1997).

Ignoring Important Human or Ecological Dimensions

The social and economic dimensions of ecosystem-based management should not be overlooked (Machlis, 1992; Lee, 2001). Humans play a vital, if problematic, role in all aspects of ecosystem-management (Grumbine, 1994). Ignoring the needs of humans, their communities, and their diverse value systems will eventually undermine ecosystem-based management and impede the implementation of successful land and resource management plans.

Determining Suitable Targets for Social and Economic Indicators

There is a substantial amount of uncertainty in measuring the current values of, and assigning targets for, social and economic indicators (Maclaren, 1996). Decision-makers must decide which key indicators truly represent social and economic conditions in the region. They must also assign short-term targets for communities to work towards to achieve their goals. While choosing precise targets will be difficult, it is important that the management plan is successful in progressing towards the community's goals and objectives.

7.0 Social and Economic Risk and Uncertainty

As ecosystems change, so too must goals and objectives (Slocombe, 1998). Decision makers must acknowledge that there are inevitable limits to the predictability of both natural and human systems. This means that there is a need to emphasize flexibility and adaptability to deal with risk and uncertainty regarding the management of these systems. Rather than ignore uncertainty, resource managers must expect it, and have processes in place to respond to changes in knowledge, values, and/or conditions. Social and economic uncertainty comes from a variety of sources, including: market price fluctuations for natural resources, evolving societal values regarding quality of life, social sustainability and economic health, and difficulties in valuing non-market goods (such as pollution).

Strategies to manage land and resources adaptively, including monitoring, must include mechanisms that ensure that adaptable, flexible goals are developed which can be revised through an ongoing process (Slocombe, 1998). Methods to deal with risk and uncertainty include:

- Sensitivity Analysis

When faced with uncertainty, managers and decision-makers must make predictions regarding social, economic and ecological systems. Sensitivity analysis incorporates more information into the decision-making process by using ranges of data (rather than single values) to determine all of the possible outcomes which might occur from different management strategies. For example, market prices for natural resources fluctuate. In

order to determine the profitability of natural resource development, decision makers should use sensitivity analysis to determine the full range of possible outcomes which could occur in instances of high, medium, or low prices, rather than attempting to precisely predict the price on a given day in the future. This can be done by using the historical ranges of natural resource prices rather than a specific price on a given day. The results from the sensitivity analysis allow decision makers to avoid high risk projects with potentially harmful environmental and/or social costs.

- Prototypes

Conducting multiple, modest experiments designed to test the effects of proposed management decisions on natural and socio-economic systems will help to avoid large, costly mistakes (Grumbine, 1997). If successful, a prototype can be implemented on a larger scale; if not, the prototype can be terminated without significant cost (Grumbine, 1997). For example, strategies to increase employment opportunities in different industries should be implemented on a small, community scale before being applied to a whole region.

- Adaptive Management

Adaptive management implies that decision-makers are attempting to deal with uncertain systems, and are continuously improving management techniques and incorporating the results of previous activities over time. Using adaptive management techniques involves “continuous experiments, where incorporating the results of previous actions allows managers to remain flexible and adapt to uncertainty” (Grumbine, 1994). For example, by monitoring unemployment rates, decision makers might learn that their management plan is not achieving its goal of increasing the availability of meaningful employment for residents. Decision makers can then take this information and reassess their management strategies in terms of the overall management plan’s goals and objectives, and develop new modified strategies for increasing meaningful employment for residents. This requires not only a systematic monitoring program, but also decision-making mechanisms that are able to alter management practices in response to monitoring results.

8.0 Conclusion

Social and economic systems are key considerations in ecosystem-based management. Because humans need healthy ecosystems to survive, and healthy human communities have the capacity to maintain ecological systems, all three components (social, economic, and ecological) must be considered to achieve an effective, sustainable ecosystem-based management plan.

Like ecological integrity, social wellbeing and economic health are related to resiliency. Communities are said to be resilient when they have the capacity to adapt to new situations and to evolve successfully over time. Social wellbeing and economic health are not

measured simply by the status quo. Systems (both human and natural) will change over time, and so should the human and natural communities living within them.

Clearly articulated and carefully targeted sustainable goals and objectives are required for ecosystem-based management. These goals, developed and supported by the community, can drive the process towards achieving social wellbeing and economic health within the ecosystem's natural limits. This balance between human needs and ecological integrity can provide a high quality of life for communities while ensuring that future generations have a full range of social and economic opportunities to choose from.

Lastly, a strong commitment to monitoring and responding to social and economic progress through the use of indicators is required. Decision-makers need to understand how communities are affected by management decisions, so that they can adapt to any new conditions or situations which may arise. This commitment to long-term monitoring will also provide a sound basis for assessing the management plan's progress towards community goals and objectives that support healthy, sustainable communities and natural systems.

References

- Beckley, T.M., and T.M. Burkoski. 1999. Social indicator approaches to assessing and monitoring forest community sustainability. Information report NOR-X-360. Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta.
- British Columbia Round Table on the Environment and the Economy. 1993. Strategic directions for community sustainability. B.C. Round Table on the Environment and the Economy, Victoria, British Columbia.
- Brown, B. J., M. E. Hanson, D. M. Liverman, and R. W. Meredith Jr. 1987. Global sustainability: Toward definition. *Environmental Management* 11(6):713-719.
- Burch, W. R. Jr., and D. R. Deluca, eds. 1984. *Measuring the social impact of natural resource policies*. University of New Mexico Press, Albuquerque, New Mexico.
- Butler, R.W. 1999. Sustainable tourism: A state-of-the-art review. *Tourism Geographies* 1(1):7-25.
- Force, J.E., and G.E. Machlis. 1997. The human ecosystem part II: Social indicators in ecosystem management. *Society and Natural Resources* 10(4):367-387.
- Gibson, R. B., D. H. Alexander, and R. Tomalty. 1997. Putting cities in their place. Pages 27-39 in M. Roseland, editor. *Eco-city dimensions: Healthy communities, healthy planet*. New Society Publishers, Gabriola Island, British Columbia.
- Grumbine, R. E. 1994. What is ecosystem management? *Conservation Biology* 8(1):27-38.
- Grumbine, R. E. 1997. Reflections on "What is ecosystem management?" *Conservation Biology* 11(1):41-47.
- Hart, M. 1995. *Guide to Sustainable Community Indicators*. QLF/Atlantic Centre for the Environment, Ipswich, Massachusetts.
- Hancock, T. 1997. Healthy sustainable communities. Pages 43-50 in M. Roseland, editor. *Eco-city dimensions: Healthy communities, healthy planet*. New Society Publishers, Gabriola Island, British Columbia.
- Holling, C. S. (ed.). 1978. *Adaptive environmental assessment and management*. John Wiley & Sons, New York, New York.
- Holling, C.S., and G. K. Meffe. 1996. Command and control and the pathology of natural resource management. *Conservation Biology* 10(2):328-337.
- Kline, E. 1997. Sustainable community indicators: How to measure progress. Pages 152-166 in M. Roseland, editor. *Eco-city dimensions: Healthy communities, healthy planet*. New Society Publishers, Gabriola Island, British Columbia.

Kusel, J. 1996. Well-being in forest-dependent communities. Part I: a new approach. Pages 361-373 in Sierra Nevada ecosystem project: Final report to Congress. Vol. II, Assessments and scientific basis for management options. Centre for Water and Wildland Resources, University of California, Davis, California.

Lee, R.G. 2001. Planning principles for integrated ecosystem-based management on the central and north coast of British Columbia, including Haida Gwaii. Joint Solutions Project, Ministry of Sustainable Resource Management, Victoria, British Columbia.

Machlis, G.E. 1992. The contribution of sociology to biodiversity research and management. *Biological Conservation* 61:161-170.

Machlis, G.E., J.E. Force, and W.R. Burch Jr. 1997. The human ecosystem part I: The human ecosystem as an organizing concept in ecosystem management. *Society and Natural Resources* 10(4):367-387.

Maclaren, V. W. 1996. Indicators of urban sustainability: A focus on the Canadian experience. State of the Environment Directorate, Environment Canada Mortgage and Housing Corporation, Intergovernmental Committee on Urban and Regional Research, ICURR Press, Toronto, Ontario.

Massam, B. H., and J. Dickinson. 1999. The civic state, civil society, and the promotion of sustainable development. Pages 208-239 in J. T. Pierce and A. Dale, editors. *Communities, development, and sustainability across Canada*. University of British Columbia Press, Vancouver, British Columbia.

McCormick, F. J. 1999. Principles of ecosystem management and sustainable development. Pages 3-21 in J.D. Peine, editor. *Ecosystem management for sustainability*. Lewis Publishers, Boca Raton, Florida.

Natural Resources Canada. 2000. A user's guide to local level indicators of sustainable forest management: Experiences from the Canadian Model Forest network. Natural Resources Canada, Ottawa, Ontario.

Norris, T. 1993. *The healthy community handbook*. National Civic League, Denver, Colorado.

Noss, R., and A. Cooperrider. 1994. *Saving nature's legacy: Protecting and restoring biodiversity*. Island Press, Washington, D.C.

Prince Rupert Inter-Agency Management Committee. 2001. Draft updated planning process for the North Coast LRMP. Victoria, British Columbia.

Rossi, J. R., and K. J. Gilmartin. 1980. *Handbook of social indicators*. Garland STPM Press, New York, New York.

Slocombe, D.S. 1993. Implementing ecosystem-based management: development of theory, practice and research for planning and managing a region. *Bioscience* 45:168-182.

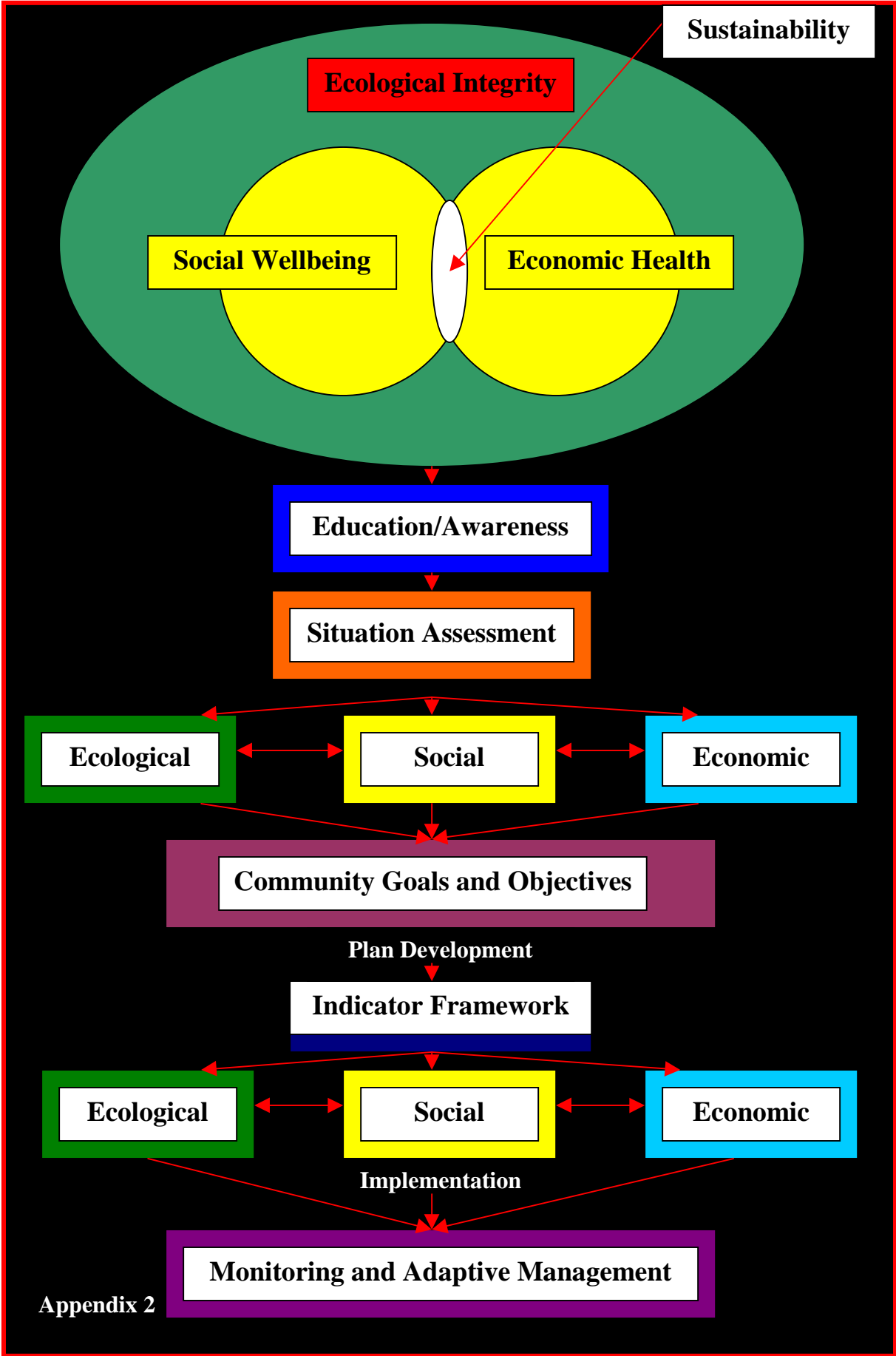
- Slocombe, D.S. 1998. Defining goals and criteria for ecosystem-based management. *Environmental Management* 22(4):483-493.
- United Nations Economic Commission for Europe. 1996. Guidelines on sustainable human settlements planning and management. UN Economic Commission for Europe, Geneva, Switzerland.
- USDA Forest Service. 1999. Sustaining the people's lands: Recommendations for stewardship of the national forests and grasslands into the next century. USDA National Forest System, Forest Service Research, Washington, D.C.
- USDA Forest Service. 1993. Eastside forest ecosystem health assessment. USDA National Forest System, Forest Service Research, Washington, D.C.
- Walter, G. R. 1997. Staples, regional growth and community sustainability. Pages 287-303 in T.J. Barnes and Roger Hayter, editors. *Troubles in the rainforest: British Columbia's forest economy in transition*. Western Geographical Press, Victoria, British Columbia.
- World Bank. 1985. Environmental requirements of the World Bank. *Environmental Professional* 7:205-212.
- World Commission on Environment and Development. 1987. *Our common future*. Oxford University Press, New York, New York.
- Woolard, R., and W. Rees. 1999. Social evolution and urban systems: Directions for sustainability. Pages 27-45 in J. T. Pierce and A. Dale, editors. *Communities, development, and sustainability across Canada*. University of British Columbia Press, Vancouver, British Columbia.
- Yaffee, S.L. 1996. Ecosystem management in practice: The importance of human institutions. *Ecological Applications* 6(3):724-727.
- Yaffee, S. L. 1999. Three faces of ecosystem management. *Conservation Biology* 13(4):713-725.

Appendices

Appendix 1: Indicators used by Model Forests throughout Canada

(Source: Natural Resources Canada, 2000)

Indicator	Model Forest
<ul style="list-style-type: none"> Stumpage rates and amount by species by product 	Lake Abitibi, ON
<ul style="list-style-type: none"> Permanent and seasonal jobs in the forestry sector relative to total jobs 	Bas-St-Laurent, QU
<ul style="list-style-type: none"> Expenditures or payments of the company (operating in the Model Forest) to residents, businesses, and governments 	Manitoba
<ul style="list-style-type: none"> Education 	Foothills, AB
<ul style="list-style-type: none"> Real estate values 	Foothills, AB
<ul style="list-style-type: none"> Satisfaction levels of users with forest recreation opportunities 	Nova Scotia
<ul style="list-style-type: none"> Population 	Lake Abitibi, ON
<ul style="list-style-type: none"> Labour force by industry 	Lake Abitibi, ON
<ul style="list-style-type: none"> Average household income 	Lake Abitibi, ON
<ul style="list-style-type: none"> Extent of public involvement in forestry issues 	Western Newfoundland
<ul style="list-style-type: none"> Number of communities with stewardship or co-management responsibilities 	Fundy, NB
<ul style="list-style-type: none"> Value of forest management contracts awarded to local enterprises 	Manitoba
<ul style="list-style-type: none"> Degree of public participation in decision making process 	Fundy, NB Lake Abitibi, ON
<ul style="list-style-type: none"> Stakeholder involvement in decision making 	Foothills, AB



Appendix 3 Example: Social Wellbeing Indicators

Social Wellbeing Indicators			
Social Resiliency	Community Capacity	Quality of Life	Empowerment with Responsibility
<ul style="list-style-type: none"> • Education attainment levels • Unemployment rate • Population size • Population growth rates • Population age structure • Rural population size • Cultural characteristics of the population • Major religious groups • Percentage of population in professional occupations 	<ul style="list-style-type: none"> • Number of community volunteers • Availability of community information • Number of volunteer, non-profit agencies • Youth involvement in community service • Community infrastructure (schools, libraries, public transit) 	<ul style="list-style-type: none"> • Divorce rates • Crime rates • Literacy rates • Average housing price • Substance abuse rates • Access to health care (divided by subgroups) • Hospital beds per capita • Malnutrition rates • Infant mortality rates 	<ul style="list-style-type: none"> • Number of public meetings held • Voter participation • Percentage of local public planning processes that require public participation • Resident involvement in civic activities • Number of communities with co-management or stewardship responsibilities

(Sources: Maclaren, 1996; Force and Machlis, 1997; Kline, 1997; Beckley and Burkoski, 1999)

Appendix 4 Example: Economic Health Indicators

Economic Health Indicators		
Economic Resiliency	Self-Reliancy	Equity
<ul style="list-style-type: none"> • Diversity of local employment base • Dominant manufacturing or extractive industry • Community trade balance (exports and imports) • Retraining opportunities • Skill development, participation rates • Employment programs • Unemployment rates 	<ul style="list-style-type: none"> • Number of home businesses • Percentage of companies locally owned • Real estate values • Percentage of population self-employed • Full-time workers, seasonal workers • Bankruptcy rates • Transfer payments • Personal savings, debt • Public debt 	<ul style="list-style-type: none"> • Income levels (divided by subgroups) • Incidence of low income • Average family income • Median income levels • Unemployment rate by gender (divided by subgroups) • Percentage of families without independent dwellings

(Sources: Maclaren, 1996; Force and Machlis, 1997; Kline, 1997; Beckley and Burkoski, 1999)