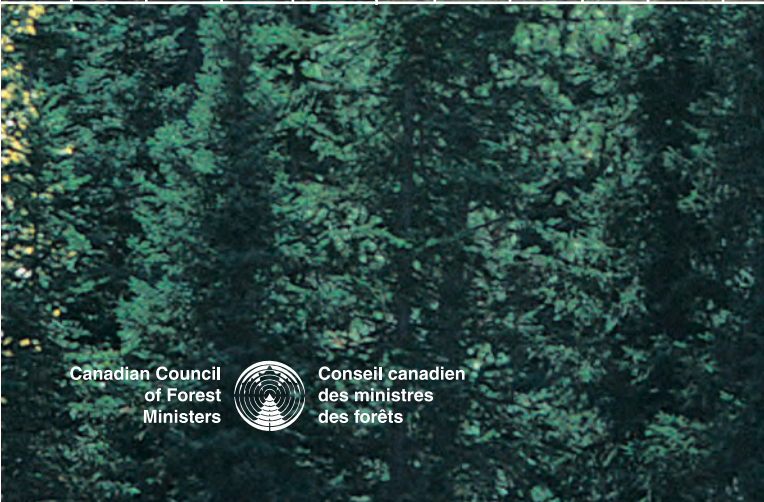


Defining
**SUSTAINABLE
FOREST MANAGEMENT**
in **CANADA**

**CRITERIA AND
INDICATORS**

2003



Canadian Council
of Forest
Ministers



Conseil canadien
des ministres
des forêts

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CANADIAN COUNCIL OF FOREST MINISTERS

FOREWORD

I am pleased to present this new version of the criteria and indicators (C&I) framework for the Canadian Council of Forest Ministers (CCFM). As Chair of the CCFM and Minister of Natural Resources Canada, I believe this framework will help ensure Canada's international leadership status in sustainable forest management.

Since the C&I framework was first developed in 1995, data availability has been enhanced, and our knowledge of the environmental, social and economic aspects of sustainable forestry has improved. With input from interested groups from across the country, the CCFM has revised the framework based on the best available scientific knowledge in a Canadian context.

Although it has fewer indicators than the original framework, the revised version uses indicators more effectively and continues to characterize the essential components of sustainable forest management in Canada. By identifying values of importance to Canadians, the revised framework will facilitate the ongoing domestic and international dialogue on sustainable forest management. Future indicator reports will improve information available to the public and decision makers, helping to guide decisions that impact on the forest.

As we implement this revised framework, sharing information and methodologies and committing resources will remain crucial. Close cooperation among the members of the CCFM—the federal, provincial and territorial ministers responsible for forests—increases capacity and reduces the costs of reporting.

By building on the experience we gain in implementing the C&I framework, we can improve our ability to assess national progress toward sustainable forest management. The revised criteria and indicators framework will continue to evolve in the future to reflect new knowledge and Canadian values.

This new framework supports the Government of Canada's commitment to the sustainable development of our forest resources. It highlights the economic importance of these resources and allied industries. Canada builds a strong society and communities through knowledge, innovation, technology and international leadership. This will help ensure our quality of life and build the Canada we want, for ourselves and for future generations.



The Honourable Herb Dhaliwal
Minister of Natural Resources Canada and
Chair of Canadian Council of Forest Ministers

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INTRODUCTION

FORESTS ARE ESSENTIAL to the long term well-being of Canada's communities, economy, and environment. Almost half of Canada's land area is forested, providing Canadians with a multitude of benefits. As stewards of 10% of the world's forests, Canada has accepted its responsibility to maintain its forests in a healthy state and to manage them in a sustainable manner.

Canada's commitment to sustainable forest management was enshrined in its 1992, 1997 and 2003 national forest strategies, which were developed by governments and others concerned with Canada's forests. Canada and the international community also recognized the importance of sustainable forest management in 1992 at the United Nations Conference on Environment and Development (UNCED) with the adoption of a Statement of Forest Principles. The concept was embodied in Chapter 11 of the conference's action plan, Agenda 21.

The release of the Canadian Council of Forest Ministers (CCFM) Framework of Criteria and Indicators (C&I) for sustainable forest management in 1995, and subsequent reports in 1997 and 2000, were important steps in implementing Canada's commitments in the national forest strategies, as well as the forestry commitments made at UNCED. The 2003 revision to the CCFM C&I demonstrates Canada's continued commitment to sustainable forest management and will improve our ability to report on and assess progress toward that goal.

The CCFM C&I provide a science-based framework to define and measure Canada's progress in the sustainable management of its forests. The criteria represent forest values that Canadians want to enhance or sustain, while the indicators identify scientific factors to assess the state of the forests and measure progress over time.

The Canadian C&I framework reflects an approach to forest management that is based on:

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1. The need to manage forests as ecosystems in order to maintain their natural processes;
 2. The recognition that forests simultaneously provide a wide range of environmental, economic, and social benefits to Canadians;
 3. The view that an informed, aware, and participatory public is important in promoting sustainable forest management; and,
 4. The need for forest management to evolve to reflect the best available knowledge and information.
-

Sustainable forest management is an adaptive process and assessing sustainability is a continuous activity. The 1995 C&I framework was expected to evolve as values changed, data availability improved and as we acquired a better understanding of sustainable forest management. Building on its experience reporting on the C&I in 1997 and 2000, the CCFM launched a review of its C&I framework in September 2001. The goal was to ensure the continued relevance of the indicators to Canadian values and improve the ability to report on indicators to assess progress toward sustainable forest management at the national level.

A task force composed of representatives from the federal, provincial and territorial governments managed the review in a three step process involving participants from government, academia, the Aboriginal community, industry, the environmental community, woodlot owners, and special interest groups. First, focus groups were convened across Canada to identify Canadians' values with respect to sustainable use of the forest. Second, the task force established six technical working groups, composed of technical experts drawn from various organizations, to review the framework and recommend a revised suite of indicators. Third, the task force validated the revised indicators with various government and non-government organizations that use the C&I framework. The process provided a broad exchange of views that ensured the revised indicators are based on the best available knowledge.

The revised CCFM C&I framework consists of six criteria and 46 indicators. The criteria have not changed but have been reworded slightly to improve clarity. The number of indicators in the revised framework has been reduced, compared to the 1995 framework, by focusing on indicators that are most relevant to Canadians' values, are most often measurable with available data, and are understandable to policy makers, forest managers and an informed public. Links between the criteria have also been more explicitly defined and, in some cases, indicators address multiple values under different criteria. By using indicators more efficiently, the revised CCFM C&I address the values, issues and concerns of Canadians while maintaining continuity with the 1995 framework; many of the values addressed by quantitative indicators in the original CCFM C&I framework are addressed by similar indicators in the revised framework.

To make the framework more understandable for non-technical audiences, 36 indicators in the revised framework that relate to values, issues or concerns that are of great interest to Canadians have been identified as *core* indicators. These indicators raise public awareness and focus public attention on what sustainable forest management means. Ten *supporting* indicators complement *core* indicators by providing more detailed information.

No single criterion or indicator alone is an indication of sustainability; rather, the individual criteria and indicators must be considered in the context of other criteria and indicators. Also, the revised indicators are designed for reporting at the national level. While some indicators lend themselves to reporting at the ecozone level or the provincial/territorial level, the indicators are not intended to assess sustainability directly at a local or forest management unit level. Still, in the past, the CCFM C&I framework has provided a starting point for developing sub-national C&I frameworks, and the revised framework should continue to do the same.

The data required for national reporting on most of the revised indicators can be provided through current information systems. For other indicators, such as those addressing values not traditionally dealt with in forest management, like non-timber forest products, Aboriginal and treaty rights, and Aboriginal knowledge, reporting must evolve as research is undertaken and data become more available. It is also recognized that the reporting on the indicators across Canada may not necessarily be uniform, because of differences in the availability of data, expertise and resources.

Internationally, Canada is actively involved in the Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, otherwise known as the "Montréal Process". Information from CCFM C&I reports has formed the basis for Canada's contribution to Montréal Process reports in the past. The revised CCFM C&I framework continues to be compatible with most of the indicators in the Montréal Process C&I framework, while at the same time providing more detail on values of importance to Canada. The revised CCFM C&I will facilitate Canada's domestic and international reporting.

Canada has received many benefits from the development and implementation of its national C&I framework. The C&I provide a framework for standardizing national forest data collection and for developing and implementing a national forest inventory. The sharing of information and resources between jurisdictions and stakeholders has helped to build capacity and reduce reporting costs, and the framework has been used to guide national research planning. The national framework has led to the development of sub-national and local level initiatives, which help to evaluate policies and regulations, facilitate meaningful public input, and guide forest practices. The revisions to the CCFM C&I framework improve the ability of the framework to continue to provide these benefits and ensure that the C&I remain an important tool for helping Canada achieve sustainable forest management.

CRITERION

Biological Diversity

1.1 Ecosystem Diversity

1.1.1

1.1.2

1.2 Species Diversity

1.2.1

1.2.2

1.2.3

1.2.4

1.3 Genetic Diversity

1.3.1

1.3.2

The variability among living organisms and the ecosystems of which they are part

Biological diversity encompasses organization at levels ranging from complete ecosystems to the chemical structures that are the basis of heredity. Maintenance of the natural range of ecosystems, and the ability of their components to react to external forces and processes, provides the equilibrium required for the maintenance of species diversity. Changes in ecosystems necessarily cause changes in species populations and distribution. Knowing that certain species are vulnerable or threatened may suggest changes in forest management and other measures to restore biological diversity. Maintenance of genetic diversity ensures that species maintain viability through their capacity to evolve and adapt to change. Together, indicators of ecosystem, species and genetic diversity provide a way to assess our forests' biological diversity.

ELEMENT 1.1: ECOSYSTEM DIVERSITY

Ecosystem diversity is the variety and relative abundance of ecosystems and their plant and animal communities. Maintenance of the variety and quality of the earth's ecosystems is necessary for the preservation of species. Without sufficient quantities of their natural habitats, species become vulnerable to extinction.

- 1.1.1 Area of forest, by type and age class, and wetlands in each ecozone. (Core Indicator)
- 1.1.2 Area of forest, by type and age class, wetlands, soil types and geomorphological feature types in protected areas in each ecozone. (Core Indicator)

ELEMENT 1.2: SPECIES DIVERSITY

The greatest and most readily recognizable form of biological depletion lies with species extinction. Slowing down the rate of species extinction due to anthropogenic factors is a key objective for the conservation of biodiversity. Changes in species population levels and distribution may provide an early warning of changes in ecosystem stability and resilience, as will increases in the number of invasive, exotic forest-associated species.

- 1.2.1 The status of forest-associated species at risk. (Core Indicator)
- 1.2.2 Population levels of selected forest-associated species. (Core Indicator)
- 1.2.3 Distribution of selected forest-associated species. (Supporting Indicator)
- 1.2.4 Number of invasive, exotic forest-associated species. (Supporting Indicator)

ELEMENT 1.3: GENETIC DIVERSITY

Genetic diversity, or the variation of genes within a species, is the ultimate source of biodiversity at all levels; it is the material upon which the agents of evolution act. Loss of variation may have negative consequences for ecological fitness and prevent adaptive change in populations.

- 1.3.1 Genetic diversity of reforestation seed-lots. (Core Indicator)
- 1.3.2 Status of *in situ* and *ex situ* conservation efforts for native tree species within each ecozone. (Core Indicator)

Relevant indicators under other criteria

The pattern and variety of communities and ecosystems is an important part of ecosystem diversity. Additional insight into ecosystem diversity can be gained by examining the causes of changes in forest area (indicator 2.2), for example, due to the construction or removal of linear features like roads. The pattern and variety of forest types and age classes is also linked to disturbance regimes, with spatial and temporal patterns of fires, harvesting and insect defoliation often driving the distribution of age classes and forest types (indicator 2.3).

Species diversity is often correlated with ecosystem productivity (indicator 2.1). Changes in productivity over time or space may help explain changes in species diversity.

Similarly, species and genetic diversity may also be influenced by regeneration after harvest (indicator 2.5), particularly if the area is replanted with exotic species. Some exotic species may compete with, interbreed with, or displace native species.

CRITERION

2

Ecosystem Condition and Productivity

2.1

The stability, resilience and rates of biological production in forest ecosystems

2.2

2.3

2.4

2.5

The sustainable development of our forested ecosystems depends on their ability to maintain ecological functions and processes and to perpetuate themselves over the long term. Relative freedom from stress (stability) and relative ability to recover from disturbance (resilience) within a forest ecosystem combine to provide an indication of ecosystem condition. Productivity

refers to the ecosystem's ability to accumulate biomass, which depends on the degree to which nutrients, water and solar energy are absorbed and transferred within the ecosystem.

Sustainable productivity within a forest ecosystem is dependent upon the ability of the ecosystem's components and their populations to recover from or adapt to disturbances. While most disturbance and stress events are fundamental to the maintenance of forested ecosystems, others may overwhelm an ecosystem's resilience, alter ecosystem patterns and processes, or detrimentally affect the forest's ecological function. Measures of long-term forest land conversion, major biotic and abiotic stresses, and impairment of forest function due to pollutants, provide an indication of disturbance and stress. Measures of successful regeneration after harvest assess the forest ecosystem's ability to recover from disturbance, while measures of total growing stock on all forest lands provide an indication of the balance of forest productivity and disturbances. Ecosystem condition and productivity are closely linked, with improvements in condition often associated with increases in productivity. However, increases in the productivity of species used for timber at the expense of other species may lead to a decline in ecosystem condition. Collectively, these indicators provide a basis for improved decision-making to ensure that the biophysical capacity of the forests is maintained or enhanced.

- 2.1 Total growing stock of both merchantable and non-merchantable tree species on forest land. (Core Indicator)
- 2.2 Additions and deletions of forest area, by cause. (Core Indicator)
- 2.3 Area of forest disturbed by fire, insects, disease and timber harvest. (Core Indicator)
- 2.4 Area of forest with impaired function due to ozone and acid rain. (Core Indicator)
- 2.5 Proportion of timber harvest area successfully regenerated. (Core Indicator)

Relevant indicators under other criteria

Ecosystem condition and productivity is linked to biological diversity in many ways. For example, a healthy and diverse ecosystem (indicator 1.1.1) is better able to respond to and recover from changes in the environment. Likewise, changes in ecosystem productivity are often linked to changes in species diversity (indicators 1.2.1, 1.2.2 and 1.2.3).

Ecosystem condition and productivity is also linked to soil conservation. Soil disturbance beyond locally applicable standards (indicators 3.1 and 3.2) can reduce future productivity.

CRITERION

3

Soil and Water

3.1 *The quantity and quality of soil and water*

3.2 Soil and water are essential components of forests, sustaining the functioning and productive capacity of forest ecosystems. The primary reason for soil conservation is the maintenance of the living substrate for forest stands. Water conservation is important for the provision of potable water for humans and wildlife and the provision of suitable aquatic environments for plants and animals.

3.3 The construction of access roads and other forestry practices may impact on the quantity and quality of soil and water in a number of ways. These include soil erosion and compaction, siltation of aquatic habitats, flooding and increased water temperatures. In order to ensure that terrestrial and aquatic ecosystems are maintained in good condition, jurisdictions have enacted policies, guidelines and standards to provide for specific management practices and the protection of sensitive sites.

Directly assessing the impacts of forestry practices on soil and water quality and quantity across all of Canada's forests is difficult and expensive. However, indicators of compliance with locally applicable soil disturbance standards and road construction, stream crossing and riparian zone management standards can provide an effective measure, provided the standards are periodically updated and supported by ongoing long-term research and the best available scientific knowledge. Measurements of forest cover removal from watersheds can be used to highlight areas where there may be significant changes in water yield, timing and peak flow.

- 3.1 Rate of compliance with locally applicable soil disturbance standards. (Core Indicator)
- 3.2 Rate of compliance with locally applicable road construction, stream crossing and riparian zone management standards. (Core Indicator)
- 3.3 Proportion of watersheds with substantial stand-replacing disturbance in the last 20 years. (Supporting Indicator)

Relevant indicators under other criteria

Research is a necessary adjunct to policies, guidelines and standards on soil and water conservation. Information on new or updated standards, particularly related to soil and water conservation (indicator 6.5.4) and on investment in forest research and development (indicator 6.5.3) helps in assessing whether the standards are based on the best available scientific knowledge.

The conversion of productive forest to another land use, such as agriculture, roads, mines, and reservoirs, usually has long-term impacts on soil productivity. In particular, some soil types may preferentially be selected for conversion (e.g., to agriculture or aggregate extraction). Likewise, the slow degradation of soils due to pollutant deposition can have serious impacts on soil and water quality. Tracking the variety of soil types in protected areas (indicator 1.1.2), the loss of productive soil from the forest area (indicator 2.2), and the area and severity of ozone and acid rain impacts (indicator 2.4) are important steps in helping to conserve soil and water resources. Similarly, the rapid regeneration of forests following timber harvesting (indicator 2.5) is essential for maintaining moisture and nutrient levels in the soil, minimizing disruptions in stream flow rates and timing, and minimizing soil erosion, stream siltation and downstream water quality effects.

CRITERION

4

Role in Global Ecological Cycles

4.1

Carbon Cycle

4.1.1

4.1.2

4.1.3

4.1.4

The impact of the forest and forest activities on global ecosystem functions

Global ecological cycles are a complex of self-regulating processes responsible for recycling the earth's limited supply of water, carbon, nitrogen and other life-sustaining elements. The world's forests are critically dependent upon, and make substantial contributions to, these global processes.

The indicators under this criterion deal with the role of forests and the forest sector in the global carbon cycle. Forest management can have substantial impacts on the role of forests in the carbon cycle. The impact of forest management on the global hydrological cycle is also important, but related indicators are found under criterion 3.

ELEMENT 4.1: CARBON CYCLE

Concentrations of greenhouse gases in the atmosphere are increasing as a result of human activities. While the impact is not known with certainty, it is believed that humans are having a discernible influence on the global climate, and that future effects will be potentially more serious. The major source of emissions is the burning of fossil fuels, and the major greenhouse gas in terms of volume emitted is carbon dioxide. Global ecological cycles are believed to be negatively affected by the accelerated release of CO₂ into the atmosphere. Estimates of the total carbon stored in Canada's forests and the balance between carbon sequestration and carbon release from forests and forest products provide indicators of the nation's contribution to atmospheric carbon. Measures of forest sector CO₂ emissions are used to track the industry's reliance on fossil fuels for conversion of raw materials to manufactured products.

ELEMENT 4.1: CARBON CYCLE

- 4.1.1 Net change in forest ecosystem carbon. (Core Indicator)
- 4.1.2 Forest ecosystem carbon storage by forest type and age class. (Supporting Indicator)
- 4.1.3 Net change in forest products carbon. (Core Indicator)
- 4.1.4 Forest sector carbon emissions. (Core Indicator)

Relevant indicators under other criteria

Forests make a major contribution to global cycles through the uptake, storage and release of carbon. The longevity and large area of standing crops can make forest ecosystems particularly well adapted to long-term positive carbon balance. Conversely, conversion of forest lands to low biomass, short-lived standing crops with rapid turnover rates, or the permanent removal of forest cover, can reduce the land's capacity to absorb and store carbon. For this reason, information on the area of forest (indicator 1.1.1), additions and deletions to the forest area (indicator 2.2), and the area disturbed by fires, insects, disease and harvesting (indicator 2.3) provide important supplemental information when discussing forest contributions to the global carbon budget.

Hydrological cycles are also a vital component of global ecological cycles. The removal of forest cover (indicator 3.3), by natural and anthropogenic causes, can have significant impacts on aspects of the hydrological cycle such as streamflow and water yield.

CRITERION

5

Economic and Social Benefits

5.1 Economic Benefits

5.1.1

5.1.2

5.1.3

5.1.4

5.1.5

5.2 Distribution of Benefits

5.2.1

5.2.2

5.3 Sustainability of Benefits

5.3.1

5.3.2

5.3.3

5.3.4

5.3.5

5.3.6

Sustaining the flow of benefits from forests for current and future generations

Forests provide substantial commercial benefits, including timber, non-timber forest products, water and tourism, and significant non-commercial benefits, including wildlife, recreation, aesthetics, and wilderness values. Although not always measurable in monetary terms, all these activities are highly valued by Canadians and provide significant benefits to Canadian society. The distribution of these benefits is a key aspect of social equity. Sustainable forest management requires that forests be managed to provide these goods and services over the long term.

ELEMENT 5.1: ECONOMIC BENEFITS

Canadians receive many economic benefits from the forest. Timber products, non-timber forest products and forest-based services are produced, consumed, and traded internationally. Wealth from forest use flows to Canadians through the market economy (which can be measured with economic indicators such as gross domestic product) and through the subsistence economy (involving income in-kind from the extraction and use of fuel wood; building materials; meat, fish, and fur products; medicinals; ecosystem services like fresh water; etc.).

- 5.1.1 Contribution of timber products to the gross domestic product. (Core Indicator)
- 5.1.2 Value of secondary manufacturing of timber products per volume harvested. (Supporting Indicator)
- 5.1.3 Production, consumption, imports and exports of timber products. (Supporting Indicator)
- 5.1.4 Contribution of non-timber forest products and forest-based services to the gross domestic product. (Core Indicator)
- 5.1.5 Value of unmarketed non-timber forest products and forest-based services. (Supporting Indicator)

ELEMENT 5.2: DISTRIBUTION OF BENEFITS

Sustainable forest management involves economic development and, with that, requires consideration of how the management control and the benefits from development are distributed in society. An examination of forest ownership and timber tenures and the distribution of key financial benefits provide important indicators of social equity.

- 5.2.1 Forest area by timber tenure. (Core Indicator)
- 5.2.2 Distribution of financial benefits from the timber products industry. (Core Indicator)

ELEMENT 5.3: SUSTAINABILITY OF BENEFITS

In order to ensure that resources are conserved while still maintaining a satisfactory flow of benefits, efforts must be made to ensure that resource use does not exceed the long-term productive capacity of the resource base to provide a wide range of goods and services. Excessive rates of resource use are unsustainable and inconsistent with the concept of sustainable forest management. In order to ensure that economic benefits continue to flow to Canadians, it is vital that a fair and competitive investment climate be maintained within the forest sector. A competitive rate of return is essential if Canada's various forest-based industries are to attract the necessary capital for maintaining their capacity to create jobs and incomes for Canadians.

- 5.3.1 Annual harvest of timber relative to the level of harvest deemed to be sustainable. (Core Indicator)
- 5.3.2 Annual harvest of non-timber forest products relative to the levels of harvest deemed to be sustainable. (Supporting Indicator)
- 5.3.3 Return on capital employed. (Core Indicator)
- 5.3.4 Productivity index. (Supporting Indicator)
- 5.3.5 Direct, indirect and induced employment. (Core Indicator)
- 5.3.6 Average income in major employment categories. (Supporting Indicator)

Relevant indicators under other criteria

The magnitude of potential economic benefits depends on the area, type, age and growing stock of forests (indicators 1.1.1 and 2.1), including those in protected areas (indicator 1.1.2), which provide recreational and other non-timber benefits. The sustainability of benefits depends on the forest's condition and productivity (indicators 2.3, 2.4 and 2.5) and on decision-making processes that consider the social costs associated with community instability (indicators 6.3.1 to 6.3.4). Similarly, investment in forest research, timber products industry research and development, and education (indicator 6.5.3) is important to ensure the continued sustainability of the economic activities based on our forests.

CRITERION

6

Society's Responsibility

6.1

Aboriginal and Treaty Rights

6.1.1

6.1.2

6.2

Aboriginal Traditional
Land Use and Forest-based
Ecological Knowledge

6.2.1

6.3

Forest Community Well-being
and Resilience

6.3.1

6.3.2

6.3.3

6.3.4

6.4

Fair and Effective Decision-
making

6.4.1

6.4.2

6.5

Informed Decision-making

6.5.1

6.5.2

6.5.3

6.5.4

Fair and effective resource management choices

The concept of sustainable forest management transcends biological, environmental, and economic considerations; ultimately, it is about people. It is about society's values, the quality of life of members of society - both individually and collectively - and the effectiveness with which we have organized ourselves as a society to ensure that we are managing the relationship between ourselves and our resources in a way that is in the best interests of present and future generations. Thus, this criterion addresses the effectiveness of institutions in managing resources in ways that accurately reflect social values, the responsiveness of institutions to change as social values change, how we deal with the special and unique needs of particular cultural and/or socio-economic communities, and the extent to which the allocation of our scarce resources can be considered to be fair and balanced.

ELEMENT 6.1: ABORIGINAL AND TREATY RIGHTS

Existing Aboriginal and treaty rights are recognized and affirmed in Canada's Constitution. Various levels of government in Canada aim to meet their legal obligations with respect to Aboriginal and treaty rights and develop sustainable forest management policy and

legislation for their respective jurisdictions accordingly. When discussed in relation to renewable resources, such Aboriginal and treaty rights generally relate to hunting, fishing and trapping and, in some cases, gathering.

Forest policies, legislation and agreements related to forest management should be developed, as appropriate to individual circumstances and capabilities, in consultation with affected Aboriginal communities as well as other affected groups and communities. The same is true for the forest management and planning processes. Forest management plans should reflect the options considered and actions taken with respect to Aboriginal and treaty rights. Increasingly, Aboriginal people are also taking ownership of land, often as a result of resolved land claims. Land ownership offers a level of control over resource access that does not exist on publicly owned lands or on co-managed lands.

6.1.1 Extent of consultation with Aboriginals in forest management planning and in the development of policies and legislation related to forest management. (Core Indicator)

6.1.2 Area of forest land owned by Aboriginal peoples. (Core Indicator)

ELEMENT 6.2: ABORIGINAL TRADITIONAL LAND USE AND FOREST-BASED ECOLOGICAL KNOWLEDGE

Aboriginal peoples possess a vast amount of traditional ecological knowledge related to the forest that has been passed down from generation to generation over the centuries. Efforts need to be made to use this knowledge in forest management planning.

6.2.1 Area of forested Crown land with traditional land use studies. (Core Indicator)

ELEMENT 6.3: FOREST COMMUNITY WELL-BEING AND RESILIENCE

Sustainable forest management is particularly important to rural forest-based communities. Unsustainable resource practices have the potential to result in high social costs concentrated among residents of rural communities. Many of these rural communities are Aboriginal communities that are

surrounded by forest and are dependent on the forest for their economic and social well-being. Indicators under this element examine the well-being and resilience of both Aboriginal and non-Aboriginal forest communities. Decision-making processes must consider social costs associated with community instability in order to contribute to sustainable forest management.

- 6.3.1 Economic diversity index of forest-based communities. (Core Indicator)
- 6.3.2 Education attainment levels in forest-based communities. (Core Indicator)
- 6.3.3 Employment rate in forest-based communities. (Core Indicator)
- 6.3.4 Incidence of low income in forest-based communities. (Core Indicator)

ELEMENT 6.4: FAIR AND EFFECTIVE DECISION-MAKING

Decision-making is often complicated by cultural differences, conflicting economic interests, and differences in exposure to risks. Decision-making processes are embedded within the various institutions that have been established to manage and allocate forest resources. More and more, decision-makers try to involve the public in the decision-making process in order to effectively incorporate the full range of social values into decisions and to be responsive to changes in values over time. The satisfaction of the public with their involvement in these processes is an indicator of how fair and effective the decision-making process is. Decisions are effective only if they are implemented. Compliance with laws and regulations confirms that decisions have been implemented.

- 6.4.1 Proportion of participants who are satisfied with public involvement processes in forest management in Canada. (Core Indicator)
- 6.4.2 Rate of compliance with sustainable forest management laws and regulations. (Core Indicator)

ELEMENT 6.5: INFORMED DECISION-MAKING

Part of society's responsibility to ensure sustainable forest management is a commitment to improve our collective understanding of ecosystems and the relationship between the environment and the economy. At the individual level it is important that we make an effort to learn and understand each other's perspectives relative to resource use and forest values and that individuals make an effort to become fully informed about the issues. At an institutional level, it is important that agencies responsible for forest management use the best available data, that these data are also made available to the public to increase transparency in forest management, that standards are supported by the best available research, and that agencies continue to update or add to their forest management standards.

- 6.5.1 Coverage, attributes, frequency and statistical reliability of forest inventories. (Core Indicator)
- 6.5.2 Availability of forest inventory information to the public. (Core Indicator)
- 6.5.3 Investment in forest research, timber products industry research and development, and education. (Core Indicator)
- 6.5.4 Status of new or updated forest management guidelines and standards related to ecological issues. (Core Indicator)

Relevant indicators under other criteria

Forest community well-being and resilience are also linked to indicators under element 5.3, especially the annual harvest of timber and non-timber forest products relative to the level deemed to be sustainable (indicators 5.3.1 and 5.3.2) and indicators on overall employment and average income in the forest sector (indicators 5.3.5 and 5.3.6). These indicators help to provide a measure of the availability of resources that provide employment at reasonable wages. An additional aspect of forest community well-being and resilience is the proportion of managed public forest with tenure arrangements that allow for some degree of community control (indicator 5.2.1).

1 BIOLOGICAL DIVERSITY

1.1 Ecosystem Diversity

1.1.1

Area of forest, by type and age class, and wetlands in each ecozone

1.1.2

Area of forest, by type and age class, wetlands, soil types and geomorphological feature types in protected areas in each ecozone

1.2 Species Diversity

1.2.1

The status of forest-associated species at risk

1.2.2

Population levels of selected forest-associated species

1.2.3

Distribution of selected forest-associated species

1.2.4

Number of invasive, exotic forest-associated species

1.3 Genetic Diversity

1.3.1

Genetic diversity of reforestation seed-lots

1.3.2

Status of *in situ* and *ex situ* conservation efforts for native tree species within each ecozone

1.1.1

Core

1.1.1

Supporting

2 ECOSYSTEM CONDITION AND PRODUCTIVITY

2.1

Total growing stock of both merchantable and non-merchantable tree species on forest land

2.2

Additions and deletions of forest area, by cause

2.3

Area of forest disturbed by fire, insects, disease and timber harvest

2.4

Area of forest with impaired function due to ozone and acid rain

2.5

Proportion of timber harvest area successfully regenerated

3 SOIL AND WATER

3.1

Rate of compliance with locally applicable soil disturbance standards

3.2

Rate of compliance with locally applicable road construction, stream crossing and riparian zone management standards

3.3

Proportion of watersheds with substantial stand-replacing disturbance in the last 20 years

4 ROLE IN GLOBAL ECOLOGICAL CYCLES

4.1 Carbon Cycle

4.1.1

Net change in forest ecosystem carbon

4.1.2

Forest ecosystem carbon storage by forest type and age class

4.1.3

Net change in forest products carbon

4.1.4

Forest sector carbon emissions

5 ECONOMIC AND SOCIAL BENEFITS

5.1 Economic Benefits

5.1.1

Contribution of timber products to the gross domestic product

5.1.2

Value of secondary manufacturing of timber products per volume harvested

5.1.3

Production, consumption, imports and exports of timber products

5.1.4

Contribution of non-timber forest products and forest-based services to the gross domestic product

5.1.5

Value of unmarketed non-timber forest products and forest-based services

5.2 Distribution of Benefits

5.2.1

Forest area by timber tenure

5.2.2

Distribution of financial benefits from the timber products industry

5.3 Sustainability of Benefits

5.3.1

Annual harvest of timber relative to the level of harvest deemed to be sustainable

5.3.2

Annual harvest of non-timber forest products relative to the level of harvest deemed to be sustainable

5.3.3

Return on capital employed

5.3.4

Productivity index

5.3.5

Direct, indirect and induced employment

5.3.6

Average income in major employment categories

6 SOCIETY'S RESPONSIBILITY

6.1

Aboriginal and Treaty Rights

6.1.1

Extent of consultation with Aboriginals in forest management planning and in the development of policies and legislation related to forest management

6.1.2

Area of forest land owned by Aboriginal peoples

6.2

Aboriginal Traditional Land Use as an Forest-based Ecological Knowledge

6.2.1

Area of forested Crown land with traditional land use studies

6.3

Forest Community Well-being and Resilience

6.3.1

Economic diversity index of forest-based communities

6.3.2

Education attainment levels in forest-based communities

6.3.3

Employment rate in forest-based communities

6.3.4

Incidence of low income in forest-based communities

6.4

Fair and Effective Decision-making

6.4.1

Proportion of participants who are satisfied with public involvement processes in forest management in Canada

6.4.2

Rate of compliance with sustainable forest management laws and regulations

6.5

Informed Decision-making

6.5.1

Coverage, attributes, frequency and statistical reliability of forest inventories

6.5.2

Availability of forest inventory information to the public

6.5.3

Investment in forest research, timber products industry research and development, and education

6.5.4

Status of new or updated forest management guidelines and standards related to ecological issues

