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TOWARD A CITIZENS' GUIDE TO SUSTAINABLE FOREST MANAGEMENT IN NEWFOUNDLAND AND LABRADOR

by

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ABSTRACT

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The management of forests has dramatically changed in the past few decades. Forest managers no longer can prepare and implement forest management plans in isolation of other resource values and local citizens. Today, the economic, ecological and social values are blended together into sustainable forest management. Finding a balance among these values in Newfoundland and Labrador is done through local district planning teams. The team participants need to understand the principles of sustainable forest management and the overall planning process. To help them acquire these skills and knowledge a citizens' guide to sustainable forest management was developed.

The requisite content of the guide was determined by searching the literature for citizen-guide formats. Likewise, the literature was searched to evaluate the essential components of sustainable forest management. The guide's content was determined from the results of these two searches. That content includes legislation and policy, a primer for sustainable forest management, information requirements, the process to establish a planning team, how to establish values, goals, indicators and objectives, how forest forecasts are conducted, and the need to monitor during plan implementation.

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L.J.M.

INTRODUCTION

Managing forests across Canada has changed dramatically during the past twenty years. The past two decades have seen a major change in Canada's forest sector, from a near total preoccupation with sustained-yield fibre production to a growing concern for non-timber values such as recreation, environmental quality, aesthetics and heritage (Hardy 2000). Similarly, Erdle and Sullivan (1998) reported that forest management changes occurring across Canada have included increased public participation, the inclusion of forest values such as biodiversity, wildlife habitat and ecological health, a change in management focus from stand and forest to ecosystem and landscape, and a perception change from a human and economic orientation to an environmental and ecosystem one. This management shift to a more ecological and participatory approach has been termed sustainable forest management (CCFM 1995; 1998).

Never the less, the sustainable forest management (SFM) concept is not new. At the Canadian Institute of Forestry - Newfoundland Section meeting in 1955, Don Nickerson (1955) presented a paper espousing the need to manage forests sustainably for a range of ecological and resource values. Likewise, Emmett (2000) quoted Dr. Frank Adams (Dean of Applied Science at McGill University and President of the Royal Society of Canada) in 1965 as saying "we are prosperous now, but we must not forget that it is just as important that our descendants should be prosperous in their turn.

Each generation is entitled to the interest on the natural capital, but the principal should be handed down unimpaired."

While the concept of SFM has been around since the mid 1900s, society has now demanded that it be implemented. Applying SFM means involving interested stakeholders (organizations/agencies) and citizens in developing SFM plans. This involvement of non-timber interests, however, has not been without its struggles. Efforts to apply SFM have resulted in conflicts between various stakeholders who represent specific values. This is supported by Ross (1995) who stated that Canada has witnessed increasing conflicts among governments, forest workers and the general public. Similarly, Kimmins (1997) identified numerous reasons for forest controversies, prominent among them being the different societal views on the nature and balance of values for which forests should be managed.

Provinces across Canada have been implementing a variety of public involvement processes and have been designing management tools to incorporate the range of values being defined in SFM. Duinker (1998a) recognized these efforts when he stated:

> "the Canadian public is actively involved in provincial and national forest policy discussions and debates as well as forest management planning exercises on local public lands. These participation processes range from using consensus decision-making frameworks (Newfoundland Forest Service 1995) to some form of public advisory groups (O'Neill 1993; Chege 1994; BC-CORE 1995; Yukon Renewable Resources 1995; Ontario Ministry of Natural Resources 1996; Weyerhaeuser Canada 1997)."

Public involvement processes have evolved as people are becoming increasingly critical of traditional resource management decision-making processes (Higgelke and Duinker 1993). They are not satisfied with the decisions of resource managers and the

management actions being implemented. Consequently, people want to participate in decisions that affect their lives, and fewer people are accepting decisions dictated by someone else (Fisher and Ury 1981). Duinker (1998a) suggested that people are becoming more engaged in public participation processes. However, these involvement concepts demand that participants be knowledgeable about SFM to enable meaningful involvement.

Citizens' knowledge of SFM is critical to the success of the planning exercise and management of the forest. Traditionally, there has been no, or at best limited, information on SFM supplied to citizens. Even when information has been provided, it has been sporadic. Citizens had to determine what the information means, what is useful, and how to apply the knowledge within the context of a planning team.

The current public involvement process in Newfoundland and Labrador began in 1993 when the Department of Forest Resources and Agrifoods submitted a five-year operating plan for Management District 20 (Cartwright, Labrador) for registration under the Environmental Assessment (EA) Act. Following review of the plan, the Minister of Environment and Labour required an environmental preview report (EPR).
The purpose of the EPR was to elaborate an adaptive management concept proposed in the plan as a method to involve non-timber interests, resolve resource conflicts and address past problems with the application of EA to five-year operating plans.

The conflicts between timber and other forest values involved gaps in the basic understanding of the forest ecosystems being managed. The adaptive management concept was proposed as an approach to management that involved learning about

ecosystems through the management of them and applying more-rigorous science to planning. Based on the EPR, the Department of Forest Resources and Agrifoods was released from further assessment and the Newfoundland Forest Service became committed to a new planning framework that included:

1. Establishing planning teams (comprised of local public, organizations and government representatives) to prepare district management plan reports and five-year operating plans.
2. Applying the process to the preparation of all district management plan reports and five-year operating plans, regardless of land tenure.
3. Using a consensus decision-making framework as opposed to consultation.
4. Applying adaptive management as the foundation of the new process. Learning about ecosystems would occur through their management.
5. Introducing a strong science foundation to the plans.
6. Conducting a review of the adaptive management process to assess its effectiveness.
7. Resubmitting the district 20 five-year operating plan using the new planning process.

Since implementation of the process in 1995, sixteen, five-year operating plans have been submitted for registration through the EA process. All sixteen plans have been released from further assessment, signifying that resource conflicts and uncertainty in knowledge and management are now being addressed successfully.

In April, 1998, the Newfoundland Forest Service evaluated this adaptive

management planning process. During the assessment, a profound lack of understanding about the process and forest management concepts among non-forestry personnel was identified. This situation was constraining the potential effectiveness of the public's involvement. Moores and Duinker (1998) recorded the educational weakness as follows:

> "Probably the largest set of issues has to do with erroneous expectations for and understanding of the process. Workshop participants felt that many people have serious misconceptions about the planning, decision-making and public participation process in general, and about the Newfoundland forest-planning process in particular. For many stakeholders, uncertainty prevails, so the learning curve is steep. People are unsure of their roles and responsibilities, of how decisions are made, of the bounds of the process, of the time-frames involved, of how to seek decisions by consensus and other matters."

Recently, planning team participants in Newfoundland and Labrador have again expressed their frustration with understanding the concept of SFM and how it is implemented in the province (Anonymous 2000). To improve this situation, A Citizens' Guide to Sustainable Forest Management in Newfoundland and Labrador was developed. The guide identifies the key components of SFM, how the planning process is implemented, and how citizens of the province can actively participate in planning and implementation of SFM.

What information needs to be contained in such a citizens' guide? What form would such a guide take? The literature and internet were searched for existing citizens' guides (Levy undated; Anonymous 1982; Anonymous 1985; Vance 1990; Northcare 1992; Ontario Ministry of Natural Resources 1997; Newfoundland Forest Service 1999; Eastern Community Co-op 2000; Utzig and Macdonald 2000) and the primary

components of SFM. These guides have focused on describing components of SFM (plans, planning framework, public involvement, annual allowable cuts) and are briefly discussed below.

The Federation of Ontario Naturalists (FON) produced a guide titled Timber Management Planning: A Guide for the Public (Levy undated). The guide describes how citizen's can analyze and make critical comment on individual timber management plans. It focuses primarily on a basic understanding of ecology and how timber values influence other values. While this guide is strong in forest ecology and management, it is weak in how planning teams are formed, defining the role of participants, what inventories are required for planning, and how monitoring will occur.

A Citizens' Guide to Forest Planning (Anonymous 1982) was designed to help people get involved and influence the forest planning process. It has a definite focus on timber management and how to extract timber. The guide describes the concept of forest management, but provides minimal understanding of how citizens can actively participate in planning.

The technical aspects of SFM are explained in the Citizens' Guide to Timber Management in the National Forests (Anonymous 1985). How the public can participate in the timber management areas is lacking or absent from the discussion.

Vance (1990) has developed the guide Tree Planning: A Guide to Public Involvement in Forest Stewardship. This guide provides a good description of the criteria involved in managing timber. However, the guide provides no direction as to how the public can be involved in planning. Offered is a basic layman's overview of

the concepts pertaining to timber management.

There are three guides (A Guide to Forest Management Planning in Ontario (Northcare 1992); A Guide to Forest Management Planning (Ministry of Natural Resources 1997); A Citizens' Guide to Public Participation in Forest Management (Extension Community Co-op 2000)) all of which describe the overall planning process and how the public can be involved. The components of SFM are absent, along with how citizens can effectively participate. Likewise, the roles and responsibilities of the public are not described.

The Newfoundland Forest Service (1999) prepared a District Ecosystem Management Planning Team Participants Handbook. This handbook focuses on the overall planning process and how the public can participate. The roles and responsibilities of citizens is explained along with how decisions are made and the necessity for ground rules. The technical aspects of SFM are not mentioned in the handbook.

In British Columbia there is a Citizens Guide to Allowable Annual Cut Determination: How to Make a Difference (Utzig and Macdonald 2000). This is a detailed guide explaining how the province of British Columbia conducts its annual allowable cut calculation and where the public can participate. While this is an extensive guide on the calculation of annual allowable cuts, no other component of SFM is mentioned.

These guides separately describe various components of SFM and the planning process. However, no single guide appears to consolidate all the components of SFM

from policy and legislation to understanding SFM, public involvement, required inventories and monitoring. Likewise, the existing guides provided only cursory explanation of how citizens can actually engage in discussions pertaining to SFM.

All this information was evaluated to determine how to structure the guide. I believe the guide should be structured to contain the following components: policy and legislation; understanding of SFM; inventory; public involvement process; establishing values, goals, indicators, objectives; forecasting future scenarios; and monitoring. These proposed components will focus citizens on the legal planning framework within the province and an understanding of SFM. Citizens need to become more active in establishing values, goals, indicators and objectives, and in how the objectives will be developed. Most important, citizens need to understand monitoring concepts and their role in monitoring during plan implementation. A table of contents was designed for an SFM guide, the rationalization of which follows:

1. The legal framework for SFM and public involvement provides the authority and setting for management. Clearly, a citizens' guide must establish the legal bounds of the process and bring clarity to the task the public is to undertake. Without clarity on the legal bounds and task, false expectations arise of what the process can deliver for the participants.
2. The learning curve to understand basic concepts of SFM is steep. Consequently, a conceptual primer is proposed to provide a basic appreciation of the key components associated with SFM. The actual content for the primer is derived from various sources of literature (e.g. Erdle and Sullivan 1998; Erdle 1999; Duinker 1999).

3. An inventory of information on the forest and all forest values is critical to producing a credible plan. This information must be readily available to planning team participants.

4. Defining the process to establish a planning team is important. Participants need to understand the transparency of the process, the various expectations of participants, and how decisions will be made. Explaining how a planning team is created is the first order of business when establishing the process.

5. A primary function of planning teams is establishing values, goals, indicators and objectives. Understanding these concepts and how to establish the actual content is essential to a meaningful plan. Planning team members need to understand the process to develop their own values, goals, indicators and objectives, and that forecasts of future forest conditions and scenarios are necessary elements of technically sound planning. Alternative strategies should be evaluated which test a range of variables before selecting a preferred strategy.

6. Finally, a citizens' guide must include a section on monitoring. A key complement to the forecasting component of SFM is to monitor the actual results in the forest. The comparison of monitoring data versus forecasted data enables learning and improved management in the future.

An actual SFM plan contains descriptive information about the management district. The descriptive data are necessary to understand the context of the forest being managed, but is not an essential component of SFM to warrant being highlighted in the citizens' guide.

The guide I am proposing will bring together the planning process and

framework, as well as basic SFM concepts, including an explanation of a consensus decision-making process. The foundation for this citizens' guide was achieved by researching and summarizing the necessary literature to validate the appropriate SFM components. These components are placed into context of relevance to citizens participating in SFM and their applicability in Newfoundland and Labrador. The Appendix contains the proposed text and elements of the guide. The objective of this report is, then, to provide justification and explanation of the concepts to be included in a citizens' guide to SFM in Newfoundland and Labrador.

LEGAL POLICY SETTING IN NEWFOUNDLAND AND LABRADOR

HISTORY

Forest policies are paths and means to direct management of forests. In Canada, strong public forest policy is vital because Canada is 45% forested, hold about 10% of the world's forests, and 90% of all forest lands are public (Luckert and Salkie 1998). Timber being reserved for the use by the French and British navies (eastern and central Canada) was the initiation of forest policy in Canada. From there it expanded into the regulation of transport and export activities associated with the square timber trade after 1806 (Ross 1995). Kimmins (1997) suggested that forest management during this time was largely unregulated exploitation.

Prior to the 1940s, Ross (1995) found that forest policy in Canada dealt largely with licensing timber to the growing pulp and paper industry. The development of this industry had a big influence on forest policy in Canada. Specifically, the capital-intensive nature of this industry and its large-scale production of paper required a long-term commitment of a fibre supply to ensure the viability of the industry. Consequently, timber on Crown land was licenced to corporations.

The next policy development stage occurred from the 1940s to the 1970s where policy was implemented to ensure the long-term conservation of forest resources. This meant that policy focused on forest protection and sustained-yield forest management. Such a direction remained in place until the 1980s when non-timber values began to be

considered in policy. Today, Adamowicz and Veeman (1998) suggested that there are two emerging policy approaches to SFM:

1. A social science approach to forest management with the objective of maximizing the net social benefit. The objectives include benefits associated with economic activity along with preferences for environmental attributes such as recreation, aesthetics, and biodiversity.
2. The second policy approach centres on a natural disturbance regime paradigm which constitutes a biocentric approach to policy that relies on hypotheses about natural patterns inherent in ecosystems (e.g. fire, insects, wind). The main hypothesis presented in the literature is that by maintaining the disturbance-related patterns on a regional scale, sustainability will be achieved.

Adamowicz and Veeman (1998) suggested that the natural disturbance approach appears to have risen in response to weakness in the social science approach.

Forest policy in all provinces has had a similar evolution from unregulated exploitation to regulation of forest users through the allocation of various resource tenures. Policy has progressed from the protection of forests from fire and insects to sustainable fibre management until today when we have policies with significantly more emphasis on non-timber values and their management (Adamowicz and Veeman 1998). Today, policy-makers are challenged to remain flexible enough to respond to these changes in management direction and public values in the pursuit of SFM, while ensuring that the forest-products sector remains competitive and is able to respond to international pressures (Luckert and Salkie 1998).

NEWFOUNDLAND AND LABRADOR

Understanding the legal framework associated with managing the forests of the province is essential to planning and implementation. Legislation, regulations and policy establish the context and bounds of citizen involvement in SFM. Without the bounds of authority established, citizens may develop false expectations of their authority in SFM. There have been occasions in forest management planning in Newfoundland and Labrador when citizens believed they could change legislation, regulations and policy, or at least establish separate regulations and policies for a particular management district. The provincial government considers this expectation unreasonable as government does not delegate its legislative authority to planning teams in Newfoundland and Labrador. Therefore it is critical for the legal and policy setting to be clearly articulated and understood.

For example, citizens need an appreciation of the planning framework to understand the task they are requested to achieve i.e. prepare a district forest management plan report and five-year operating plan. Clarification is required to discern if a timber management plan is the task, or if non-timber values are to be a component of the planning exercise. How non-timber values will be incorporated into the plan also needs to be addressed and clearly stated.

The legal framework for forest management in Newfoundland and Labrador is found in the Forestry Act 1990 (Government of Newfoundland and Labrador 1990). The Act assigns the Newfoundland Forest Service the mandate to manage the forest resources of each forest management district as the legal planning area and proclaims

that each district must prepare a forest management plan. The province is divided into eighteen forest management districts on the island of Newfoundland and six in Labrador (Figure 1).

Section 4 of the Forestry Act provides the legal authority for the Newfoundland Forest Service to ensure the proper management, protection and utilization of the forest resources of the province. Specifically, the Forest Service shall supervise, control and direct all matters relating to:

1. Constructing and maintaining forest access roads.
2. Protecting the forests of the province from fire, insects and disease.
3. Carrying out programs of afforestation, reforestation, forest improvement and tree improvement.
4. Cutting, classifying, measuring, manufacturing, marking and inspecting trees and timber.
5. Preparing timber management plans for areas of productive forest land.
6. Developing and maintaining an up-to-date inventory of the timber resources of the province.

Also, the Forestry Act (Section 3) instructs the Minister to consult with and advise all departments of government respecting the planning, development and use of the forest resources of the province. The Minister must also consult with the residents of the province, in an appropriate manner, who may be directly affected by:

1. The preparation of a forest management plan.
2. The designation of a timber production forest.
3. The issuance of a Crown timber license or a timber sale agreement.

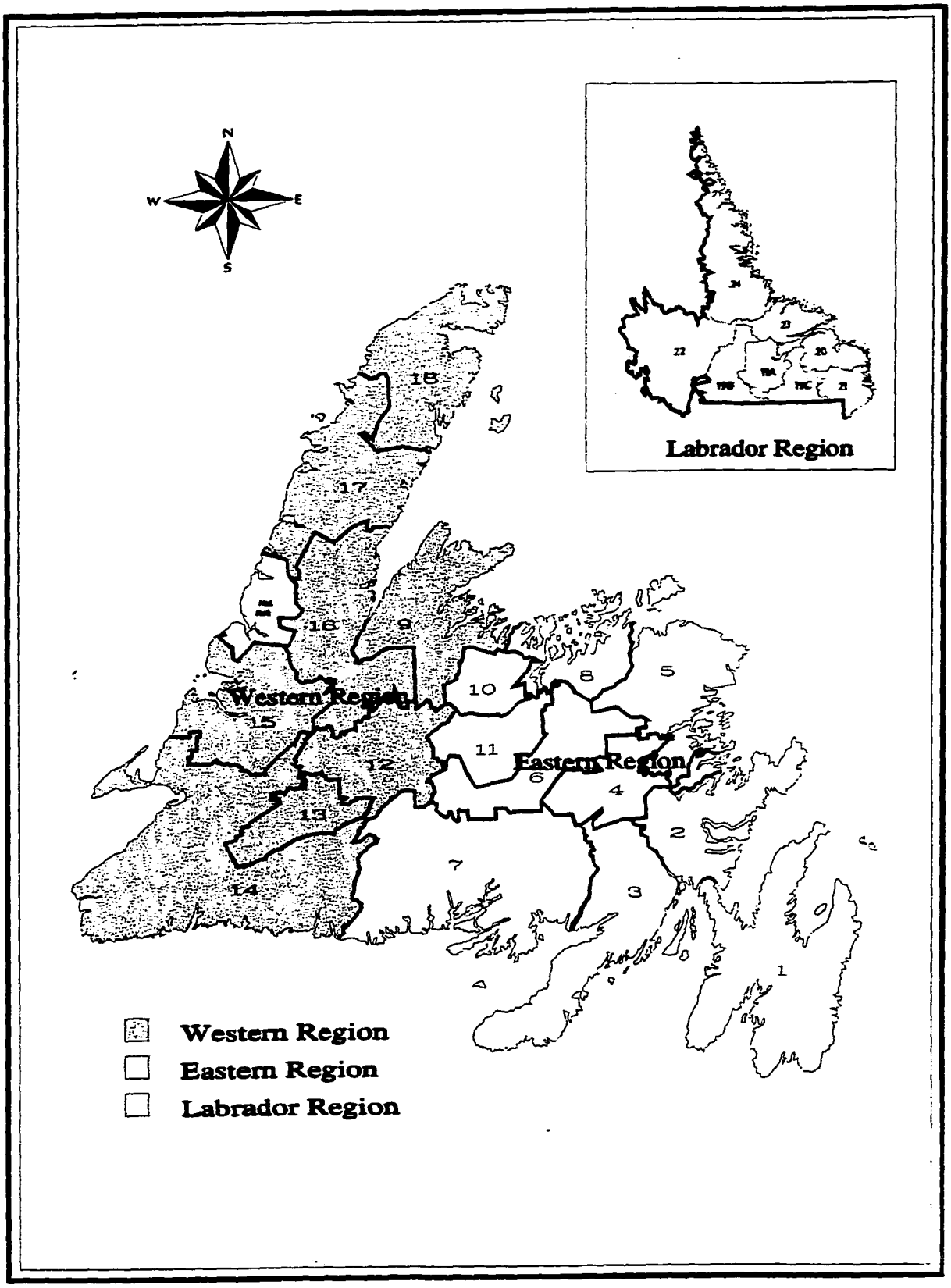

Figure 1. Forest Management Districts in the Province of Newfoundland & Labrador

Besides the legal requirements, policy direction for the Newfoundland Forest Service is derived from the Provincial Twenty-Year Forest Development Plan, (Newfoundland Forest Service 1996) the National Forest Strategy (CCFM 1998) and the Canadian Biodiversity Strategy (Environment Canada 1995). The overarching policy statement for the Newfoundland Forest Service is found in the vision statement of the Provincial Twenty-Year Forest Development Plan (Newfoundland Forest Service 1996):

> "To conserve and manage the ecosystems of the Province which sustain forests and wildlife populations and to provide for the utilization of these resources by the people of the Province under the principles of sustainable development, an ecologically-based management philosophy and sound environmental practices."

Additionally, the Provincial Twenty-Year Forest Development Plan (Newfoundland Forest Service 1996) identifies five guiding principles:

1. "To manage ecosystems so that their integrity, productive capacity, resiliency and biodiversity is (sic) maintained.
2. To refine and develop management practices that reflect all resource values in an environmentally sound manner.
3. To develop public partnerships and networks to facilitate meaningful public involvement in resource management.
4. To promote adaptive management and conduct research that focuses on ecosystem processes, functions and ecosystem management principles.
5. To establish and enforce conservation and public safety laws with respect to managing ecosystems."

These guiding principles provide the management philosophy of the Newfoundland

Forest Service and overall policy direction.

Perhaps the most significant change in forest policy has been the rising importance of ecological concerns and the broad acceptance of public involvement in decision-making processes (Duinker 1998a). According to Thomas (1999), foresters must come to grips with the reality that forestry is too complex and too important to be left solely to foresters. For many citizens, values like fish, wildlife, recreation and water quality are at least as important as wood products (Shindler 1998). The forest industry and provincial governments across Canada have addressed society's demand for consultation by implementing processes to involve the public (Duinker 1998a).

What has resulted in resource management is a shift from representative democracy whereby elected officials act on behalf of the citizens, towards a participating democracy where people effect decisions autonomously (Roberts 1995). This involvement demanded by society has evolved concurrently with the broadening of values held by society and with the non-timber benefits expected from the forest. Blouin (1998) stated that public involvement is no longer an option as people desire to exercise their right to determine how their forests are managed using participatory democracy approaches. The benefits of public participation have been documented and are summarized as follows (Blouin 1998; Moores and Duinker 1998):

1. More-insightful decisions that reflect a broader range of public concerns, interests and values.
2. Reduction or avoidance of conflict and confrontation resulting from decisions and public support for and ownership of the decisions taken.
3. Increased credibility of the forest management planning process.

4. Building partnerships and expanding the education of all parties involved.

SFM involves all interests sitting at the same table to develop a plan. In fact, Naisbitt and Aburdene (1990) claimed that participatory democracy is one of the ten mega-trends occurring in society. Throughout the past five years, the Newfoundland Forest Service public involvement process has involved a potentially large list of stakeholders (Figure 2).

The Provincial Twenty-Year Forest Development Plan (1996-2016), in addition to describing the province's forest resource and its management policies, also provides a detailed timber supply analysis which establishes the timber available for harvest for a five-year period. The development plan directs provincial strategies on the management of forest ecosystems and must be revised every five years according to the Forestry Act 1990.

The Forestry Act 1990 gives the Newfoundland Forest Service the mandate "to ensure the management, protection and utilization of forest resources of the province." To fulfil this obligation, the Act states:

> "all persons who have a right to cut and remove trees from a parcel of land, or part of a parcel, or who are vested with a continuing benefit derived from having the trees cut and removed on their behalf, are responsible for the proper management of the land."

Proper management is developed through the preparation of plans, regardless of tenure, in accordance with the province's Guidelines for the Preparation of Forest Ecosystem Management Plans (Newfoundland Forest Service 1995b), which embraces an adaptive management approach and reflects the requirements of a 1995 generic EPR

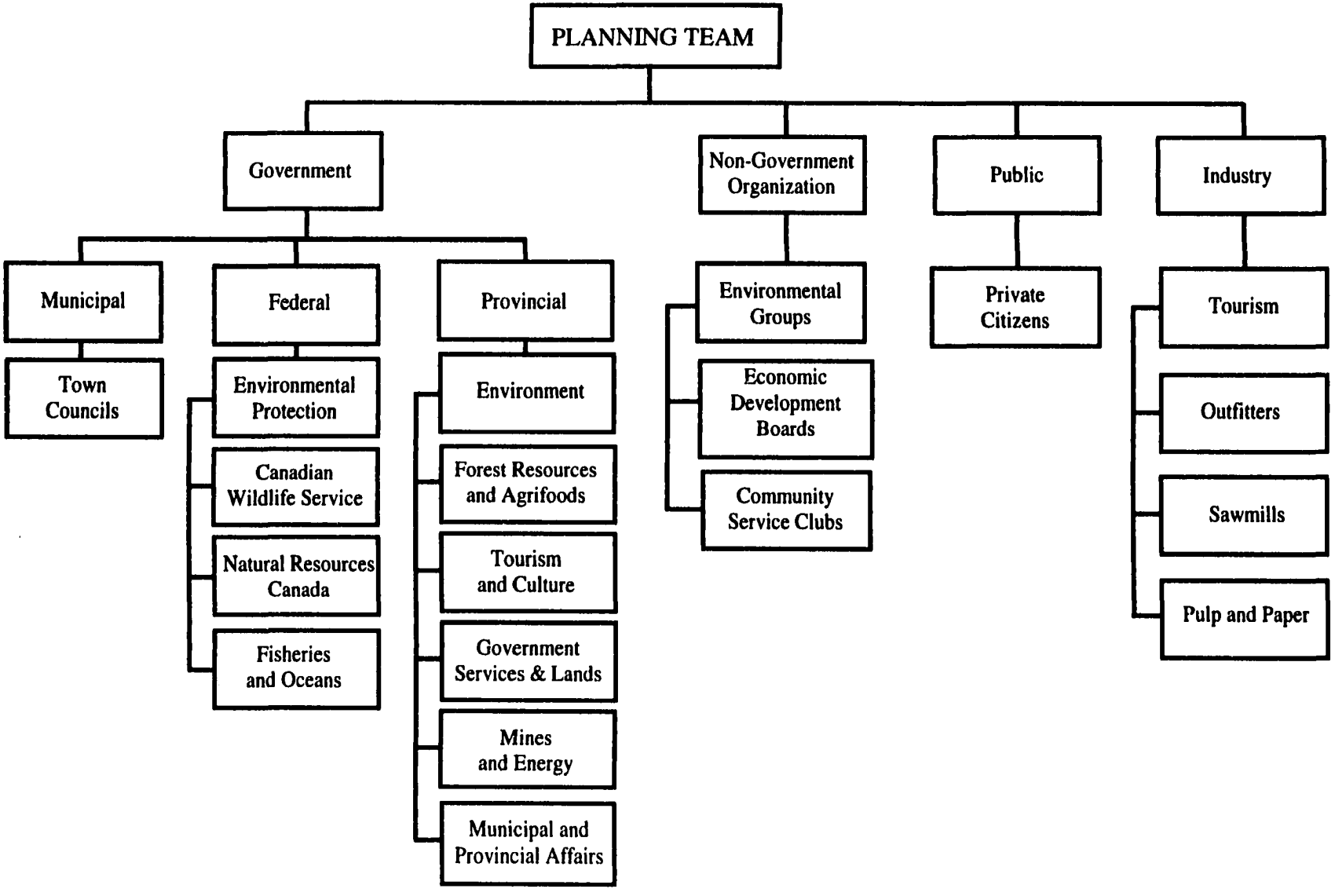

Figure 2. Potential stakeholders for participation on planning teams.

(Newfoundland Forest Service 1995a) on a proposed adaptive management planning process.

MANAGEMENT PLAN REPORT

Each district must produce a Forest Management Plan which comprises the following three documents: a twenty-year management plan report, a five-year operating plan and an annual work schedule (Figure 3). Section 2(1) of the Forest Act 1990 states:

> "the management plan report means a document describing the parcel of forest land to which the plan applies and setting out the nature and extent of the forest resources contained within the parcel, the problems associated with the attainment of a regulated forest and the general policies and practices to be employed in the long-term for the attainment of a regulated, sustained yield forest."

The Forestry Act further defines sustained yield management as:

> "a policy, method or plan of management to provide for an optimum continuous supply of timber in a manner consistent with other resource management objectives, sound environmental practices and the principles of sustainable development."

The management plan report (now called the district ecosystem strategy document) uses the Provincial Twenty-Year Forest Development Plan as the basis for management direction.

FIVE-YEAR OPERATING PLAN

The five-year operating plan identifies the locations and types of timber to be harvested and silviculture treatments to be applied, the locations of primary resource

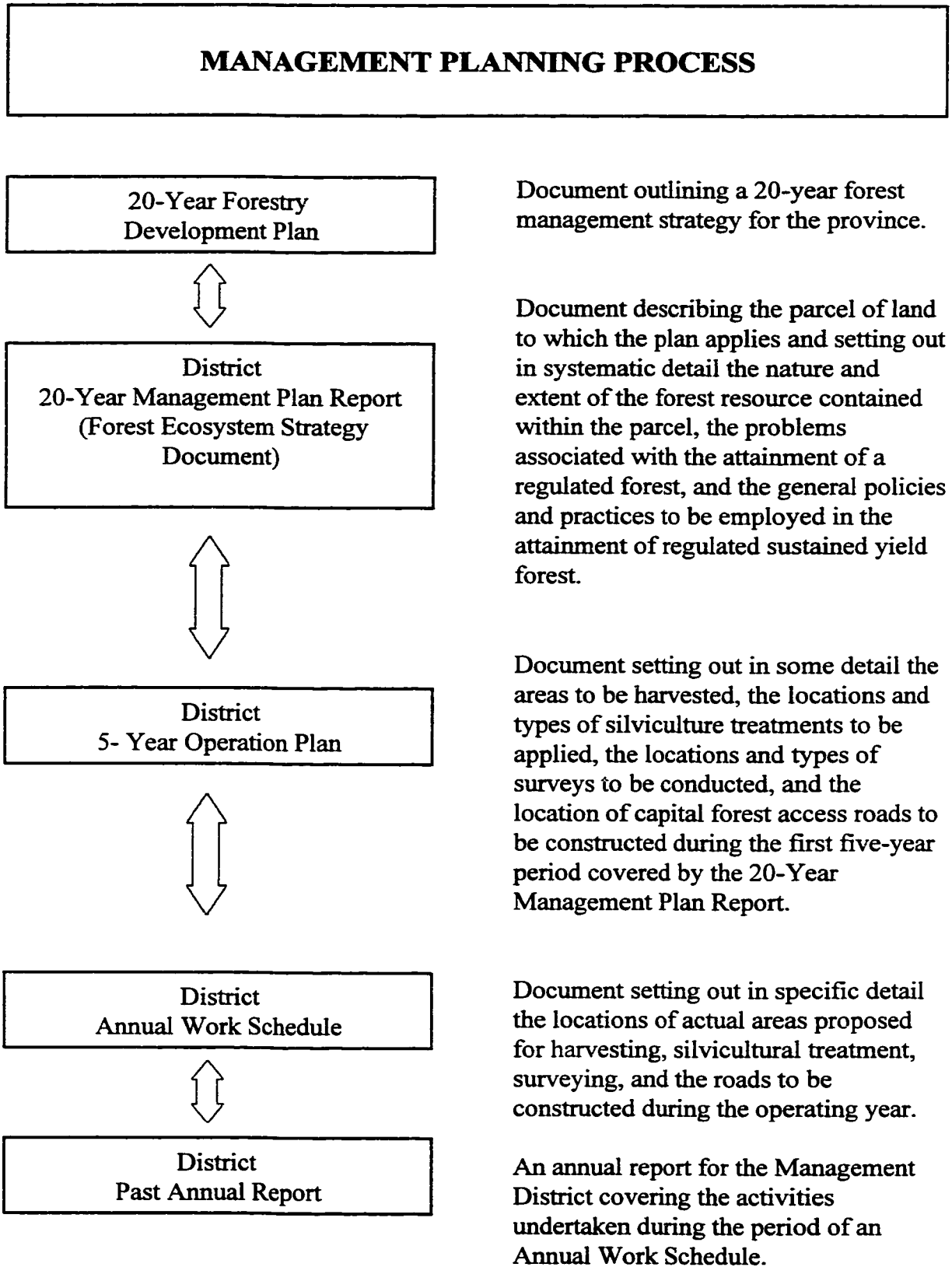

Figure 3. Sustainable forest management planning framework for Newfoundland and Labrador.

access roads, and demonstrates how various forest values will be integrated when timber management actions are implemented. The five-year plan actions are described in more detail (e.g. maps outline the general areas as to where, when, and how activities will occur) than in the management plan report. The annual allowable cut is defined in the management plan report and is allocated spatially and temporally in the five-year operating plan.

ANNUAL WORK SCHEDULE

The annual work schedule identifies exactly where forestry operations are to occur for a particular year. Where the five-year operating plan provides general locations, the annual work schedule provides specific details for all proposed activities.

PAST ANNUAL REPORT

Each year a past annual report is completed. This report covers the activities undertaken during the period of the previous annual work schedule. Comparisons of proposed versus actual on-the-ground activities are conducted and any discrepancies explained.

ENVIRONMENTAL ASSESSMENT

Environmental assessment legislation and regulations influence SFM in Newfoundland and Labrador. The Government of Newfoundland and Labrador proclaimed a new Environmental Assessment (EA) Act in May, 2000, and new regulations were approved and effective August 3, 2000 (Government of Newfoundland

and Labrador 2000a; 2000b). The EA Act defines environment to include the physical, biophysical, social, economic, recreational and cultural environments. This broad interpretation gives the EA Act a mandate to evaluate the ecological, economic and social implications of almost any proposed development activity.

Schedule 1 of the current EA Regulations identifies five-year operating plans as a development and, therefore, a registerable undertaking subject to EA. Each plan has to be registered no later than 180 days prior to implementation. Registering the plan with the Minister of Environment and Labour involves five major steps:

1. Registration: Every proponent who is planning an undertaking which has the potential to produce a significant effect on the environment is required to register the project with the Minister of Environment and Labour.
2. Screening process: Within ten days of the date of registering a project, the Minister of Environment and Labour must publicly announce receipt of the registration document and make it available to interested members of the public and government (federal/provincial) departments for assessment and comment within thirty-five days.
3. Minister's decision: Within forty-five days of having received the project registration, the Minister must make one of three decisions and inform the proponent. The three possible decisions are: release the undertaking, order an environment preview report (EPR), or call for a complete environmental impact statement (EIS).
4. Proponent's action: Based on the Minister's decision, the proponent can either implement the undertaking, prepare an EPR, or develop an EIS.

5. EPR/EIS is completed: The Minister announces receipt of the EPR/EIS document and the assessment committee and the general public make recommendations to the Minister on its acceptance. The Minister can make the decision on an EPR; however, the Cabinet makes the final decision on an EIS.

When the Minister calls for further assessment, an environmental assessment committee for the proposed development is established. The committee undertakes to guide and analyze the assessment produced by the proponent and advises the Minister on the acceptability of all baseline studies and assessment reports.

In Newfoundland and Labrador, the legal context for participating on a planning team and preparing a management plan report and five-year operating plan is described at the beginning of the process. Participants are invited to ask questions that clarify the legal context of the planning exercise and their level of authority and autonomy. Likewise, the planning framework and specific district plans to be prepared are outlined and described. Again, participants ask questions for clarification on type of plan to be produced (e.g. timber vs. ecosystem).

CONCEPTUAL PRIMER OF SUSTAINABLE FOREST MANAGEMENT

SUSTAINABLE FOREST MANAGEMENT

Forest management continues to evolve in Newfoundland and Labrador. Historically the forests was utilized domestically for fuelwood, construction timber and boat building. Today, domestic use of the forest is still an important value. Commercial use of the forest started in the 1800s with the harvesting of white pine for ship masks and progressed to sawmills and finally pulp and paper. Initial management direction in Newfoundland and Labrador involved introduction of a fire suppression program during the 1960s. By the early 1970s, forest protection programs aimed at fire and insects was the primary management effort.

In 1974 the province was divided into forest management districts and each district was to have a forest management plan. At that time these plans focused entirely on managing the forest for timber production. This management focus remained until the late 1980s when the public, other forest industries and organizations began to bring forward alternative values and objectives beyond timber. The evolution from timber management in Newfoundland and Labrador toward SFM signified a philosophical shift in forest management.

SFM attempts to ensure continuous availability of timber, recreation, wildlife, and other values over time in a forest (Baskerville 1996). While the values and objectives may change and the means to reach them become more sophisticated, forest

management is still an attempt to guide forests towards the values and goals established by society. The basic concept is to take a parcel of land, determine the values and goals for the area, and then decide what type of future forest conditions are required to meet them. After establishing the goals and the preferred future forest, actions are designed and implemented. Finally, SFM involves monitoring the actions to determine if the forest response is as forecasted. Based on this new knowledge, the plan is revised accordingly. Erdle and Sullivan (1998) defined the process of forest management this way:

1. Designing and implementing a set of actions; which
2. Is deemed likely to result in a set of forest conditions; which
3. Is deemed likely to provide the desired values in the desired amount over time.

The Canadian Standards Association (CSA) - Sustainable Forest Management standard (Canadian Standards Association 1996b) defines SFM as:

> "management to maintain and enhance the long-term health of forest ecosystems, while providing ecological, economic and cultural opportunities for the benefit of present and future generations."

The CSA continuous management loop Figure 4 (Canadian Standards Association 1996b) provides an adaptive management structure for SFM which includes preparation - planning - implementation - measurement and assessment - review/improvement.

Baskerville (1996) proposed that to maintain the range of values determined by society requires the manager to define the relationship between the value and forest condition (stand type, age of stand development and geographical pattern of types and stages) that supports the value (Figure 5). Without this information, the value cannot be

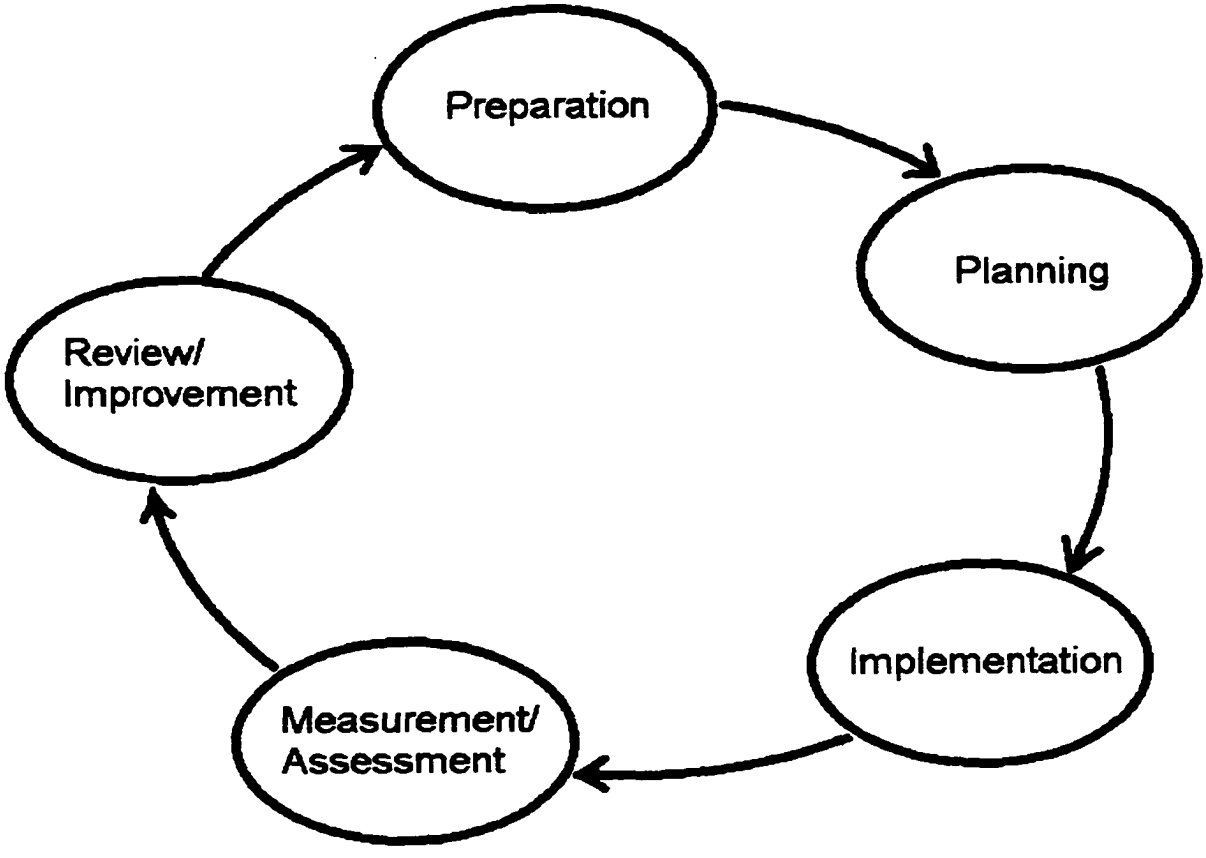

Figure 4. Continuous management loop for sustainable forest management (Based on Canadian Standards Association 1996b).

Forest Value	Stand Structure and Composition	Forest Pattern
Operable timber	> 100 m^3/ha > 1.5 m^3/tree	> 5 ha stand size > within 2 km of road neighbour > 10 years
Aesthetic View	openings defined as: Crown closure <50 % or height < 5 m	openings < 10% of areas within delineated zone single openings < 10 ha
Mature Coniferous Habitat	>100 m^3/ha softwood >60 years old	>375 ha concentrated within 500 ha

Figure 5. Example of defining forest values in terms of stand structure, composition and pattern (based on Erdle and Sullivan 1998).

managed in a forest (Baskerville 1996; Erdle and Sullivan 1998). This approach is probably best suited to managing biological values that are related to forest parameters. It is not possible to define some important forest-related values, such as those associated with CCFM (1995) criterion six (Accepting Society's Responsibility for Sustainable Development) through a forest parameter definition.

The concept of SFM is implemented in the district management plan report. The report's overall strategy addresses the ecological, economic, and cultural values and how they are sustained. The district planning teams identify the local values and determine how to balance the values into the future. The decisions from these discussions form the foundation of the management plan report.

ADAPTIVE MANAGEMENT

Adaptive management for natural resources and the environment was initiated in the early 1970s by Dr. C.S. Holling and Dr. C.S. Walters and their associates at the University of British Columbia and the International Institute for Applied Systems Analysis near Vienna, Austria (Holling 1978). The adaptive management concept focuses on learning while managing a complex system where uncertainty is high regarding ecological relationships. As Holling (1978) explained, adaptive management assumes that knowledge is provisional and focuses on management as a learning process incorporating the results of the previous actions and allowing managers to remain flexible and adapt to uncertainty.

The concept of adaptive management has been heralded as the logical framework for applying SFM (Baskerville 1985; Lee 1993). Application of adaptive

management in SFM is logical because huge forest ecosystems are being managed under conditions of profound uncertainty about the interrelationships and interactions among forest values and management strategies. Adaptive management provides a framework for learning about these relationships in a structured environment.

Bernard et al. (1994) identified four positive attributes of using an adaptive management framework:

1. Improved decision-making: Actions are designed to encourage "learning to manage by managing to learn." New knowledge is used to re-evaluate goals and objectives and consequently redesign management actions.
2. Improved public participation: Community perspectives are included in management decisions, generating creative options from a more diverse decision-making group.
3. Stronger scientific base for management: Management is designed to produce information through testing and retesting of assumptions and forecasts.
4. More systematic approach: An adaptive management approach requires various agencies to work together as a whole to achieve defined objectives.

Conversely, a report published by ESSA (1982) cited four main reasons for failure of adaptive management in about half of the sixty projects evaluated:

1. Lack of institutional support. Governments and/or companies are not prepared to invest the time, effort, and financial resources to make adaptive management work
2. Model inadequacies. The technical reliability of forecasting models is suspect.
3. Data inadequacies. The availability of properly collected data is low.

4. Misunderstanding of adaptive management concepts. Those involved in resource management do not have a clear understanding of adaptive management and how to apply the concept in their work.

The overall goal of adaptive management is not to maintain an optimal condition of the forest resource, but to develop an optimal management strategy (Johnson 1999). This is accomplished by maintaining an ecological resilience in the forest that allows the system to react to inevitable stresses, and by generating flexibility within institutions and among stakeholders that allow managers to react when conditions change (Gunderson 1999). In adaptive management, rather than managing for single outcomes, a series of explicit forecasts is created and tested to enable learning about the correctness of the predictions and the factors underlying them.

The application of adaptive management is in its infancy stages in Newfoundland and Labrador. Through the district planning team, forecasts are made for sustainable wood supply which results in future forest conditions. Similar forecasting tools are being developed for assessing landscapes and wildlife. The following structure, described by Duinker (1998c), will assist planning teams in designing adaptive management strategies to address the uncertainty involved in management:

1. Define the problem.
2. Determine jurisdiction involved.
3. Define the valued ecosystem components and goals.
4. Establish indicators for goals.
5. Identify driving forces and mitigations.

6. Determine the time frame and spatial bounds of the strategy.
7. Define what information is required and available.
8. Propose alternative hypotheses.
9. Examine forecasting tools and choose/build one.
10. Determine who the decision-makers are.
11. Determine how and what to monitor, and who will monitor.
12. Determine when an assessment of the strategy will occur.

Implementation of an adaptive management program will be a major challenge to the Newfoundland Forest Service and planning teams across the province. For adaptive management to be successful, participants must consider it the best approach to management.

CRITERIA AND INDICATORS

Criteria and indicators, often shortened to C&I, is the term used to describe a systematic approach to measuring, monitoring and reporting on SFM (WNMF 1999). Planning teams need to have a working knowledge of C&I to participate effectively in developing values, goals, indicators and objectives, and in creating a report on district-level sustainability indicators. Because of the important role of C&I in the structure and measuring of progress in SFM, they are a requirement in the district management plan report.

In Canada, the federal government made a commitment that by 1993 it would develop a system of national indicators to measure and report regularly on the progress in achieving SFM (CCFM 1992). Through the Canadian Criteria and Indicator

Working Group, the CCFM achieved its aim to create a framework for scientifically sound C&I for SFM in Canada (Riley 1995). The framework (CCFM 1995) establishes a working definition of SFM for Canada, and was adopted as a key component of the Canadian Standards Association (1996b) SFM standard. It provides a common understanding and definition of SFM by identifying the key values Canadians wish to sustain and enhance. The Canadian framework for C&I reflects an approach to SFM that is based on (CCFM 1995):

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

Criteria define broad values, such as biodiversity and benefits to society, which we want to sustain. Indicators establish specific variables to enable assessment of progress with the value. For each indicator there is a quantitative objective that establishes a direction for the indicator.

Establishing C&I for a forest management district takes understanding, learning, patience and effort on the part of planning team members. The Western Newfoundland Model Forest C&I guide (WNMF 1999) describes a process for planning teams to determine local C&I through first determining the values and goals for the district, and then selecting indicators for the values, and objectives for the indicators.

PUBLIC INVOLVEMENT AND DECISION-MAKING

During the 1950s and 1960s, decisions about land use and forest management on provincial Crown land was virtually the exclusive domain of the forest industry and the provincial government (Blouin 1998). Industry and government management agencies were quietly conducting their activities, and society was generally oblivious to any happenings. However, with population growth in North America came urbanization, a more-educated public, and a society requesting alternative uses of the forest beyond resource extraction. This is consistent with Lloyd et al. (1996) who reported that conflict over forest resources is inevitable given the expanding population, relatively fixed resource base, and lack of broad social consensus about appropriate roles of forests.

The 1990s could be considered the awakening of the public in resource management. Prior to the 1990s, at best, the public was invited to open houses for information on proposed forest management activities. However, through the last decade, citizens and organizations began to express their concerns regarding how forests were being managed. They are not satisfied with resource managers' decisions and their management practices. Likewise, the public is more highly educated and more informed about management issues through the media. Consequently, in today's society, people want to participate in decisions that affect them; fewer and fewer people will accept the decisions dictated by someone else (Fisher and Ury 1981). The challenge to resource managers suggested by Tanz and Howard (1991) was to develop ways to share management planning with the public, since the public can no longer be

excluded from participating in forest management planning.

The Canadian Standards Association (1996a) defined public involvement as "a process through which people who will be affected by or interested in a decision, and who have a stake in the outcome, get a chance to influence its content before the decision is made." As a warning to those responsible for these public processes, Shindler and Neburka (1997) suggested avoiding public consultation experiences that:

1. Inform the local citizens of proposed activities.
2. Solicit the input of local citizens on the proposed activity.
3. Ignore what the citizens said, and do what you want.

To be credible, public processes must be open, transparent and offer the opportunity for meaningful dialogue and change.

Many organizations approach the public as if it were a homogeneous and stable population. However, there is no single public; instead there are a number of publics, some of which may emerge at any time during the process depending on the particular concerns and issues (Roberts 1995). From a process perspective, everyone is entitled to an opportunity to participate and, for those who decide not to, their interests are protected in several ways. Participants can be assigned to represent the absent interests or the participants may be requested to respond to comments of citizens who decide not to participate.

One way or another, people who have never before considered being involved in resource management are now participating in decision-making exercises. Public involvement in various forms is being implemented by the provincial governments and forest industry. Duinker (1998a) confirmed the effort of public involvement when he

stated that the Canadian public is now actively involved in provincial and national forest policy discussions and debates as well as local public-land forest management planning exercises.

Public participation processes should be designed to meet local circumstances and should function using their own unique mechanisms. There are basic principles of public involvement that can assist and guide those establishing these processes. Duinker (1998a) and Shindler and Cheek (1999) described complementary principles necessary for public involvement. These principles are:

1. Openness, fairness and inclusiveness. Public involvement is usually considered more successful if the process includes all affected parties and aims for broad representation. Every effort should be made to ensure that no one is excluded.
2. Clear mandate and preparation. What is expected of people should be clearly laid out at the beginning of the process.
3. Professional design and facilitation. Skilled leadership in public involvement is weak among resource managers. Many have inadequate skills to design and implement good public involvement processes. However, a properly designed process is important for success.
4. Design for positive-outlook problem-solving. Processes which simply receive people's complaints accomplish little. Meetings need to be designed to elicit participants' collective ideas on how to solve forest management problems (Duinker and Wanlin 1995).
5. Clear influence on decision-making. Participants of a public involvement process need to know that their contributions are influencing decisions. The

credibility of the entire participation exercise is lost without people seeing their efforts turned into action.

6. Sufficient time and supporting technical resources. Public participation takes time and organizers must always be prepared to overshoot original deadlines. Also, information must be shared with all participants to formulate sound options based on timely and reliable information.

7. Keeping decision-makers informed. Process leaders must maintain liaison with those who will be receiving the recommendations.

8. Reasonable and realistic expectations. People can only accomplish so much and cannot produce the impossible. These processes take a lot of time, effort and resources, and may not generate a consensus, but they should generate greater understanding. Everyone must understand what can be realistically achieved.

To sum up, society is demanding (and has) a more proactive role in natural resource management and decision-making. Resource managers are learning how to involve the public constructively. According to Knopp and Caldbeck (1990), in the final analysis, we must test our faith in the collective wisdom of the people. When the opportunity for effective participation exists, even if the outcome is not necessarily what some participants would have wanted, an open decision and/or planning process is more likely to be seen as legitimate than if the public had been excluded.

The district planning team is where local public involvement occurs in preparing district forest management plan reports and five-year operating plans in Newfoundland and Labrador. Advertisements are placed in the paper and the public is invited to participate and assist the district manager to prepare the plans. This is an open and

transparent process so all those interested in participating on a planning team are welcomed.

ANNUAL ALLOWABLE CUT

The annual allowable cut (AAC) is the sustainable supply of timber available for harvest for a specified period of time from a specified forest. The AAC attracts so much attention because it is the number that states the theoretical upper limit of actual cut in the province (Clark 1995). The AAC is defined here as the non-declining, even-flow, long-run sustainable timber harvest level. Three primary parameters influence available wood supply from a forest of given structural characteristics (Erdle 1999). These are:

1. Area of forest available for wood production.
2. Growth rate (wood production) of stands in the forest.
3. Timing of harvest of stands across the forest.

To enable forecasting of forest development, the forest land base must be defined and characterized. The land base is usually characterized by classifying the forest into age classes, forest types, and land designated eligible for timber harvesting. Generally, the larger the forest land base, the larger the available timber supply (all other factors equal). A portion of the land base may not be available for timber-related management due to regulatory, environmental or operational reasons (e.g. wildlife habitat, ecological reserves, treed buffer zones, parks, protected water supplies). These areas are not included in the timber-supply calculations.

Wood volumes of stands in a forest are commonly expressed as a yield curve with the y-axis representing m^3/ha and the x-axis stand age (Figure 6). These so-called

yield curves are necessary to predict future forest development. The effect of stand volumes on timber supply is obvious; the more rapid and higher the volume increase in forest stands (measured in terms of volume, quality or value), the higher the available timber supply because each available hectare yields a higher output per unit time (Erdle 1999).

When forest stands are scheduled for timber harvest, the scheduling algorithm can directly affect timber supply availability. Basically, the more restricted the harvest queue of stand availability, the lower the long-term harvest level.

Just as important as the determination of a harvest level are the future forest conditions forecasted through alternative scenarios. These scenarios involve changing the landbase, the assumptions used, and the management actions. The various scenarios are evaluated and a preferred future forest condition selected. Actions are then designed to move the forest towards the selected forecasted condition. The wood supply forecast is a tool for sustainability by restricting the level of harvest to conform to a preferred future forest condition.

The AAC calculation has traditionally involved only Newfoundland Forest Service personnel. The Forest Service determines the land base available for harvest, creates the yield curves (using permanent sample plot data), and establishes the scenario for the model runs. Planning teams need to understand the AAC concept and have a basic knowledge of how the AAC is determined. With this new understanding, planning team members will have a more active role in the data preparation phase of determining the AAC. Specifically, planning teams can assist in determining the landbase available for timber harvesting and develop management scenarios for testing.

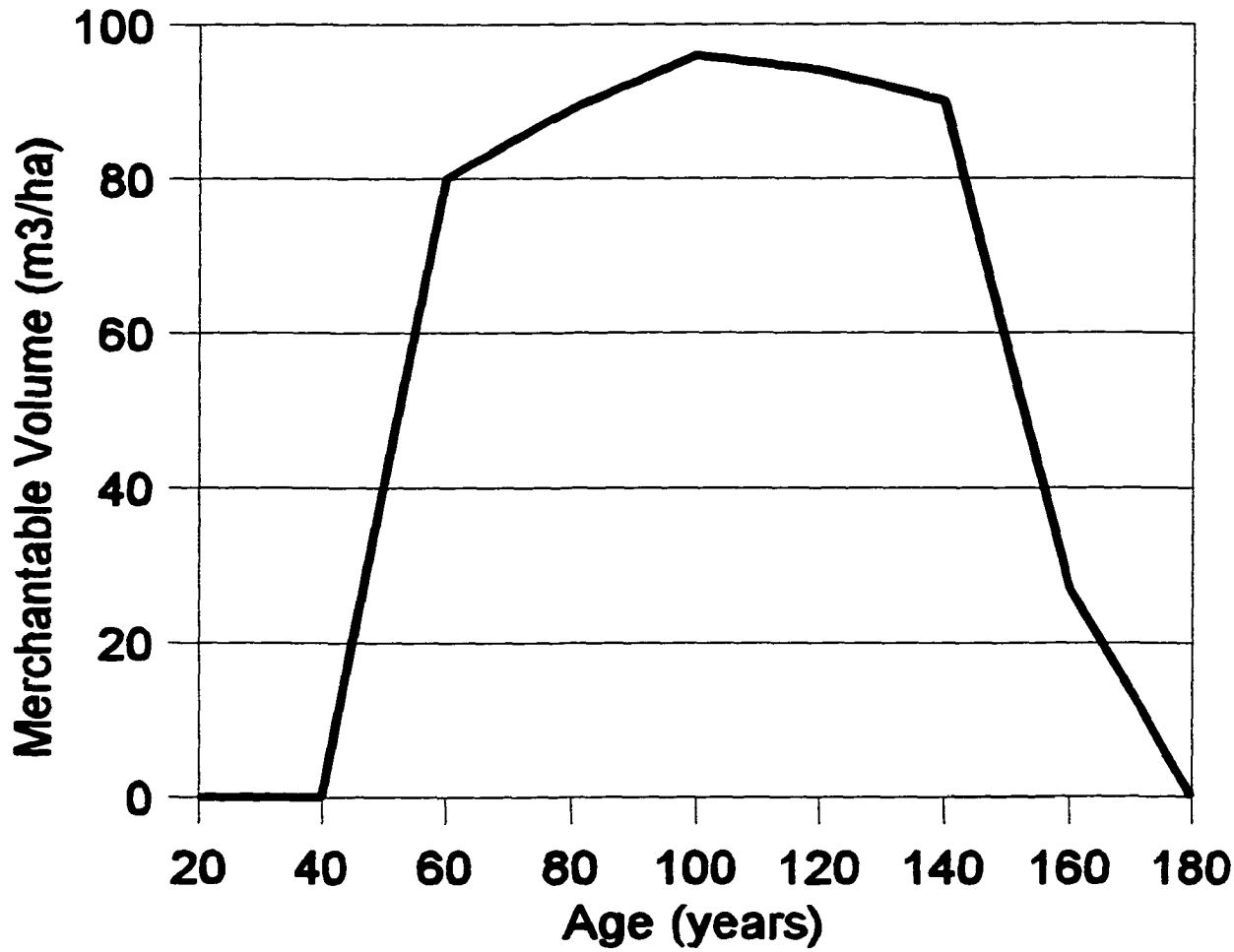

Figure 6. Yield curve for a medium black spruce site in central Newfoundland.

CERTIFICATION

It is widely accepted that forest resources and associated lands should be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations (Forest Stewardship Council 2000). Today's consumers are requesting information on the state of forest management where the wood product was derived. In response to these demands for certification of forests, management systems and certified wood products have evolved.

The concept of forest certification emerged in the late 1980s after environmental groups (Friends of the Earth, World Wildlife Fund and Greenpeace) lobbied the International Tropical Timber Organization (ITTO) to implement an SFM scheme for tropical timber. Forest certification was provided as an incentive to improve tropical forest management (Elliott and Hackman 1996). It is a voluntary process involving a written certificate produced by an independent third party attesting that management of a specific forest area meets a defined standard.

Balsillie (2000) noted that in Canada the focus has been on three processes:

1. Canadian Standards Association CAN/CSA Z809-96 (Canadian Standards Association 1996b);
2. Forest Stewardship Council (Forest Stewardship Council 2000);
3. International Organization for Standardization (ISO) 14001 (Woodside and Aurrichio 2000).

While there are additional forest certification standards, they are not as prominent in Canada as ISO, CSA and FSC. Below is a brief description of the three processes.

Canadian Standards Association Z809-96

The Canadian Standards Association (Canadian Standards Association 1996b), one of four standards development organizations in Canada that operates under the Standards Council of Canada, has developed a voluntary forest certification standard. This standard not only contains the same structural elements as the management systems approach of ISO 14001, but also uses a performance approach which requires adherence to the CCFM criteria and associated elements as well as public participation (Canadian Standards Association 1996b). The CSA standard is therefore linked to internationally and domestically recognized SFM processes (Balsillie 2000). It has been developed through an open and transparent multi-stakeholder process, with representation of the major stakeholders (academics, auditors, governments, environmental and consumer groups).

Forest Stewardship Council

The Forest Stewardship Council (FSC) is a non-governmental, self-appointed organization formed in 1993 in Toronto. FSC certification uses a chain of custody to label products as originating from forests that are managed according to FSC Principles and Criteria. The Canadian FSC initiative was launched in 1996 and there are currently three processes aimed at defining FSC regional standards (Great Lakes-St. Lawrence region, British Columbia region, and the Maritimes region). Another process, led by the

World Wildlife Fund, is aimed at developing a standard for the boreal region of Ontario.

International Organization for Standardization

Unlike SFM certification such as CSA and FSC, which only deals with forest management, the ISO 14001 environmental management system standards (EMS) can apply to both resource management and manufacturing (Balsillie 2000). The EMS approach references national regulations and legislation and the development of corporate environmental policy. While designed for all sectors, forest managers (in Canada) wishing to work towards the goal of SFM can incorporate the CCFM criteria and indicators into their policies and management objectives.

Timber companies in Newfoundland and Labrador are actively involved in getting their respective land bases certified under ISO to maintain their position in the market-place. In Newfoundland, Abitibi Consolidated was audited and achieved the ISO 14001 standard in December, 1999 while Corner Brook Pulp and Paper is preparing for an ISO 14001 certification audit in December 2000. The Newfoundland Forest Service has initiated a gap analysis to determine actions necessary to meet the ISO 14001 standard on unalienated Crown land. Certification will likely have little effect on the planning team task of preparing a management plan report and five-year operating plan. However, forest industry representatives could engage the planning team in discussions on their specific requirements for certification.

SILVICULTURE

Silvicultural actions influence future forest structure, configuration and species composition. Because of the effect silviculture has on the forest, planning team members need to have an understanding of the silvicultural tools applied in the province. This knowledge is vital to understanding how intervention in a forest system occurs and how the resultant future forest condition is based on the silvicultural tools used and the intensity applied.

Silviculture can be defined as the art of controlling the establishment, composition, structure and growth of an individual forest stand or forest (Smith 1996). Basically, silviculture consists of many treatments ranging from timber harvest to regeneration (planting and thinning). The foundation of silviculture in natural science is silvics, which deals with the principles underlying the growth and development of single trees and of a forest's biological units (Smith 1986). The challenge to the resource manager is to analyze the biological and social factors bearing on each stand and then devise and conduct the treatments most appropriate to the objectives of management.

While growing timber is a common forest management objective, today it is not the only objective. Silviculture can be designed to support other forest values such as wildlife habitat, recreation and aesthetics. According to Smith (1986), management objectives for non-timber values are achieved through silvicultural actions that:

1. Control stand structure.
2. Control species composition.

3. Control stand density.

4. Restock unproductive areas.

5. Control rotation age.

6. Conserve site quality.

The primary silviculture tools in Newfoundland and Labrador are the following:

Planting

Trees are planted for a variety of reasons; however, the main purpose is to re-establish trees on forest land after natural (insect, wind, fire) and anthropogenic disturbances (timber harvesting). Naturally occurring tree species most suitable to the site conditions are usually used as planting stock, preferably from a local seed source.

Thinning

The yield of merchantable fibre on individual trees can be improved by reducing the stand density of trees resulting in increased vigour of individual trees by decreasing the competition for water, light and nutrients, which will enhance the diameter growth on the remaining trees. Surplus trees are removed in thinning to concentrate the potential wood production on a smaller number of selected trees. The intent of thinning is to regulate the distribution of growing space for the benefit of the remaining trees.

Reproductive Methods

A reproductive method is a procedure by which a stand is established or renewed (Smith 1986). Any procedure (silvicultural system), intentional or otherwise, that leads

to the development of a new stand of trees is identifiable as a method of reproduction. This is often the most important stage of the silvicultural cycle in terms of its impacts on non-timber values of the forest such as wildlife and aesthetics (Kimmins 1992). The final harvest can be done using any of six reproductive methods (Kimmins 1992; see Figure 7):

1. Single-tree selection: Individual trees are removed from the stand and younger trees fill the openings created.
2. Group selection: A small group of trees is removed to create a small opening in the forest canopy.
3. Patch cut: A small clearing is created in the stand.
4. Shelterwood: A clear-cut in which the final harvest is done in two or sometimes more stages.
5. Seed tree: Trees are left scattered across the cut area enabling their seed to be the source of reproduction.
6. Clear-cutting: All trees are harvested in a single cut from an area large enough that the forest influence is removed from the majority of the area harvested.

The type of silvicultural system applied will depend on the forest type, tree species, stand age and objectives for the stand.

Planning teams today obtain an understanding of forest ecology and silviculture through presentations by a Natural Resources Canada ecologist and a Newfoundland Forest Service forester. Field trips are the preferred mechanism to learn about forests and silviculture. Misconceptions about basic silviculture (i.e. regeneration and thinning) still persist and education through field trips provides an opportunity for team

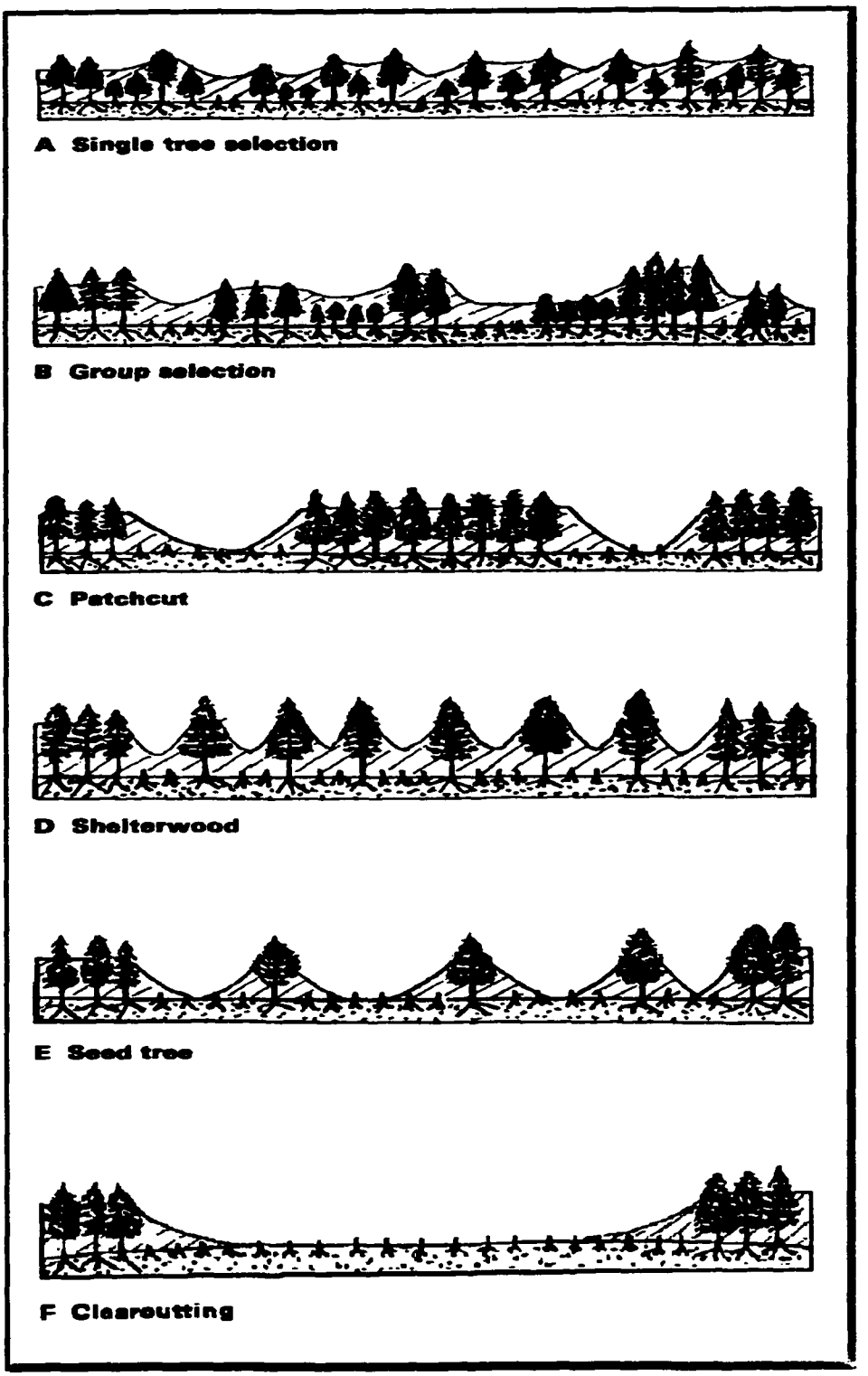

Figure 7. Schematic description of six different tree reproduction methods (Source: Kimmins 1992).

learning on forest ecology, silvicultural actions, and forest response to these actions. This visual learning approach supports the saying that "a picture is worth a thousand words." Clarification of ecology and silviculture is important when planning teams begin to discuss what the future forest should be and how to manage the forest to get there. Good discussion on management options occurs when there is a common understanding of forest ecology and silviculture.

INFORMATION IN SUSTAINABLE FOREST MANAGEMENT

Information is a fundamental requirement of SFM. Without a strong knowledge base about the forest, its values and uses, any efforts towards SFM are futile. The information must be readily available and up-to-date. For example, a thirty-year-old forest inventory is of marginal value for SFM. Likewise, the less precise the forest inventory, the greater the uncertainty in the data available for management, and therefore the less credible the plan and management.

Provincial and federal resource departments have inventories supporting their mandates. This information is stored in various formats and must be available to planning teams and easy to understand. Also, local value inventories need to be created. A local value inventory involves citizens within a management district identifying (on maps) areas of value to them. This information is put into a digital format and stored within the inventory data base.

Creating a forest inventory requires a set of objective sampling methods designed to quantify the spatial distribution, composition and rates of change of forest patterns with specific levels of precision for the purposes of management (Helms 1998). Forest inventories have traditionally focused on tree parameters (diameter, height, crown closure, density) and site capability (good, medium, poor). These data are collected from aerial photographs, along with temporary and permanent sample plots and are used to calculate growth and yield rates. The progression to SFM has necessitated expanding these traditional inventories to include such variables as wildlife

habitats and populations, coarse woody debris, soil nutrients, water quality and quantity, and ecological land classes, to mention a few.

The National Forest Strategy (CCFM 1998) recognized the enlarged inventory requirements by stating in objective 1.1 the need to broaden:

> "the scope of inventories and information on key forest and landscape characteristics, including the impact of natural processes and human activities on forest ecosystems, non-timber features and growth and yield of forest resources. Such information is needed to manage the forest sustainably for a wide range of values, to forecast changes in the forest ...."

However, inventories are a challenge to management organizations because they are costly to maintain and keep current. Consequently, decisions regarding what information to collect, how to collect it, and who will analyze are important. Duerr et al. (1982) recommended that inventories should evolve around the question, "What information does the forest manager require and where does the manager find it?" While there is an abundance of information that could be collected, efforts must focus on the parameters required in forecasting future forest conditions and values. Inventory costs are too high to collect data that will not be applied in managing the forests. Venkata Rao (1986) suggested four questions to assist developing a meaningful inventory:

1. What are the inventories that have to be acquired?
2. From what source will the inventories be acquired?
3. How much of the inventories should be acquired?
4. When should the inventories be acquired?

The importance of a solid and expanding inventory will continue as SFM is more clearly defined and C&I data collection methods are refined.

An important addition to SFM inventories has been the ecological classification system to support ecologically-based wildlife and forest management plans. Traditionally the plans have focused on vegetation types. However, predicting ecological landscapes based on vegetation types alone limits the ability to account for alternative successional pathways or natural disturbance factors possibly affecting the management area. According to Haufler and Irwin (1993), "an ecological perspective of landscapes is necessary in forest planning for biodiversity and resource use, and an ecological land classification is essential for landscape diversity analysis."

In one ecological land classification system, Canada is divided into ecozones, ecoregions and ecodistricts (Ecological Stratification Working Group 1995). There is no single leading factor responsible for the delineation of ecounits on different hierarchical levels. Criteria for their delineation are relatively similar as can be seen in their definitions (Ecological Stratification Working Group 1995):

Ecozone: An area of the earth's surface representative of large and generalized ecological units characterized by interactive and adjusting abiotic and biotic factors.

Ecoregion: A part of an ecozone characterized by distinctive regional ecological factors, including climate, physiography, vegetation, soil, water, fauna and land use.

Ecodistrict: A part of an ecoregion characterized by distinctive assemblages of relief, geology, landforms, soils, vegetation, water, fauna and land use.

In the future, planning teams will require more-detailed knowledge of the natural attributes of forest habitats, disturbances by fire and insects and timber harvesting.

Planning team members will require access to information data bases of all government resource management agencies. A major task facing participants is to

understand all these data bases, which means that resource management agencies will have to simplify data presentation. The Newfoundland Forest Service is responsible to collect all data on behalf of the planning team.

CREATING A PLANNING TEAM

Participants in SFM planning exercises need to understand why and how a planning team is formed. Comprehension of the process enables the participants to evaluate the credibility and transparency of the process and whether additional planning team members are required. Important forest value interests could be absent from the planning team and participants may wish to search for someone to represent that value. Also, the planning team's tasks, roles and responsibilities need to be clearly defined. Without this clarification, confusion and uncertainty will create havoc within the planning team.

Generating interest among people in becoming involved in the forest management planning process is an important task of the Newfoundland Forest Service and involves a three-step process:

1. Public notification of the intent to establish a planning team in a management district is placed in the local paper, and on the local cable TV and radio channels. The notification mentions (a) the intent to establish a multi-stakeholder planning team, (b) its mandate, and (c) the date, time and location of its first meeting.
2. Letters of invitation to attend the information meeting regarding the creation of a planning team are sent to government departments (both federal and provincial) and to individuals whom district staff feel may be interested.
3. A public meeting of all individuals interested in the planning team concept is

held. Following an explanation of the process, attendees are asked to indicate their interest in becoming involved. Before ending the initial meeting, a date, time and location is determined for the first planning team meeting.

Planning teams have a specific purpose: to assist the district manager to prepare a district management plan report and a five-year operating plan. Through a consensus decision-making framework, planning teams must accomplish their task within the bounds of existing legislation, regulations, and policies. If consensus cannot be reached, the Department of Forest Resources and Agrifoods, with the legal authority, will make decisions respecting the plans. Even when consensus is reached, there is a possibility that a plan may be revised by the Minister of Forest Resources and Agrifoods or the Minister of Environment and Labour. Such a revision might result from public disapproval of an action in the plan or violation of government policy and/or regulation.

The main responsibilities of the planning team are:

1. To foster cooperation between government departments, aboriginal groups, non-government organizations, regional economic boards and the general public in preparing the required documents.
2. To identify values, goals, indicators, objectives, and strategies to be described in the forest ecosystem strategy document and implemented in the five-year operating plan.
3. To support implementation of the strategic document and operating plan.
4. To foster open communications among all participants and to make every effort to reach consensus.

5. To establish reasonable time frames to complete the documents.

The planning process requires considerable commitment and time from the team members. In Newfoundland and Labrador, experience has shown that 18-24 months (20-25 meetings) are required to complete both plans for one district. Knowing these commitments of time and effort in advance will help an individual decide whether to participate. Participants on a planning team are expected to:

1. Attend and participate in meetings regularly (at least one meeting per month).
2. Represent and be responsible for the interests and concerns of their respective organizations.
3. Participate in relevant workshops and seminars related to the planning process.
4. Assist in the analysis of information and be part of the decision-making process.
5. Contribute ideas and offer suggestions based on personal knowledge and expertise.
6. Foster improved relationships among stakeholders and collaborate in creative problem-solving towards achieving sustainability.
7. Build respect for a better understanding of different viewpoints.
8. Support plan implementation and follow-up monitoring.

GROUND RULES

Ground rules are critical to the success of any multi-stakeholder process (Cormick et al. 1996). Experience with planning teams in Newfoundland and Labrador confirmed that every planning team must have ground rules before starting the process to develop the plans. These rules provide structure and clarity to the task and process,

while avoiding inefficient and unproductive discussions. The ground rules specify why there is a planning team, how the planning team members will work together, what are the limitations of the plans, who participates, and the administrative procedures such as meeting schedules. Below are major components defined for Newfoundland and Labrador that are incorporated into planning team ground rules:

1. Specify who participates on the planning team and in what capacity.
2. Define the administrative structure of the planning team (i.e. meetings, dates, notice of meetings, how meetings will be run, who is responsible for minutes).
3. Define what the planning team is to accomplish.
4. Define consensus and when consensus is reached (this can be a partial agreement or an agreement to disagree).
5. Identify what to do when consensus is not possible.
6. Provide standards of conduct and behaviour.
7. Explain confidentiality around information and general discussion.
8. Establish who will be responsible for contact with the media.
9. Clarify how information is shared between planning team members.

When establishing a planning team in the province, developing ground rules is its initial task. Through the ground rules, potential participants gain an understanding of the process so they can make an informed decision on whether to participate.

MAKING DECISIONS AND SEEKING CONSENSUS

How decisions are made in public involvement processes is important to participants. The actual decision-making authority of the planning team and the limitations of that authority need to be clearly defined. Confusion and false expectations by planning team participants have occurred where the decision-making process was vague.

During the 1990s, consensus-seeking decision-making has become an alternative to traditional decision-making frameworks used in resource management (National Round Table on the Environment and Economy 1993). Consensus processes are inclusive of all interests, each of which has an equal voice in searching for a balanced solution. The traditional voting framework for groups leaves the dissenting interest at a disadvantage in the discussions. In fact, the specific interests can be voted out of the entire process. These concerns have led to consensus-seeking decision-making becoming more prominent in SFM.

It is significant to note that achieving SFM is not primarily a technical or scientific challenge; rather, the main challenge is dealing with people and their diverse cultures, interests, visions, priorities and needs (Cormick et al. 1996). The traditional decision-making processes for district managers preparing plans in isolation of other interests has resulted in court challenges (in some provinces), protests and road blockades. Fortunately these conflicts are giving way to collective (consensus) decision-making (Saint and Lawson 1994). Alternative forms of decision-making need

to evolve in support of SFM. These alternatives are consistent with thoughts of Cormick et al. (1996) who noted Albert Einstein's observation of more than half a century ago:

> "The world we have created today as a result of our thinking thus far has created problems that cannot be resolved by thinking the way we thought when we created them."

In 1993, the National Round Table on the Environment and the Economy (NRTEE) suggested a new approach to resource management decision-making. NRTEE stated that consensus processes are invaluable in solving many complex environmental, economic and social problems. NRTEE recommended ten principles (Figure 8) to guide people's involvement in a consensus decision-making process. NRTEE even suggested that a consensus process that does not follow the principles could result in misleading people or making the conflict situation worse.

Consensus is basically a mutual agreement. It does not mean unanimity on everything (Saint and Lawson 1994). Rather, consensus is the mutual feeling that all concerns have been addressed. National Round Table on the Environment and Economy (1993) defined the consensus process this way:

> "Participants work together to design a process that maximizes their ability to resolve their own differences. Although they may not agree with all aspects of the agreement, consensus is reached if all participants are willing to live with the total package."

Consensus decision-making processes have advantages and disadvantages, some of which are listed here (National Round Table on the Environment and Economy 1993; Cormick et al. 1996):

Principle 1: Purpose driven: People need a reason to participate in the process.

Principle 2: Inclusive not exclusive. All parties with a significant interest should be involved.

Principle 3: Voluntary participation. The parties who are affected or interested participate voluntarily.

Principle 4: Self design. The parties design the consensus process.

Principle 5: Flexibility. Flexibility should be designed into the process.

Principle 6. Equal opportunity. All parties have equal access to relevant information and the opportunity to participate effectively throughout the process.

Principle 7. Respect for diverse interests. Acceptance of diverse values, interests and knowledge of the parties involved.

Principle 8. Accountability. Participants are accountable to their constituencies and the process.

Principle 9. Time limits. Realistic deadlines are necessary throughout the process.

Principle 10. Implementation. Commitment to implementation and monitoring must be made.

Figure 8. Ten principles to consensus decision-making (Source: National Round Table on the Environment and Economy 1993).

Advantages:

1. The involvement of stakeholders to find a solution leads to greater commitment to whatever decision is reached. Not involving the stakeholders in the decision-making process often leads to indifference or even resistance to the solution, even if it is a good one.
2. Compared to other decision-making approaches, increased resources and a broader range of potential solutions are made available.
3. There is a greater potential to focus on the real needs and interests at stake, rather than on diverging opinions and positions.
4. The existence of "winners and losers" and the hardening of positions, the growth of embitterment, and the desire for retaliation that frequently accompany resolution by a majority are avoided.
5. A decision based on consensus has greater credibility with the parties involved. Further modifications of a decision may be more easily achieved because the parties are aware of the initial assumptions and the basis for change.
6. Conflict resolution by consensus has a better chance of leading to closure of an issue. The parties are committed to the decision so they are less likely to appeal or protest it.
7. The parties can achieve a greater understanding of resource management choices and their implications and they can gain some empathy for the dilemmas that resource managers face on a day-to-day basis. Furthermore, the process of consensus builds working relationships among interests that may otherwise never have the opportunity to work together or learn other points of view.

Disadvantages:

1. Consensus approaches can be time-consuming, costly and frustrating to anyone who simply wants to get on with the job. Making a unilateral decision with a measured amount of consultation can be quick and efficient.

At the local level, district planning teams use a consensus-seeking framework for decision-making in preparing the district management plan report and five-year operating plan. When the planning team cannot reach consensus on an issue, the district manager, as representative of the Minister of Forest Resources and Agrifoods makes a final decision and records that the team did not achieve a consensus on that issue.

Participants continue to struggle with the consensus concept, opting to disagree instead of searching for balanced decisions. Consequently, consensus workshops are now being delivered to planning teams to assist them to understand consensus and how they will apply the consensus approach. The workshops also articulate the bounds of decision-making for the planning team. The legal decision-making authorities are defined and the bounds and scope of planning team decision-making are explained.

VALUES, GOALS, INDICATORS AND OBJECTIVES

Defining forest values, establishing goals for these values, determining how to measure progress to achieve the values, and establishing measurable objectives are vital to SFM. To manage a forest we need to decide what are the values we want to sustain and then determine how to sustain them. The concept of C&I in SFM has provided a framework for planning teams to structure their thinking. Understanding C&I will assist citizens to develop their values, goals, indicators and objectives in an organized manner.

With the concept of sustainability dominating forest management throughout Canada in the last decade, a key component of SFM is a clear understanding of C&I. According to the CCFM (1995), the intent of C&I is to:

1. Clarify SFM and provide a framework for describing and assessing progress.
2. Provide a reference point for the development of policies on the conservation, management and sustainable development of forests.
3. Contribute to the clarification of issues related to environment and trade, including product certification.
4. Provide concepts and terms to facilitate the on-going domestic and international dialogue on SFM.
5. Improve information available to the public and decision-makers.

Society wants evidence that good goals and objectives for a specific forest area are set and then achieved. Duinker (1998c) stated that goals are appropriately expressed

for forest values and objectives are established for indicators. While goals are usually expressed qualitatively, objectives need to be stated unambiguously and must be measurable. In establishing good indicators, Williams et al. (1998) defined six key qualities for indicators:

1. Relevance to value - The indicator should be clearly stated and relevant to the value it is intended to represent.
2. Measurability - The indicator should be measurable on a consistent and reliable basis with relative ease using well-defined data.
3. Sensitivity to change - The indicator must respond to management actions.
4. Practicality - An indicator should not be overly expensive to assess.
5. Understandability - The intent of the indicator should be readily understandable.
6. Response-oriented - An indicator should measure a response within the forest or within the economic or social realm, rather than measuring actions or the presence of policies.

Defining values, goals, indicators and objectives can be a long process. However, the Western Newfoundland Model Forest (WNMF) (1999) outlined a process to establish values, goals, indicators and objectives at the local level. This process was developed over a two-year period and established what C&I meant and how they could be applied in planning. The six steps in the process are:

1. Form an effective public participation process.
2. Decide on values and goals. Every forest management district defines its own values and goals. The WNMF values and goals are proposed as an initial set and the local planning team determines their adequacy. Changes in the values and

goals are made as required.

3. Select appropriate indicators. The CCFM and the WNMF indicators are evaluated at the beginning for their applicability and are modified as required.

4. Develop objectives and identify practices. Objectives and practices determine what will actually be implemented to achieve the goals and to support management of the values.

5. Implement the SFM plan. The responsibility for implementing the plan lies with either the Newfoundland Forest Service or the forest industry (i.e. Corner Brook Pulp and Paper Limited and Abitibi Consolidated Incorporated).

6. Measure, monitor and report on indicators. There must be a procedure to determine the status of each indicator, including a defined time frame for each indicator, what will be measured, and who will be responsible for collecting the data.

Planning teams will develop values, goals, indicators and objectives for their forest management district and record them in the management plan report. Existing sets of C&I such as CCFM (1995), WNMF (1999) and other district efforts are reviewed for the applicability to the specific district. Implementation and monitoring of the final values, goals, indicators and objectives will be a challenge as the structure and funding requirements catch up to the concept.

THE FUTURE - FORECASTS AND SCENARIOS

Today's forests will be different 20, 50, 80 years from now. One of the main challenges for SFM is to predict long-term and broad-scale responses to a rapidly changing environment caused by both natural factors and human activities (Peng et al. 1998). With no human intervention, the forest will continue to change through natural succession and disturbance. Similarly, alternative management strategies will create different future forest conditions. Because of the complexity of the ecological relationships, and the size of managed forests in Canada, computer-based models are used to get a glimpse of the possible futures.

A computer-based model is a simplified version of reality designed to represent a physical system (Morton 1990). Models help managers to understand (a) how reality works, (b) what the gaps are in the knowledge of the ecosystems under management, (c) the complexity and uncertainty in any decisions to be made, and (d) the implications of those decisions. The forest planning models predict possible future forest conditions based on model inputs and management actions. Managers use these models to explore cause-effect relationships between management treatments, forest dynamics, and ecosystem-level management objectives (Van Damme and Moore 1994). Models help in the assessment of alternative scenarios and in producing probability statements about their outcomes.

One of the best methods for conveying the consequences of alternative management actions and forecasts is scenario planning (Maclean 1998). Scenario

planning is a disciplined method for imagining possible futures that address a wide range of issues (Shoemaker 1995). Scenarios are basically stories about possible futures. Scenarios in SFM are processed by computer-based forest models to assist in understanding the implication of different management strategies.

Forest models can be spatial or aspatial and can use either simulation or linear programming. Spatial models not only calculate a sustainable harvest level, but also produce a map of a potential harvest schedule and a future forest arrangement on the landscape. The forest manager must conduct an analysis of the potential harvest schedules for their applicability in the field. A non-spatial model provides only a calculated sustainable harvest level and another model is needed to allocate the harvest spatially. While most aspatial models use generalized data in the form of percentages of regeneration and forest strata, spatial models operate on a stand-by-stand basis.

Simulation models at the forest level are sequential inventory projection models. The models require the planner to specify parameters for each management period. Once this is done, the analyst attempts to find a suitable sustainable harvest level by running alternative scenarios in tandem and analyzing each for its strengths and weaknesses. The most important timber-related decision variables are the harvesting, planting and thinning levels.

Linear programming is an automated calculation procedure that tries to find the best solution given a set of objectives and constraints. Linear programming models identify an optimal alternative from a set of feasible alternatives. Simulation and linear programing models address different questions. Simulation models are used to evaluate detailed user-specified strategies, while linear programming models are designed to

facilitate the identification of optimal strategies.

When applying computer-based forest models, one must be constantly aware that models are a simplification of reality. They do not include all the ecological relationships and assumptions are used to compensate for lack of knowledge. Assumptions must be well understood and considered in any decision-making exercise using the model results. Any discussions and decisions must be tempered with the understanding that there is considerable uncertainty in the assumptions forming the basis of modeling.

There is no guarantee that the desired future forest hoped for will actually result from implementing the defined actions in a forest (Erdle and Sullivan 1998). Uncertainty about ecosystem dynamics and inadequacies in our understanding of biodiversity and landscapes are inherent in any modelling exercise. It must be remembered that these tools only assist resource managers in decision-making. Although models do not make decisions, their purpose is not just to provide numbers but to seek insight into SFM.

The Newfoundland Forest Service conducts a wood supply analysis using the models Woodstock/Stanley. Woodstock calculates possible sustainable timber harvest levels and forecasts forest condition based on the inputs. There are four primary inputs to enable a forest forecast:

1. Yield curves.
2. Designated land base for timber harvesting.
3. Regeneration and treatment response assumptions.
4. Management strategies.

Planning teams need to have a basic knowledge of wood supply forecasting, and where they have an opportunity for input. For example, yield curves are constructed from empirical data in a highly technical exercise. Alternatively, a planning team can participate in an exercise to define a timber supply land base and design its own management strategies.

Besides forecasting timber availability, models are available to assess future forests for ecological change and wildlife habitat. The Newfoundland Forest Service is currently working with the WNMF and Wildlife and Inland Fish Division to develop species-specific models and landscape assessment tools.

MONITORING AND EVALUATION DURING IMPLEMENTATION

Great effort is put into developing and implementing plans. Unfortunately, monitoring of the actions proposed and the forecasted outcomes has been limited. Yet monitoring is the key to learning as plans do not provide absolute outcomes. By and large, forecasts will always be somewhat incorrect (Duinker 1989) and therefore a monitoring program is necessary to validate the forecast. A strong monitoring program in SFM enables analysis of forecasted and actual actions/responses. Through this analysis, learning occurs.

SFM must be designed to enhance the learning process and to provide for systematic feedback from monitoring and research to practice (Kohn and Franklin 1997). Thus, SFM is indeed adaptive management (Kohn and Franklin 1997). Baskerville (1985) described adaptive management in a nine-step process. The fifth step is as follows:

> "At specific times the progress of the system towards the goal is measured in terms specified in Step 1 (a measurable goal is chosen from management of a natural system). The actions and their results in the cause-effect sense are also measured in the manner of their identification in Step 3 (with the model as a forecasting tool, a set of actions are designed to regulate the system towards the measured goal. The way each member of the action set causes an effect, and the way all actions in total cause the system goal to unfold are qualitatively stated)."

Baskerville's fifth step in an adaptive management process is monitoring and evaluation. Without a strong monitoring program, no learning can occur pertaining to the management of the particular forest ecosystem. Duinker (1997) reported that without proper monitoring, reliable new understanding about ecological responses to

human actions can not be gained. Managers must measure their rate of progress toward the desired future condition and be cognizant of any departures from it (Noss 1999).

If monitoring and evaluation are key components of SFM, then what needs to be monitored and what forms should the monitoring take? Duinker (1989) defined monitoring as repetitive measurements made to specify the state of a system over time. The basic goal of monitoring is to reduce uncertainty in predictions about the future. Lee and Bradshaw (1998) stated that the principal role of monitoring is to illuminate decision-making; it does this in three ways:

1. By providing an accurate assessment of the status of resources being managed.
2. By validating that management decisions are correctly interpreted and implemented and that such decisions achieved the forecasted results.
3. By improving insight into how systems operate.

Monitoring can take many forms. The literature describes the following forms of monitoring: baseline monitoring, compliance monitoring, and environmental effects monitoring (Greene and Wight 1990; Everett 1992). Whitney and Maclaren (1985) recommended a fourth type of monitoring which they called public concerns monitoring. Maclaren et al. (1997) considered a fifth monitoring category related to cumulative effects. Because monitoring is costly and time-consuming, it is paramount that an efficient program be established from the beginning.

Much of the difficulty with monitoring stems from the multiple purposes it is intended to serve (Ringold et al. 1996; USDA Forest Serve and DOI/BLM 1994). For some, monitoring is viewed as a way to resolve some of the uneasiness among constituents seeking resolutions to environmental conflict. The public often views

monitoring as a watchdog to detect adverse conditions in a sufficiently timely manner to allow corrective actions.

Monitoring must become a stronger priority of the district planning teams. Monitoring committees need to be created once the management plan report and five-year operating plan have been completed. Monitoring programs must be designed and carried out to determine:

1. Whether the plan is implemented as described.
2. The actual forest condition, to be compared against the forecasted future.

A strong district monitoring team will enhance learning and creation of new knowledge resulting in improved management.

CONCLUSIONS

Forest management has taken quantum leaps in the past twenty years. The direction has progressed from resource exploitation, to fibre management, to multiple use to integrated land management, to sustainable forestry and ecosystem management, to SFM. Thomas (1999) considered this progression as the natural evolution of management, such that no more could we stop the ocean tide from coming in than could we stop the evolution of forest management to ecosystem management.

SFM has meant an expansion from purely timber considerations to a plethora of ecological, economic and social values. This broader scope has necessitated:

1. Use of computer simulation models to assess effects of alternative management strategies on future forest conditions.
2. Expanded information sets (beyond timber parameters).
3. Changes in legislation, regulations and policy.
4. New approaches for involving the public, government departments and non-government organizations.
5. Decision-making processes that are sensitive to multiple interests.
6. Learning how to establish goals and objectives while developing processes to measure success.
7. Independent third-party audits of management agencies meeting a specified standard.

8. Learning how to manage when huge uncertainties plague our ability to forecast the future.

A cornerstone of SFM is public involvement. In fact, it is arguable that SFM is impossible without involving the public (Shindler and Neburka 1997; Duinker 1998b). Today, multi-stakeholder groups are the norm in SFM. However, one limitation of these groups has been the low level of common understanding of SFM among group members.

Citizens of Newfoundland and Labrador have expressed confusion and lack of knowledge regarding SFM (Moores and Duinker 1998). Further, Moores and Duinker (1998) believe this lack of SFM understanding limits people's ability to have meaningful involvement on planning teams. Therefore, it is critical to improve the SFM knowledge level of participants.

The lack of SFM understanding is considered serious by the Newfoundland Forest Service, as there are always three or four active planning team processes occurring in the province at any time. A citizens' guide was seen as an opportunity to improve participants' understanding of SFM and the overall planning structure (Moores and Duinker 1998). This report is written as a justification for such a guide (see Appendix for a draft text and materials for the guide).

An adaptive management philosophy will be used to implement and revise the guide. Planning teams will have a workshop as an introduction to the guide to provide basic understanding of the SFM components. Once a planning team has completed the district planning exercise, it will evaluate the usefulness of the guide in assisting members to improve their understanding and participation and recommend changes.

After several planning teams have applied the guide and recommended modification, perhaps a more permanent guide will be published.

As more Newfoundlanders and Labradorians become involved in SFM and using the guide, they will become knowledgeable about SFM and how they can contribute effectively in these processes. Hopefully, the knowledge will grow beyond planning teams to the general public at large. When broad-scale learning of SFM has occurred, then real understanding and participation can occur in managing the forest of the province.

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APPENDICES

Citizens' Guide to

Sustainable Forest Management

in

Newfoundland and Labrador

CONTENTS

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INTRODUCTION

Managing forest across Canada dramatically changed throughout the past twenty years. Newfoundland and Labrador have been part of that evolutionary management change. Initially forest managers developed and implemented plans for forested lands that focused on timber. In addition, these plans were prepared with minimal public or other resource manager consultations. Gradually values, besides timber began to be developed and considered in managing forests. The concept of consultation with the public and other resource managers evolved simultaneously to the consideration of non-timber values in forest management. Today, public involvement in managing forests has become the norm throughout North America and is an essential component of sustainable forest management (SFM). The general public, non-government organizations and resource managers are now involved in open and transparent processes to manage forests for a broad range of forest values.

In Newfoundland and Labrador, the Newfoundland Forest Service had a similar history or forest management planning. However they adopted a new planning process in 1995 when it prepared an environmental preview report on a "Proposed Adaptive Management Process." This new process had three objectives:

1. To establish a proactive planning framework to include all stakeholders.
2. To learn more about forest systems while they are being actively managed.
3. An ecosystem approach to forest management which integrates the scientific

knowledge of ecological relationships and the biological limits of growth with social values to attain the goal of sustaining natural system integrity and health over the long-term.

The foundation of this new planning process is the establishment of planning teams for each forest management district. These teams are comprised of local citizens, non-government organizations, and provincial/federal government representatives. The teams use a consensus-based, decision-making framework to make decisions and to assist the district manager in preparing district forest management plan reports (called locally forest ecosystem strategy documents) and five-year operating plans.

The current planning process was reviewed during a workshop held in Gander, April 15-17, 1998. During the workshop, the lack of understanding by participants about the process and forest management concepts became evident. This lack of understanding was constricting the potential effectiveness of the public's involvement. To improve planning team participants' understanding of the process and of forest management, this Citizens Guide to Sustainable Forest Management in Newfoundland and Labrador was developed. The purpose of this citizens' guide is to assist the public to understand SFM and to support them to provide meaningful involvement into the planning process.

The guide is organized by describing the legal authority for forest management and then leads into a primer on the major components in SFM. The guide then describes what information is required for SFM and where that information can be found. How citizens are engaged in SFM is elaborated upon in the creating a planning team section. The last three sections describe how citizens are to be involved in setting

values, goals, indicators and objectives, developing alternative management scenarios to test their impact on future forest conditions and how citizens can be involved in monitoring.

Citizens need a basic understanding of SFM to effectively participate. The goal of this guide is to provide the skills, knowledge and understanding of SFM so the public can productively participate on district planning teams. It is hoped an improved understanding of the process and of forest management concepts will improve the participation and discussion leading to more innovative and creative management of the forests of Newfoundland and Labrador.

LEGAL AND POLICY SETTING IN THE PROVINCE

The legal and policy setting in the province pertaining to Sustainable Forest Management (SFM) is primarily in four areas (Figure 1): legislation, planning, certificates of managed land, and environmental guidelines for ecologically-based forest management. These four components set the direction for implementing SFM in the province. Legislation, regulations, and policies are established by government through the normal democratic process. Planning team members cannot change legislation, regulations or policy, but must have an appreciation and understanding of the legislative framework. Understanding these components is important for citizens to effectively participate in SFM.

LEGISLATION

The primary legal framework for SFM in the province is found in the Forestry Act 1990 (Appendix I). Section 7 the Forestry Act establishes the forest management district as the legal planning area and also proclaims that each district prepare a forest management plan. The Minister of Forest Resources and Agrifoods approves the forest management plan for each district. Figure 2 defines where the management districts are on the island of Newfoundland and in Labrador. There are eighteen districts on the island of Newfoundland and six in Labrador.

Section 4 of the Forestry Act establishes the legal authority for the Newfoundland Forest Service to ensure the management, protection and utilization of

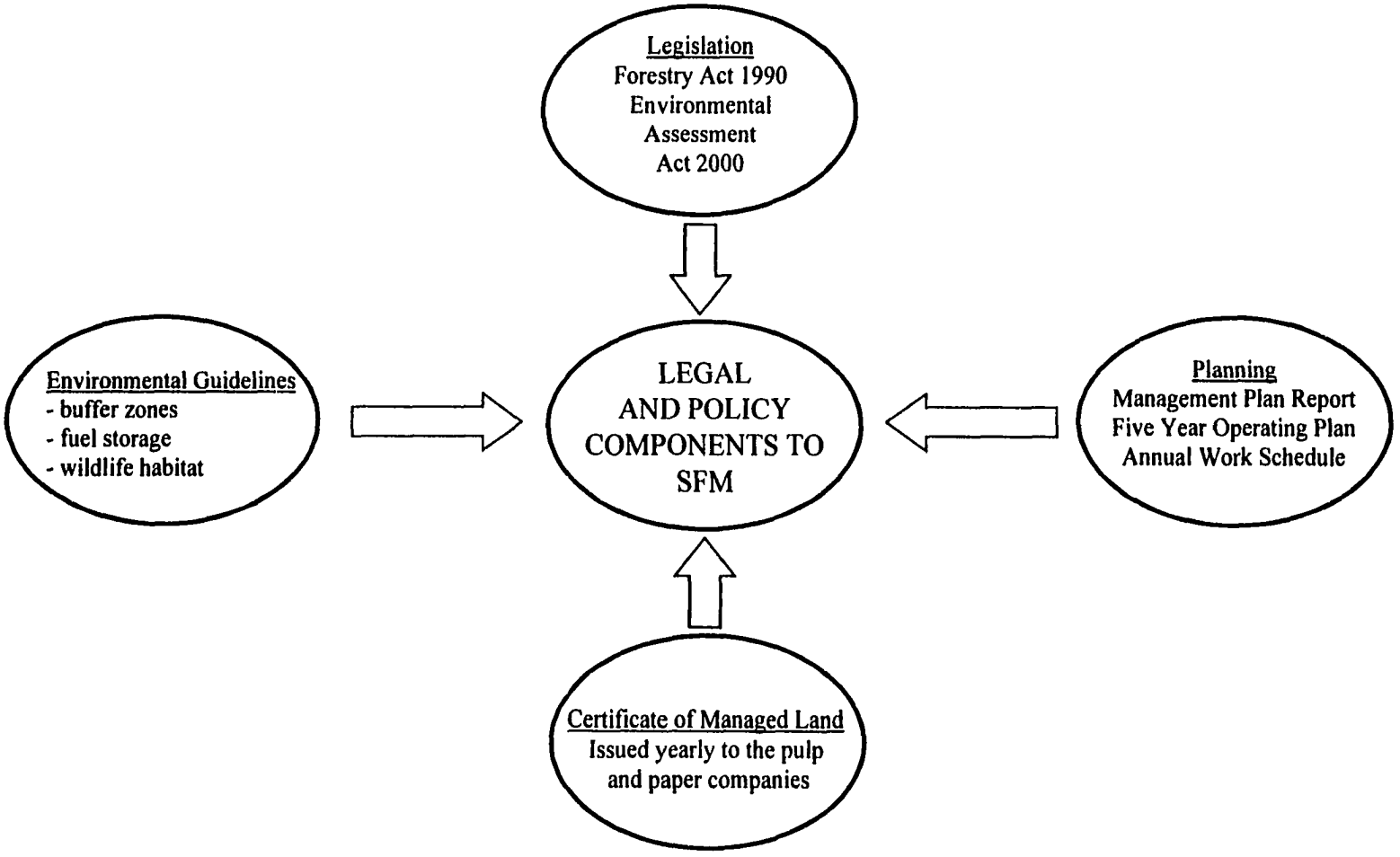

Figure 1. The four primary legal and policy components to sustainable forest management.

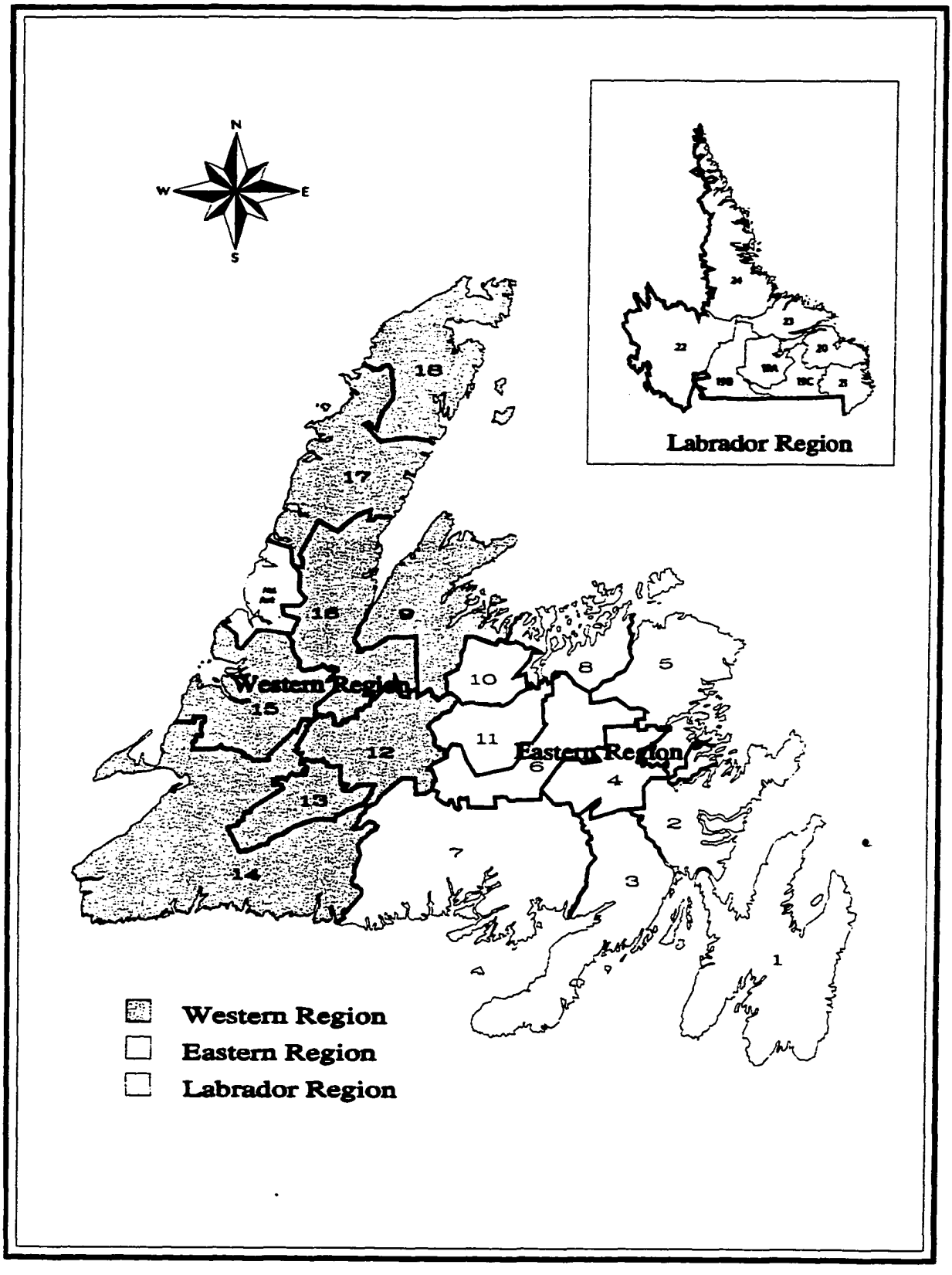

Figure 2. Forest Management Districts in the Province of Newfoundland & Labrador

the forest resources of the province. Specifically, the Act instructs the Forest Service to supervise, control and direct all matters relating to:

1. Constructing and maintaining forest access roads.
2. Protecting the forests of the province from fire, insect and disease.
3. Carrying out programs of afforestation, reforestation, forest improvement and tree improvement
4. Cutting, classifying, measuring, manufacturing, marking and inspecting trees and timber.
5. Preparing timber management plans for areas of productive forest land.
6. Developing and maintaining an up-to-date inventory of the timber resources of the province.

The Forestry Act (Section 3) also instructs the Minister of Forest Resources and Agrifoods to consult with and advise all departments of government respecting the planning, development and use of the forest resources of the province. The Minister must also consult with the residents of the province, in an appropriate manner, who may be directly affected by:

1. The preparation of a forest management plan.
2. The designation of a timber production forest.
3. The issuance of a Crown timber licences or timber sale agreements.

The Forestry Act is the primary legislation for managing the forests of the Province. However, there is additional legislation that directly influences SFM, namely the Environmental Assessment (EA) Act (Appendix II) which was proclaimed in May, 2000, and the regulations which were approved in August, 2000 (Appendix III). The

EA Act defines the environment to include air, land, water, plant and animal life; (including human life), social, economic, recreational, cultural and aesthetic conditions. This broad interpretation of the environment gives the EA Act a mandate to evaluate the biological, economic and social implications of almost any proposed development activity.

Schedule 1 of the EA Regulations identifies the district five-year operating plans as developments that must be registered under the EA Act for public review. Figure 3 explains the EA approval process. Each plan has to be registered no less than 180 days prior to implementation. Citizens need to understand that the plan may not be acceptable to the Minister of Environment and Labour after this public review. Therefore, the plan would not be implemented until acceptable revisions were made.

When the Minister calls for further assessment, an environmental assessment committee for the registration document (plan) is established. The committee undertakes to guide and analyze the assessment produced by the proponent and advises the Minister of Environment and Labour on the acceptability of all baseline studies and assessment reports. The length of time to complete the assessment will depend if the EPR or EIS is called.

Figure 4 identifies other significant legislation that influences SFM. Because of the broad definition of SFM, citizens need a basic understanding of the relevant legislation. This knowledge will help planning team participants to understand the legislative authority and regulatory requirements that must be adhered to by ensuring they are reflected in the plan.

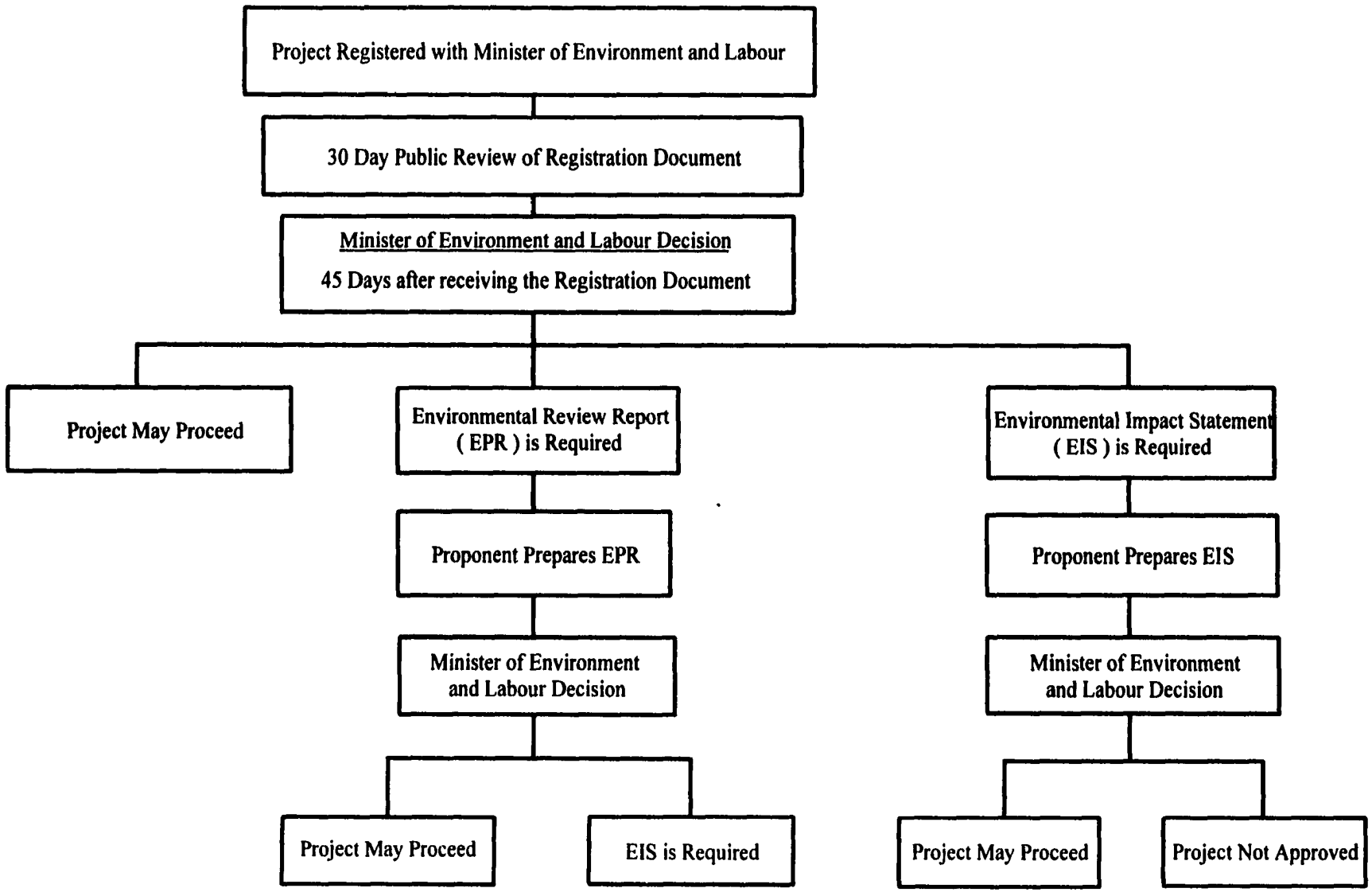

Figure 3. Decision making process for projects registered under the Environmental Assessment Act, 2000.

Legislation	(P) Provincial (F) Federal	Association with SFM
Forestry Act, 1990	P	sustainable management and protection of the forest resource (trees)
Wildlife Act, 1990	P	management and protection of wildlife
Wilderness and Ecological Reserves Act, 1980	P	establishment of wilderness and ecological reserves
Lands Act, 1991	P	allocation of Crown land for development
Environmental Assessment Act, 2000	P	facilitates wise use of natural resource and evaluates proposed development on impact on the environment
The Environment Act, 1995	P	protection of water quality and quantity
The Fisheries Act, 1985	F	protection and management of fish habitat
Canadian Environmental Assessment Act, 1992	F	assessment of proposed developments for impact on the environment
Migratory Birds Convention Act 1994	F	protection of migratory birds
Navigable Waters Protection Act	F	water crossings cannot impede access to watercraft

Figure 4. Provincial and federal legislation that influences sustainable forest management in Newfoundland and Labrador.

PLANNING

The Forestry Act requires each forest management district to have a forest management plan. This plan is comprised of three documents (Figure 5).

1. Management Plan Report.

2. Five-year Operating Plan.

3. Annual Work Schedule.

A brief description of each planning document follows:

Forest Management Plan Report

Section 2(1) of the Forestry Act 1990, states:

> "the management plan report means a document describing the parcel of forest land to which the plan applies and setting out the nature and extent of the forest resources contained within the parcel, the problems associated with the attainment of a regulated forest and the general policies and practices to be employed in the long-term for the attainment of a regulated, sustained yield forest."

The Forestry Act defines sustained yield management as:

> "a policy, method or plan of management to provide for an optimum continuous supply of timber in a manner consistent with other resource management objectives, sound environmental practices and the principle of sustainable development."

The provincial twenty-year forestry development plan is used as the basis to develop the forest management plan report (called the district ecosystem strategy document). There is only one forest management plan report for each forest management district. This report is usually prepared by the district manager, however, there are three districts (districts 11, 12 and 13) which Abitibi Consolidated is responsible for preparing the

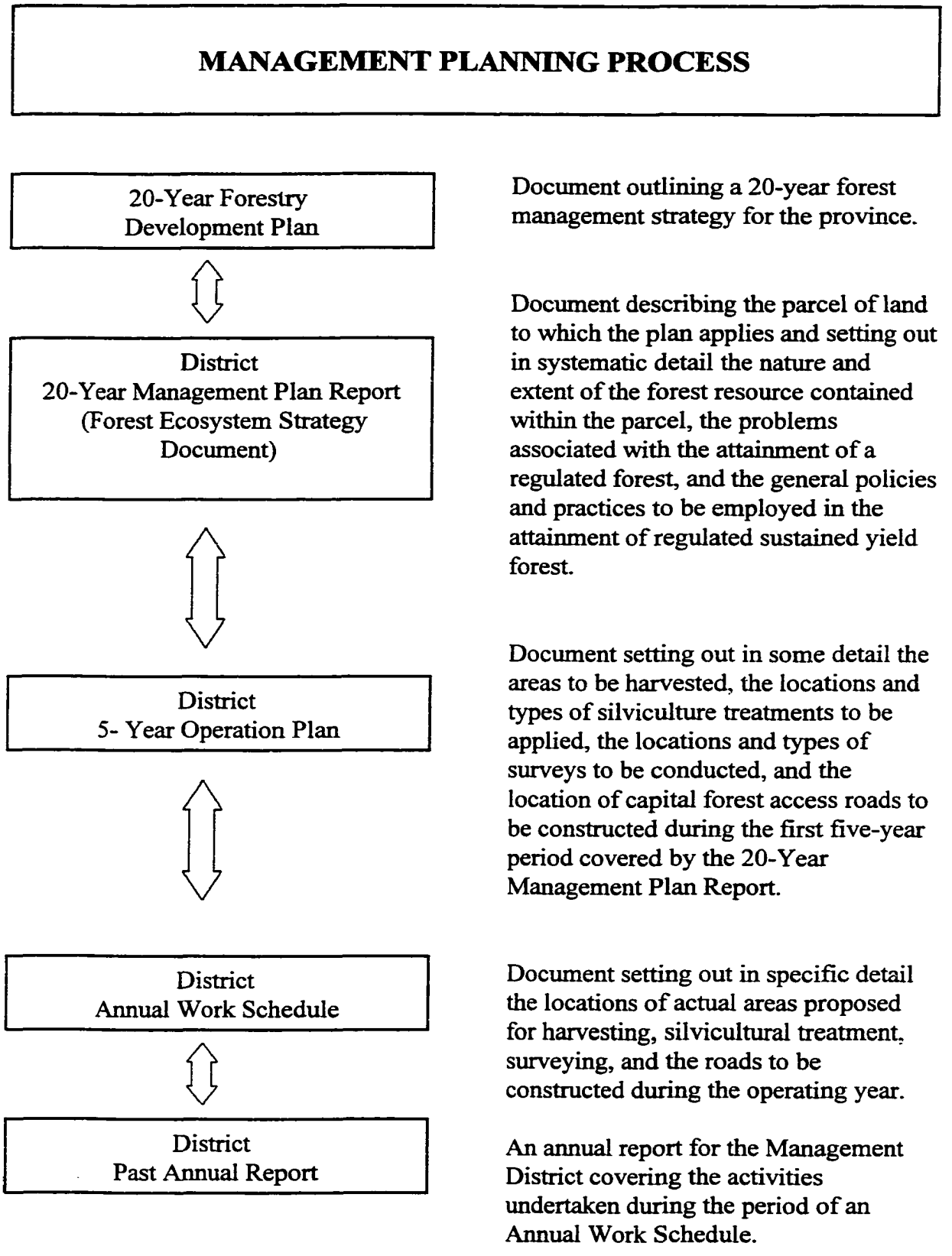

Figure 5. Sustainable forest management planning framework for Newfoundland and Labrador.

forest management plan report.

Five-Year Operating Plan

The five-year operating plan identifies areas for timber harvesting, the locations and types of silviculture treatments, the locations of primary resource access roads, and how forest values will be integrated when timber management actions are implemented. The five-year plan format is more detailed than the management plan report (e.g. it has maps outlining the areas where, when, and how management activities will occur). The annual allowable cut is determined in the forest management plan report and allocated in the five-year operating plan. A separate five-year operating plan is prepared by each organization with timber cutting rights in the management district. This means, up to three five-year operating plans (Newfoundland Forest Service, Corner Brook Pulp and Paper Ltd. and Abitibi Consolidated) may be prepared for the same management district.

Annual Work Schedule

Annual work schedule identifies the exact location where forest operations are to occur for a particular year. Where the five-year plan provides the general location, the annual work schedule provides specific details for all proposed activities and surveys. Similar to the five-year operating plan, each management agency with timber harvesting rights in a district are to prepare an annual work schedule.

Past Annual Report

Each year a past annual report is completed. This report covers the activities undertaken during the period of the previous annual work schedule. Comparisons of proposed versus actual on-the-ground activities are conducted and any discrepancies explained.

Citizens are invited to participate via a planning team to develop a forest management plan report and five-year operating plan for a management district. If a person does not support the planning team concept, he or she can write a letter to the Minister of Forest Resources and Agrifoods and express their concerns and obtain copies of any plan.

CERTIFICATE OF MANAGED LAND

The Forestry Act requires Corner Brook Pulp and Paper Limited and Abitibi Consolidated Inc. to apply annually for a Certificate of Managed Land (CML). The Government of Newfoundland and Labrador determines their management status and issues a certificate to the company. The CML is valid for one year, and Cabinet can change the managed status on any operating area in the following two year period. The CML outlines all the administrative procedures and conditions for forestry operations by operating area. Non-compliance with the procedures and conditions can lead to the recommendation of not managed status for a particular operating area or for the entire management district.

Citizens have the opportunity to determine what conditions may be attached to

the certificate of managed land by establishing conditions to operate within operating areas of a five-year operating plan. When areas in the five-year plan are scheduled for harvesting in the annual work schedule, any conditions for operating stated in the five year plan will be put in the CML.

ENVIRONMENTAL PROTECTION GUIDELINES FOR ECOLOGICALLY-BASED FOREST MANAGEMENT

Implementation of SFM requires that site specific actions be undertaken by woods workers. Within the province, the Environmental Guidelines for Ecological-Based Forest Management (Appendix IV) is where site specific actions are defined. The guidelines are broken into three primary areas:

1. General guidelines which apply to all forest management activities.
2. Guidelines for specific forest management activities such as timber harvesting, road construction, and silviculture.
3. Specific guidelines for operating in protected water supplies.

These guidelines have a legal basis for compliance by:

1. Attaching the guidelines to Corner Brook Pulp and Paper Limited and Abitibi-Consolidated Inc. annual certificates of managed land.
2. The guidelines are part of the commercial permit issued to a forest operator on Crown land.

Planning team members need to know these guidelines and how to apply them in planning and on-the-ground tasks. How these guidelines are applied is important in SFM in the Province, however, there is no opportunity for planning team members to

change these guidelines.

ENVIRONMENTAL PREVIEW REPORT ON A PROPOSED ADAPTIVE MANAGEMENT PLANNING PROCESS

In 1995 the Minister of Environment and Labour approved the environmental preview report (EPR) on a proposed adaptive management process submitted by the Newfoundland Forest Service. The EPR described a new direction for managing the forests of the province based on three objectives:

1. Establish a proactive planning framework to include all stakeholders.
2. To learn more about forest ecosystems while they are being actively managed.
3. An ecosystem management approach to forest management which integrates the scientific knowledge of ecological relationships and the biological limits of growth with social values to attain the goal of sustaining natural system integrity and health over the long term.

These objectives would be achieved through the establishment of a planning team for each management district. The planning team, comprised of government (federal/provincial), industries, non-government organizations and general public representatives use a consensus-seeking decision-making framework in preparing the district forest management plan report and five year operating plans (Figure 6).

It is important that all values are represented at the planning team table. A balanced team ensures all values are discussed and addressed in the plans. Planning team members should attempt to find individuals to represent values not at the table.

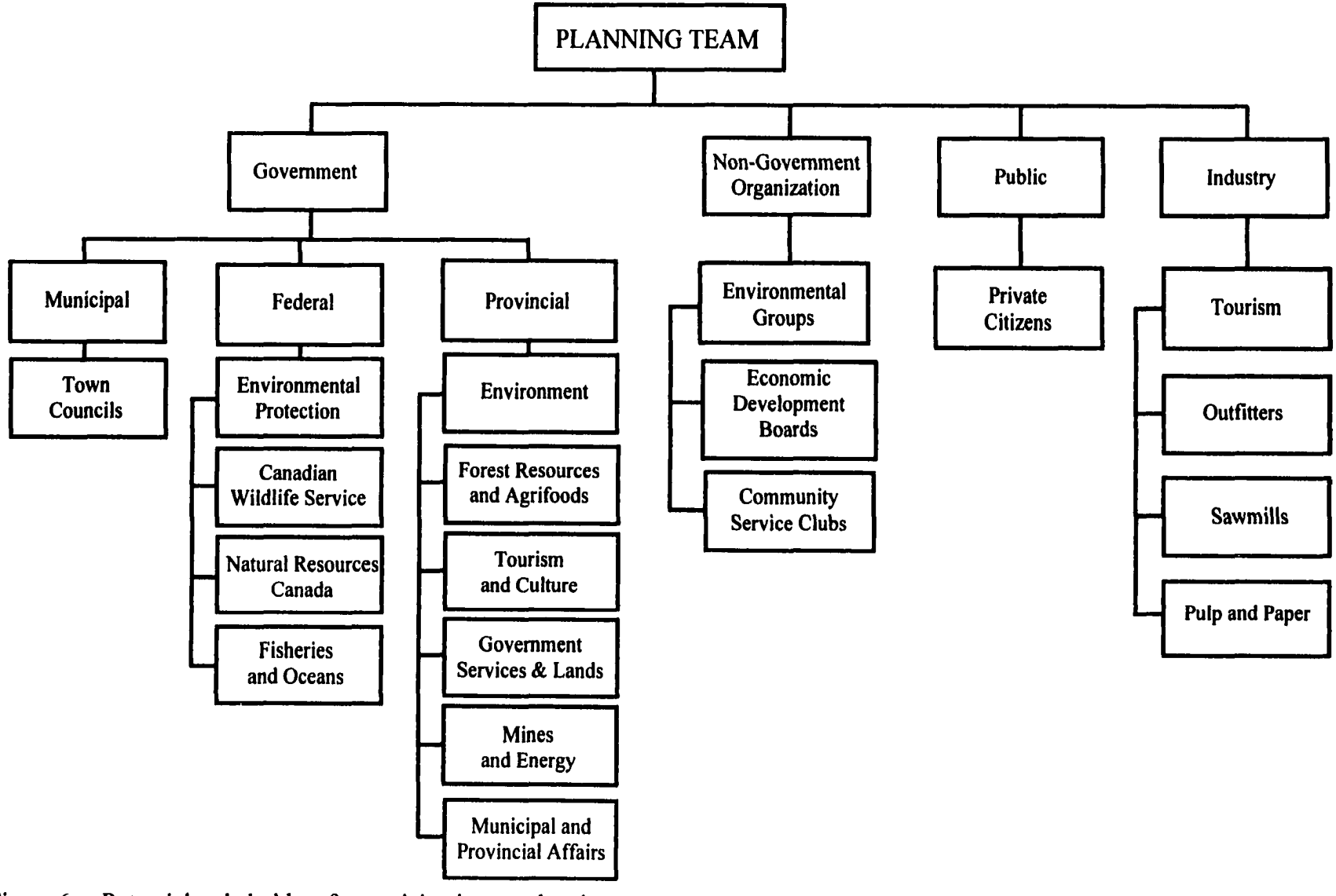

Figure 6. Potential stakeholders for participation on planning teams.

RESPONSIBILITIES IN SUSTAINABLE FOREST MANAGEMENT

The primary responsibility for SFM within the province is the Newfoundland Forest Service which has the legal mandate to manage the forests of the province. However, the Forest Service shares this role with many other agencies who have legal responsibilities and interests for forests:

Pulp and Paper Companies:

Corner Brook Pulp and Paper Ltd. and Abitibi Consolidated Inc. were granted long-term land tenure in three main forms (Figure 7) to harvest trees in Newfoundland (private, license and charter). Private land is the most complete form of land tenure. It implies ownership of the land as well as the forest and other resources in and on the land. With chartered land, (only applies the Abitibi Consolidated) rights to land, timber, mineral and certain water resources have been granted for a specified time. The chartered lands were for an initial period of 99 years and are renewable indefinitely at the option of the company. Licenses transferred property rights to timber to the licensee (paper companies) on a defined area for a specified period of time (99 years).

The Forestry Act requires both companies to prepare five-year operating plans and annual work schedules in each district where they have a licence to the timber. Abitibi-Consolidated Incorporated has three districts (11, 12, 13) with the sole right to harvest trees. For these districts Abitibi is responsible for establishing planning teams to prepare forest management plan reports.

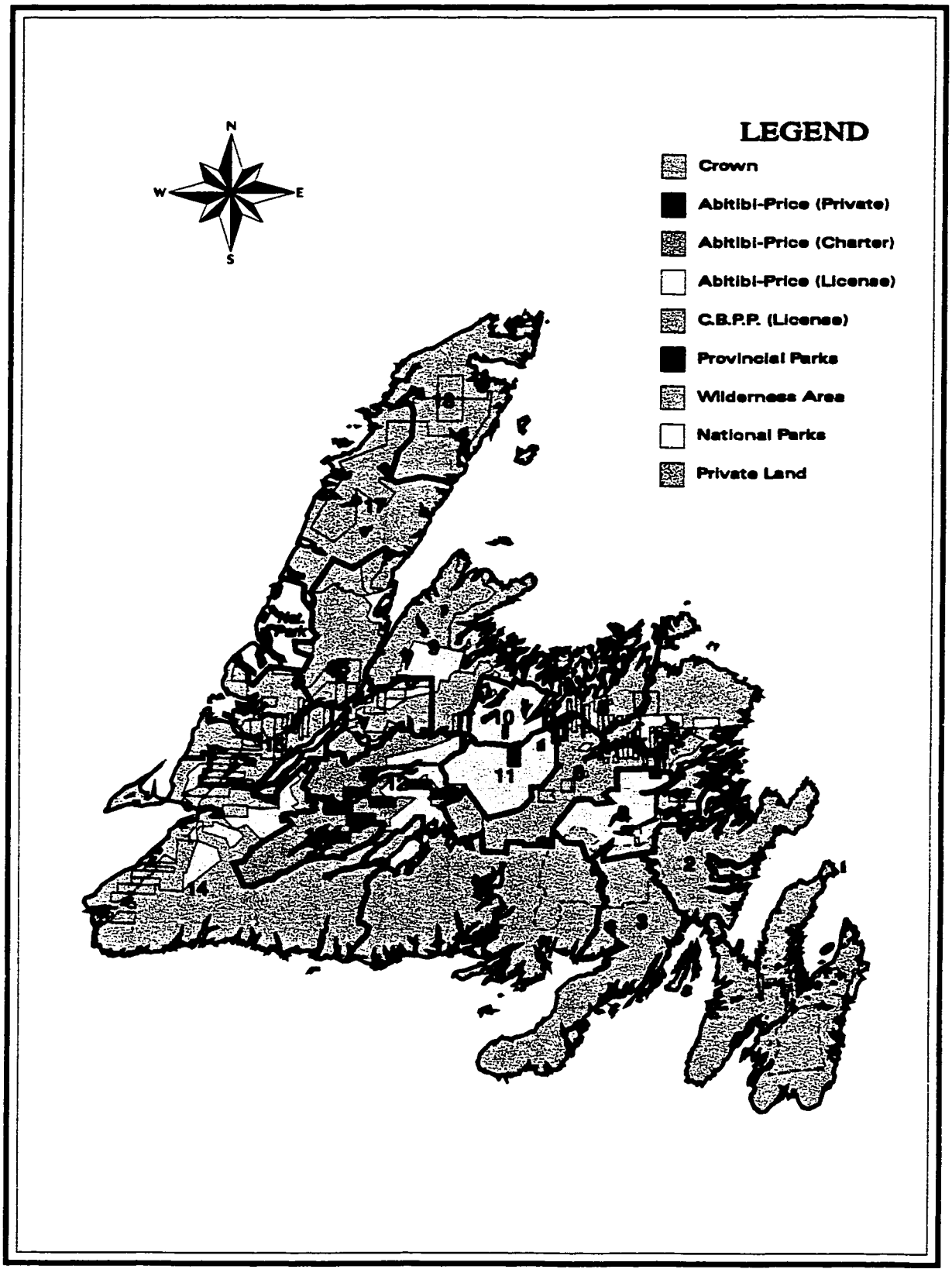

Figure 7. Land tenure on the island of Newfoundland

Federal Government:

While the provincial government has the responsibility for management of its natural resources, there are several areas of federal legislation that influence forest management in the province. Specifically, the Fisheries and Oceans Act states that it is illegal to deposit deleterious substances in water that will impact fish populations and habitat. Secondly, the Navigable Waters Protection Act requires all proposed water crossings to go through a screening process to determine the impact of the crossing on stream navigability by any form of water craft. Finally, the Canadian Environmental Assessment Act may be triggered where forest management potentially impacts federal jurisdiction.

Provincial Government:

Provincial management of natural resources does not reside in one department. Consequently, various government departments have a role in the preparation of the forest management plan report and five-year operating plans. The provincial government participants represent the mandates of their department in the discussions.

Municipal Government:

With over 700 municipalities in the province, municipal governments have a role in SFM. Before forest management actions occur within municipal planning boundaries, consultation with the local town councils is required. Preferably, these discussions can occur within the parameters of the planning team where all interests in

the local forest can be focused in one forum.

Non-government organizations:

There are groups established throughout the province with common interests. Examples of such organizations are environmental groups, snowmobile clubs, rod and gun clubs, and watershed management corporations. These organizations bring their particular interest to the planning team table.

General Public:

There are individuals in the province who enjoy being in-the-woods and have an interest in how the forests are managed. These individuals will bring their particular values for consideration in the planning process.

It is important for planning team members to understand the legal responsibilities and roles of the various participants. This understanding will assist communication between planning team members and assist what role the members will partake in the process. Without this understanding, confusion and frustration will occur within the team.

NEWFOUNDLAND FOREST SERVICE ORGANIZATIONAL STRUCTURE

Since SFM is primarily the focus of the Newfoundland Forest Service, it is important to have an understanding of the Forest Service's organizational structure and how it supports planning teams. The Newfoundland Forest Service is divided into a headquarters branch, (Figure 8) a field service branch (called Regional Services) and an

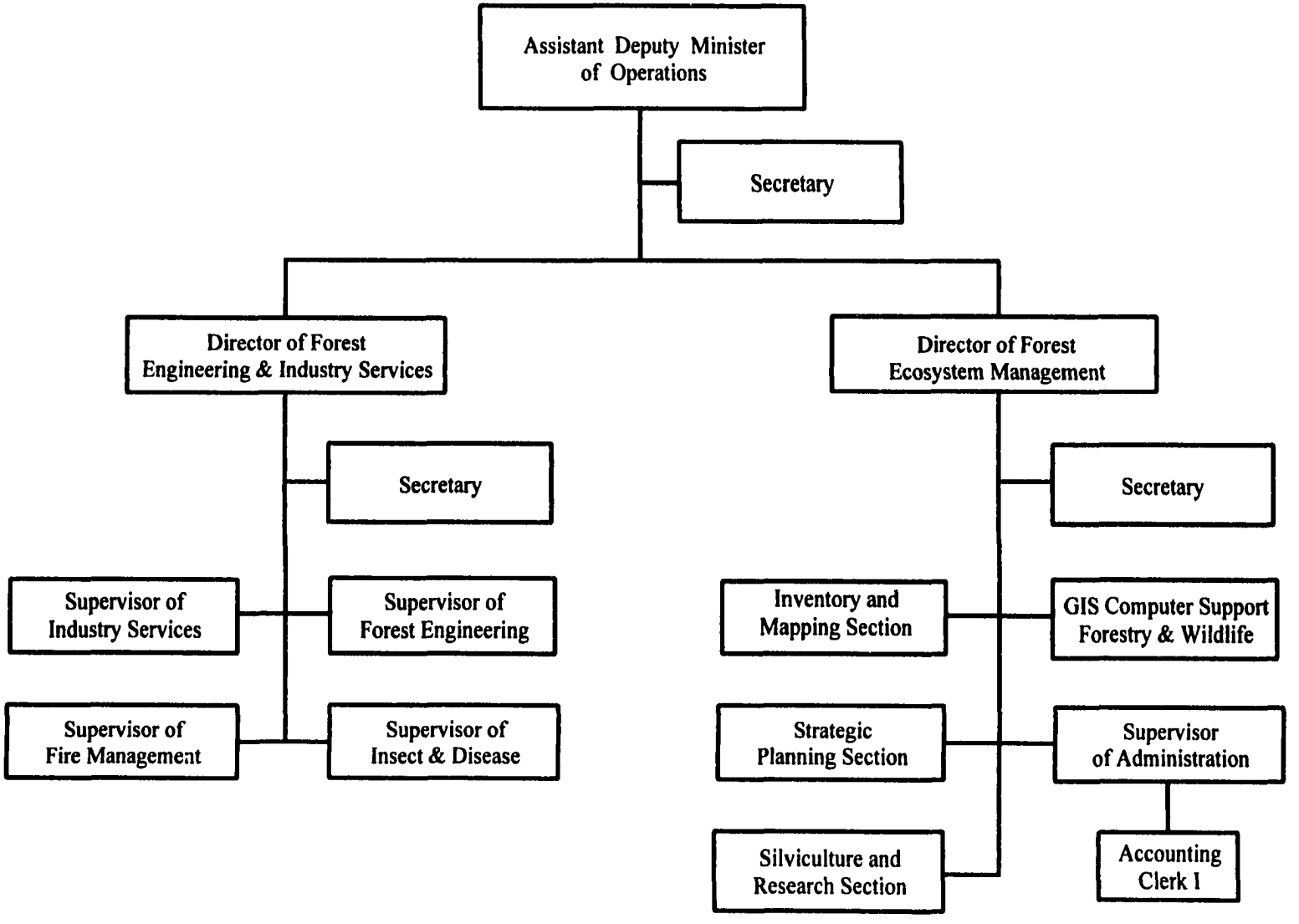

Figure 8. Newfoundland Forest Service Headquarters Organizational Chart

executive branch (St. John's). The headquarters branch provides the provincial direction and policy for managing the forests of the province. This mandate is fulfilled through the Forest Ecosystem Management Division and the Forest Engineering Services and Protection Division.

The Regional Services is the implementation branch of the Forest Service. There are three regions in the province: East, West and Labrador. Each region has a director, a regional planner and a regional ecologist along with district managers placed throughout the regions (Figure 9). The district managers are responsible for the preparation of the forest management plan report, the five-year operating plans and the annual work schedules in their district. The regional planners, the ecologists and headquarters staff provide support to the district managers and planning teams throughout the process.

Understanding the Newfoundland Forest Service structure is important to the planning team. Many Forest Service personnel participate in the process or may be asked to make a presentation. Comprehension of the Forest Service structure assists planning team members to understand the role of Forest Service participants and who may be able to assist the process.

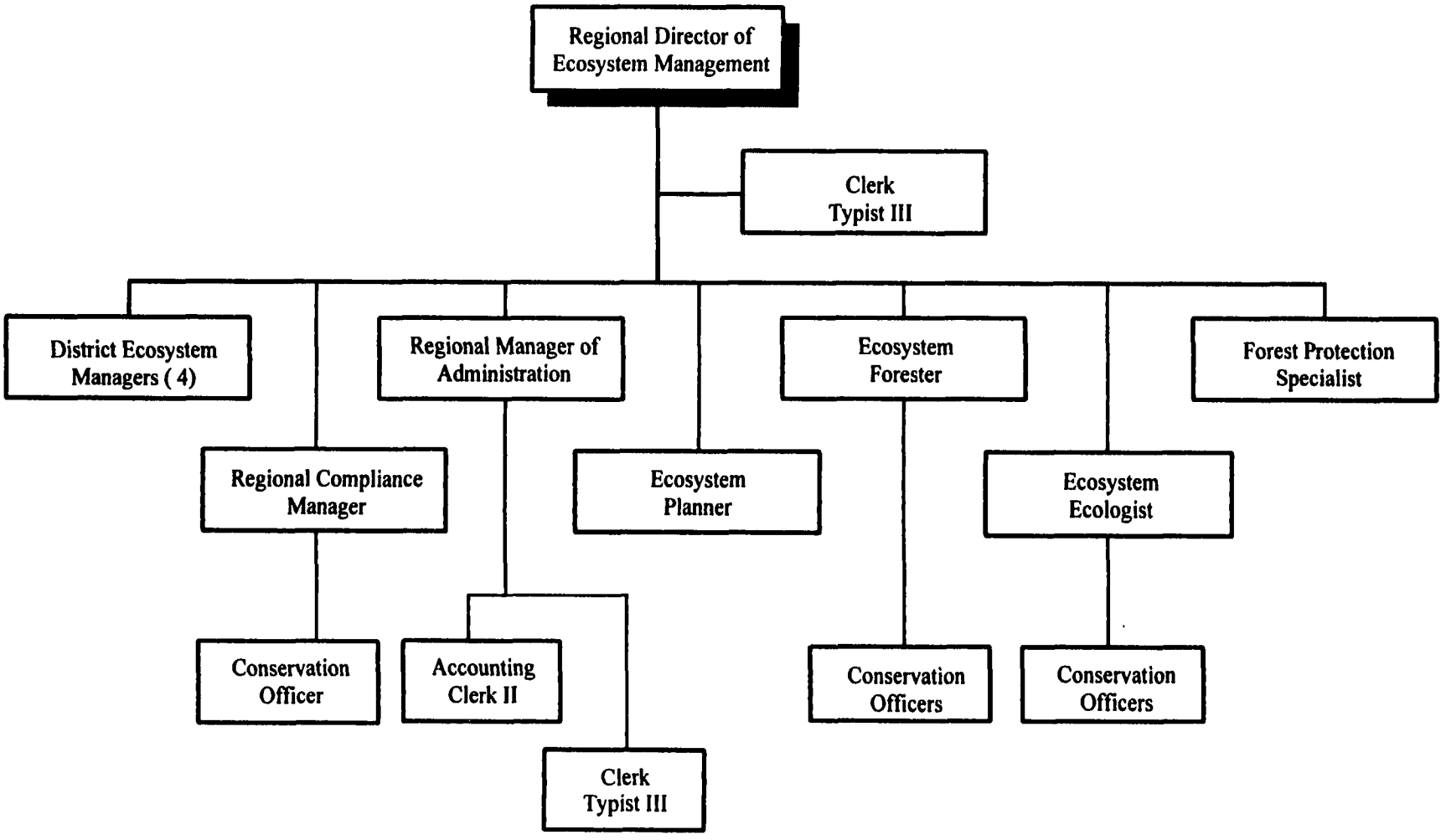

Figure 9. Newfoundland Forest Service Regional Service's Organizational Chart

CONCEPTUAL PRIMER OF SUSTAINABLE FOREST MANAGEMENT

The basis for this primer is the paper Foundations and Dimensions of Sustainable Forest Management: A Primer, by P.N. Duinker, Director, School for Resource and Environmental Studies, Dalhousie University.

WHAT IS SUSTAINABLE FOREST MANAGEMENT?

The names we give the latest and best form of forest management keep changing. For example, we hear SFM, sustainable forestry and ecosystem management. For the purposes of this guide all these concepts will be the same. They all essentially point to a re-balancing of priorities (ecological, social and economic) in forest management. Resource extraction from the forest is still important, but society today want forest managers to address a host of non-timber values (ecological and social). This guide will define SFM using the Canadian Standards Association (CSA) (1996) definition:

> "SFM is management to maintain and enhance the long-term health of forest ecosystems, while providing ecological, economic, social and cultural opportunities for the benefit of present and future generations."

While we can debate the validity of this definition, such an exercise would not be productive in the overall goal of SFM.

To more clearly understand SFM it is helpful to examine each word.

Management - Management of forests is best seen as an ongoing process of planning a

set of actions and then implementing them. In planning we set objectives and we design actions to meet them. A forest management plan contains a discrete set of objectives and specific action schedules. When actions are taken, forest managers monitor whether the actions are implemented as specified, whether the forest is responding as expected and whether objectives are being met as specified. The cycle of planning begins again, either at a legally specified interval or when objectives or action schedules (or both) are clearly in need of revision. (Baskerville 1986; Erdle and Sullivan 1998).

Forest - If SFM is about managing forests, an understanding of what is a forest is necessary. The Ontario Forest Policy Panel (1993) explained forests this way:

1. A forest is ... a great expanse of trees as far as the eye can see.
2. A forest is ... a group of trees in part of the agricultural landscape (woodlot, wind break).
3. A forest is ... trees in the urban environment, lining streets, and in parks.
4. A forest is ... all types of ages of trees: young seedlings to mature trees, natural and artificial regeneration.
5. A forest is more than trees. Shrubs, plants, animals, insects, and soil and all are part of it.

While these definitions of a forest do not mention people, it is understood people are a part of the forest ecosystem. Basically, a forest is a tree-dominated ecosystem. Forestry is therefore the profession of managing tree-dominated ecosystems.

Sustainable - The World Commission on Environment and Development (WCED 1987) define sustainable development in terms of meeting the needs of people

today without jeopardizing the ability of future generations to meet their own needs. Therefore sustainable in forest management means to provide for resource extraction, ecosystem functions and society's values now and into the future.

It is important that planning team members understand what is meant by SFM. Clarifications of SFM aids in clarifying the role and task of planning team participants.

WHAT ARE THE MAIN COMPONENTS OF SFM?

The CSA (1996) standards document breaks down SFM into a continuous learning loop (Figure 10). A detailed description of each value is described below.

1. Preparation: The forest under management must be defined in terms of boundaries and a description of current conditions. For the defined forest area, values are identified and goals and indicators established for the values. Then tentative objectives are determined for the goals. Finally, an inventory (timber, water quality, wildlife habitat, recreation) must be available that stores data, conducts field measurements as prescribed and generates maps to spatially illustrate the inventory.
2. Planning: Quantitative long-term forecasts (spatial and temporal) of possible future within the defined forest area are prepared for each indicator. Two basic forecasts are run; one without interventions and the second with planned interventions. After analysis of the forecasts, one is selected and a strategy is developed to reach the defined goals.
3. Implementation: Activities are planned to achieve the selected management objectives according to the forecast. The implementation of management

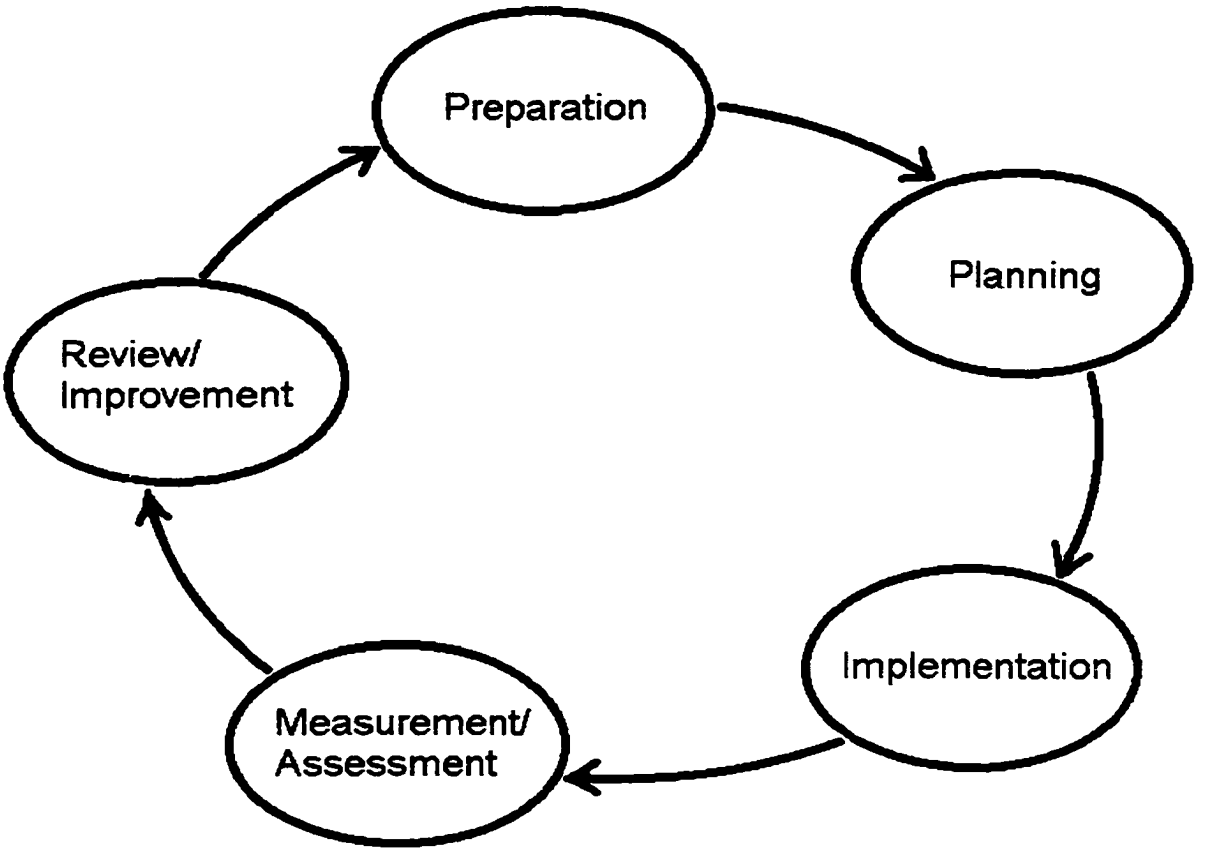

Figure 10. Continuous management loop for sustainable forest management (Based on Canadian Standards Association 1996b).

activities should be in the right places, at the right time, and to the right degree as specified in the plan.

4. Measurement and Assessment: The learning in SFM occurs when the actual forest condition is compared with the forest that was forecasted, and assessing the differences. This periodic measurement and analysis of current forest conditions is essential to determining if the values identified in the plan are being sustained.

5. Review/Improvement: Understanding the reasons for differences between the planned forest and the actual forest condition is where learning occurs. This new information and knowledge is important to improving how we manage the forests. In the next planning cycle (or earlier), this new information is used from the beginning of the five components to SFM.

The continuous planning loop enables an overview of the entire management exercise. The continuous loop is founded in adaptive management. Consequently, citizens need to understand the adaptive management concept to gain an appreciation of the continuous planning loop.

ADAPTIVE MANAGEMENT

Adaptive management is a much-discussed approach to learning and dealing with uncertainties (what we don't know or understand) in management of forests. Basically, adaptive management is a process to learn about the effects of management actions from the actual management of the forest. This management approach involves collating existing knowledge, exploring alternative actions, and making explicit

forecasts about their outcomes. Under this approach management actions and their monitoring programs are carefully designed to generate reliable feedback and to clarify the reasons underlying the outcomes. By applying a feedback loop, the actions and objectives are adjusted based on the new knowledge and learning that has occurred. It recognizes that ecosystems are complex and that we can never get perfect information for management decision- making.

The application of adaptive management is in its infancy stages in Newfoundland and Labrador. Through the current planning exercise, forecasts will be made for sustainable wood supply which results in future forest conditions. Similar forecasting tools are being developed for assessing landscapes and wildlife. All these forecasts have uncertainty in their assumptions and actual future outcomes. Duinker (1998c) provided an adaptive management strategy structure to aid in designing district adaptive management strategies to address the uncertainty involved in management:

1. Define the problem.
2. Determine jurisdiction involved.
3. Define the valued ecosystem components and goals.
4. Establish indicators for goals.
5. What are the driving forces and mitigations.
6. Determine the time frame and spatial bounds of the strategy.
7. What information is required and available.
8. Propose alternative hypothesis.
9. What forecasting tools are available.
10. Who is involved in decision-making.

11. How and who will monitor.

12. When will an assessment of the strategy occur.

Planning teams need to understand that information available to them is incomplete and sporadic. Yet a plan must be prepared in that environment. To overcome these data gaps or lack of understanding, management is itself an experiment where forecasts of the future are determined and a monitoring program implemented to measure the actual outcome.

However, adaptive management is not learning as one goes. Rather it is about implementing large-scale experiments as part of normal forest management where specific actions and monitoring occur. These experiments might range from testing the expectations of stand-level treatments related to alternative harvesting and regeneration treatments, all the way to monitoring forest-scale strategy predictions for managing habitats of sensitive species. Application of adaptive management is a key to successful SFM. The implementation of an adaptive management program will be a major challenge to the Newfoundland Forest Service and planning teams.

CRITERIA AND INDICATORS

In Canada, the criteria and indicators concept was initiated and a commitment made, that by 1993 the federal government would develop a system of national indicators to measure and report regularly on the progress in achieving SFM. The term criteria is used to refer to a very broad category of forest values. Forest values are the ways in which forests are important to people. Indicators are measurable characteristics of the values (Figure 11). The Canadian Council of Forest Ministers in 1995 released

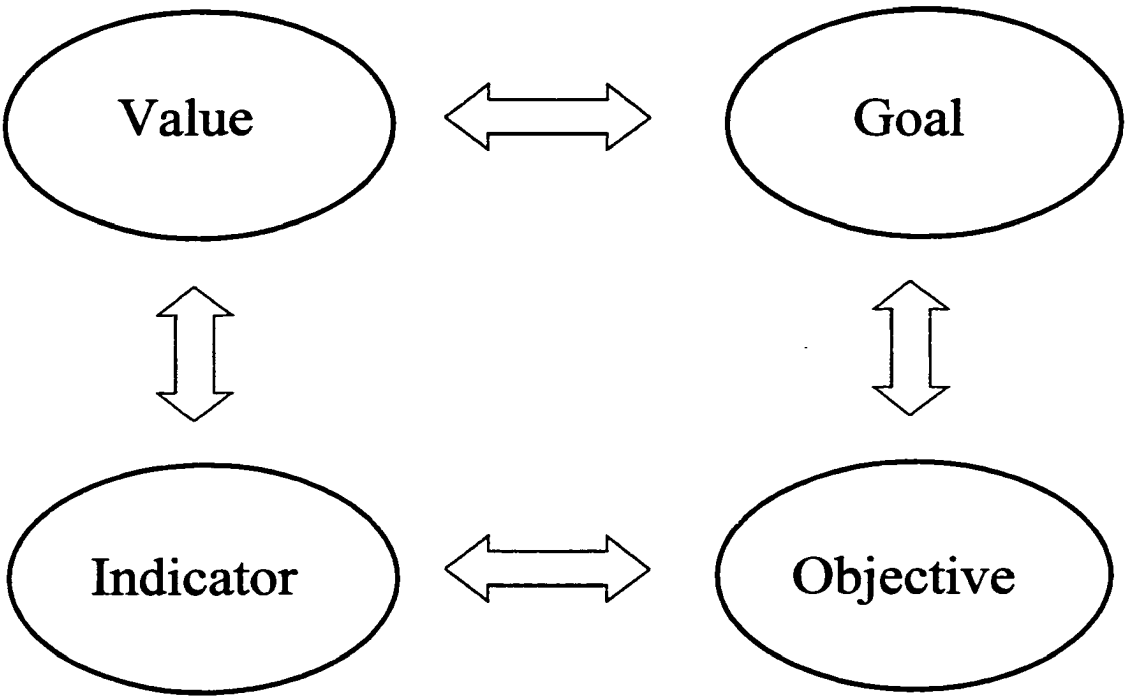

Figure 11. Relationship between values, goals, indicators, and objectives [e.g. (Duinker, 2000)].

the document Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators. This C&I framework provides a common understanding and definition of SFM with six criteria identifying the key values:

1. Conservation of Biological Diversity.
2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity.
3. Conservation of Soil and Water Resources.
4. Forest Ecosystem Contributions to Global Ecological Cycles.
5. Multiple Benefits to Society.
6. Accepting Society's Responsibility for Sustainable Development.

Criteria and indicators are needed in assessing SFM because when people are making decisions they want to have confidence they have considered all the things that are important to them. For example, if wood is a forest value, the goal could be to provide a predictable and continuous supply of quality wood to local processing plants. An indicator might be the volume of sawlogs harvested from the forest each week and the objective might be 10 000 m^3 of sawlogs each year for the next fifty years.

If we want to plan forest management in a systematic way to try to meet the wide range of expectations that people have, we must (a) identify a broad suite of criteria and specific values, (b) set goals and identify at least one indicator for each value, and (c) set objectives for each indicator.

Planning team members need to understand that C&I is the method to measure progress towards SFM. District planning teams have the WNMF and the Newfoundland Forest Service indicators to evaluate and determine their applicability.

District planning teams will select the indicator appropriate to the district.

DOES CERTIFICATION FIT IN SFM?

Governments, industry and non-government organizations have introduced a variety of initiatives to promote SFM. Forest certification is a tool that is gaining increasing international attention as a mechanism by which forest companies or organizations with forest management responsibilities can demonstrate to the markets their commitment to the principles of SFM. Forest certification provides independent third-party verification that a forestry operation meets a voluntary standard determined by a certification program. There are three certification schemes relevant to the province:

1. Forest Stewardship Council (FSC) which is based on ten principles for forest stewardship.
2. International Standards Organization (ISO) 1400 series of environmental management system standards which focuses on continual improvement.
3. Canadian Standards Association (CSA) Sustainable Forest Management Standard which provides a framework for designing and implementing a voluntary system to promote sustainable forest management in a defined forest area.

It should be understood that certification by itself is neither necessary nor sufficient for the pursuit of SFM. However, its credibility rests on the fact that the forestry practices and management systems are audited by an independent third party. It is a voluntary process, meaning that it is not regulated or legislated by governments,

but something companies pursue for its own reasons.

In Newfoundland and Labrador, Abitibi Consolidated have obtained ISO 14001 certification (December, 1999). Currently, Corner Brook Pulp and Paper are pursuing ISO 14001 certification and the Newfoundland Forest Service are completing a gap analysis in reference to the ISO 14001 standard. The Newfoundland Forest Service intent to pursue ISO 14001 certification for Crown land.

PUBLIC INVOLVEMENT

Public involvement has become an increasingly critical component of SFM in Canada. All provinces incorporate some form of public involvement in forest management. For the purpose of this guide, public involvement is defined as any situation where people and other resource managers are invited to give opinions on matters pertaining to forest use and management (Duinker 1998). We must remember that public involvement does not replace the district manager and elected officials as final decision-makers according to their authority under legislation. Rather, public involvement represents a mechanism for new information upon which to base decisions. It also provides a forum for conflicts among forest users to be addressed in a structural setting.

Within the province, public involvement in SFM is through the creation of district planning teams. These teams are comprised of local citizens, non-government organizations, and provincial/federal/municipal government representatives who assist the district managers in preparing district forest management plan reports and five-year operating plans. The entire Creating a Planning Team section of this manual goes into

more detail on public involvement.

As Abitibi Consolidated, Corner Brook Pulp and Paper and the Crown put more effort into certification it will become a force in management. However certification will not effect the task of planning teams, but a working knowledge is necessary when certification is mentioned to the planning team.

ANNUAL ALLOWABLE CUT

The calculation of a long-term sustainable timber-harvest level (annual allowable cut) is a major component of an SFM plan. Forest simulation computer models are used to simulate forest development into the future. These models permit management actions (harvesting, planting, thinning) to be incorporated into these projections. Such interventions will influence the sustainable harvest level possibilities. In establishing the annual allowable cut the harvest level cannot exceed the total growing stock for any period in the future to be considered a long-term sustainable timber-harvest level.

There are three primary parameters that will influence the timber harvest level for a forest (Erdle 1999):

1. Size of the forest available for fibre production.
2. Growth rates of forest stands in the particular forest.
3. Scheduling of forest stands for harvesting across the landscape.

To enable forest development forecasting and harvest level determinations, a forest land base must be defined and classified (usually by forest types and age-classes). Growth rates are commonly expressed as a yield curve with the y-axis representing

m^3/ha and the x-axis the stand age (Figure 12). When conducting forest forecasting simulations, one decision is to determine when forest stands will be available for harvesting. Usually, the larger the opportunity for scheduling stands for harvesting, the higher the long-term timber-harvest level. A second input are the yield curves used to forecast forest development. The third input are the level of management inputs (harvesting, planting and thinning).

Planning teams have several inputs into an AAC calculation. The first input is in defining a land base for a fibre supply. Participants may have forest lands to include or withdraw from the AAC calculation. This land decision is based on forest values defined by the planning team. The land base exercise is a critical component of wood supply analysis and planning teams can have a significant input with their involvement. Appendix V identifies the current reasons for withdrawing productive forest land from the land base used to calculate an annual allowable cut.

The second area of AAC influence is in determining management scenarios to test (harvesting, thinning, planting) for their influence on sustainable fibre flow and future forest structure. Different management scenarios will result in different harvest levels and future forest conditions. The planning team needs to select the most appropriate scenario and create a data set and develop management actions.

Planning teams will have no influence on yield curves as they are determined from over 900 PSP in the Province.

SILVICULTURE

Silviculture is about managing the establishment, composition, structure and

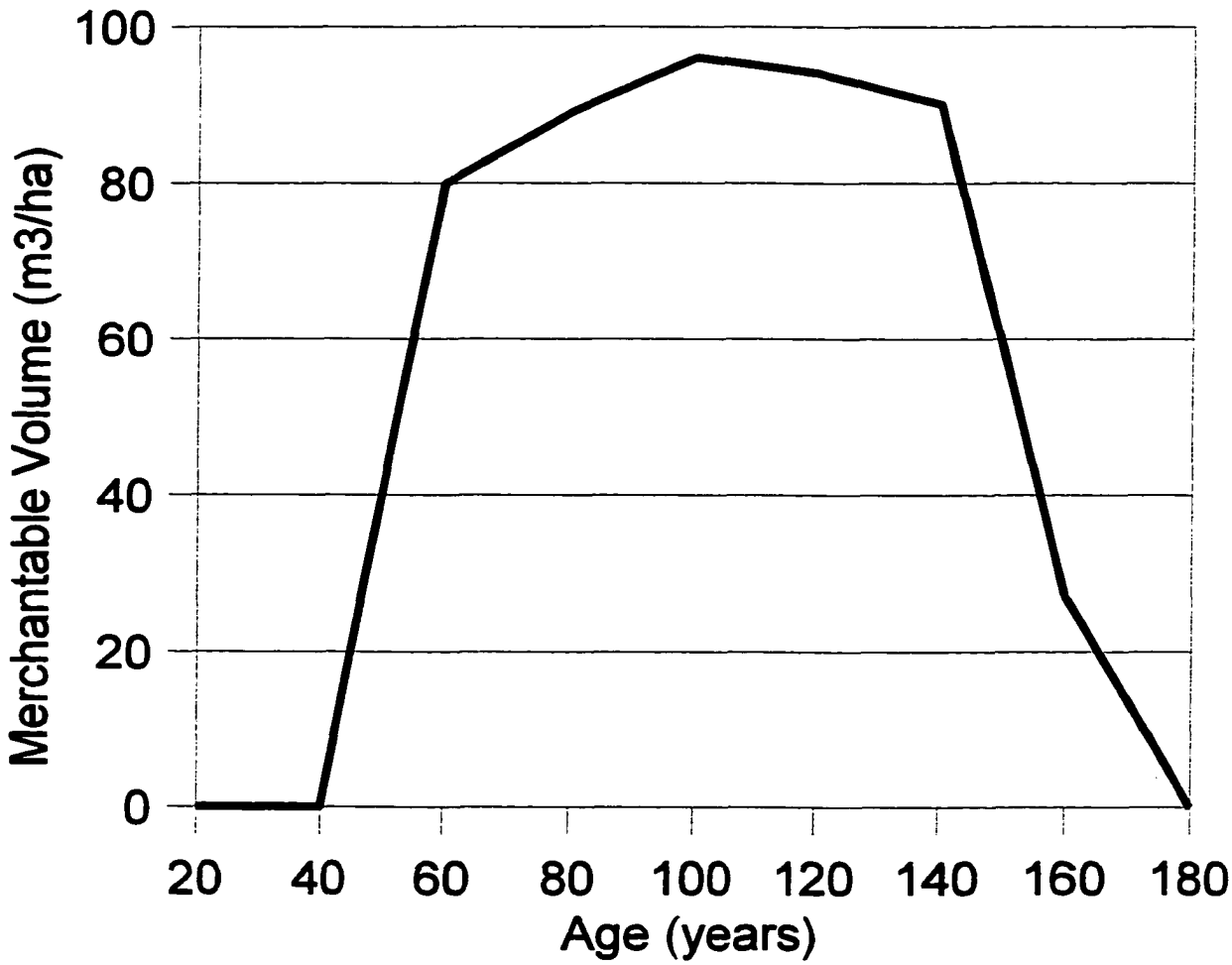

Figure 12. Yield curve for a medium black spruce site in central Newfoundland.

growth of single forest stands on a forest landscape. To design an effective silviculture program requires an understanding of the Provinces forest ecology and the silvics of the native trees (a description is found in Appendix VI).

Frequently, silviculture is considered to be only planting and thinning. However, silviculture involves stand interventions throughout the entire forest growth cycle from the establishment phase to maturity. Silviculture tools such as reproduction methods, planting, thinning (at different forest ages), fertilization and herbicides all are used to manage forest stands or forest landscapes towards specific objectives.

Any silviculture action, such as tree harvesting, that leads to the development of a new stand of trees is considered a reproduction method. This silviculture intervention is usually the most important in terms of visual, wildlife and other non-timber forest values (Kimmins 1992). Timber harvesting can be done six different ways depending on the forest type, the stand age and the objective for the stand (Figure 13):

1. Single tree selection: When individual trees are removed from the stand and younger trees fill the openings created.
2. Group selection: A small group of trees are removed to create a small opening in the forest canopy.
3. Patch cut: A small clearing is created in the stand.
4. Shelterwood: Essentially a clear-cut in which the final harvest is done in two or sometimes more stages.
5. Seed tree: Trees are left, scattered across the cut area enabling their seed to be the source of reproduction.
6. Clear cutting: The harvest of all trees in a single cut from an area of forest large

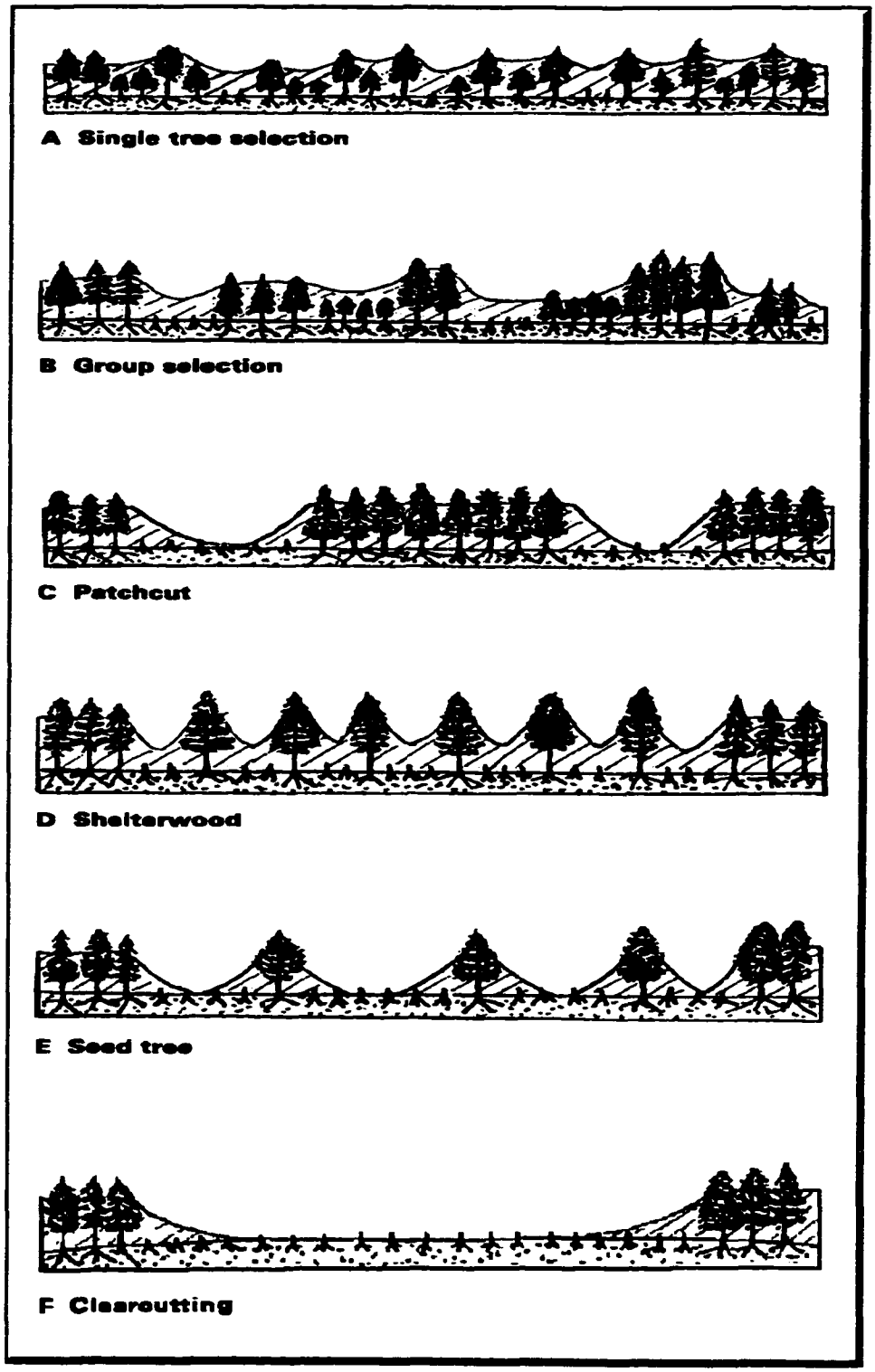

Figure 13. Schematic description of six different tree reproduction methods [e.g. (Kimmins 1992)].

enough that the forest influence is removed from the majority of the area harvested.

The primary regeneration method use in Newfoundland and Labrador is clearcutting. This reproduction method is used where the tree silvics dictate regeneration to even-aged stages following disturbance (fire, insects). Harvesting forest applying the clearcutting system will also create an even-aged stand based on the tree silvics of the species in the province. The two primary stand interventions used in the province are planting and thinning.

PLANTING

Trees are planted for a variety of reasons, the main purpose being to re-establish trees growing on a forest land base after natural disturbances, insect , wind, fire and human action (tree harvesting). Preferably, natural tree species most suitable to the site conditions are used as planting stock. Likewise, a local seed source is the preferred choice.

THINNING

The yield of merchantable fibre volume can be improved by reducing the stand density of trees. This will increase the vigor of the remaining trees by decreasing the competition for water, soil, and light which will enhance diameter growth. Surplus trees are removed in thinning to concentrate the potential wood production on a limited number of selected trees. The intent of thinning is to regulate the distribution of growing space for the benefit of the remaining trees. The majority of thinning in Newfoundland and Labrador occurs in regenerating stands less than 15 years old.

However, some thinning has occurred in forest stands up to 40 years old.

INFORMATION IN SUSTAINABLE FOREST MANAGEMENT

A prerequisite to any form of resource management is a good information base. These data bases are usually found in resource agency inventories. The Newfoundland forest Service has a forest inventory program, which had the following objectives (Department of Forest Resources and Agrifoods 1990):

1. To provide timber volumes and other statistics for forest lands in a standardized form suitable for use in preparing a forest management plan.
2. To provide up-to-date maps showing the location and extent of forest types to enable the preparation of a plan for the management and orderly development of resources within each management district.
3. To enable overall planning and development of the provincial forest resource by providing data to enable the calculation of the annual allowable cut for each management district.
4. To provide and improve growth and yield information through the establishment and remeasurement of permanent sample plots (PSP) in managed and unmanaged stands.
5. As required, to initiate special studies on cull, decay and regeneration success, to achieve these objectives.

Initially, the forest inventory program focused on tree measurement. However, with the shift to SFM, the inventory has expanded to include more than trees. The information contained within the inventory is found in Appendix VII.

The data is collected from two types of inventory plots:

PERMANENT SAMPLE PLOTS

The objectives of the PSP program are to provide stand growth data that can be used to calibrate and validate stand growth projection models and to have a network of plots sufficient to sample the important stand conditions at an acceptable intensity. The PSPs measure changes in forest stands over time. There are approximately 900 PSPs established in the Province.

TEMPORARY SAMPLE PLOTS

The temporary sample plots (TSP) is a snapshot in time and provide data to generate volume figures for different forest stand types. There are approximately 10,000 TSPs in the province.

Sustainable forest management is such a broad concept that the Newfoundland Forest Service inventory data is inadequate to meet all the information requirements. Forest values such as wildlife habitat, ecological/wildlife/wilderness reserves, archeological sites, protected water supplies, agriculture, outfitters, salmon rivers, parks, etc. have data bases with other resource management agencies. This information must be included with the forest stand data to obtain an understanding of the land base under management. Appendix VIII contains a series of value maps which is a consolidation of all the value inventory data bases. Planning team members need an appreciation of these data bases. Also, there is the opportunity to seek additional information not currently being considered.

CREATING A PLANNING TEAM

Public involvement in SFM in Newfoundland and Labrador means involving residents of the province in the preparation of district management plan reports and five-year operating plans. The participation of residents, government (provincial/federal/municipal) managers and non-government organizations is crucial to ensuring decisions are made with the consideration of the full spectrum of values. The participatory process used is described in the 1995 EPR "A Proposed Adaptive Management Planning Process." The foundation of this process id the establishment of planning teams within forest management districts. Creating a district planning team is a three step process:

1. Public notices are made (local newspapers, cable stations, radio) to announce the time, place and location of an introduction meeting to discuss what a planning team is and what is involved in preparing a forest management plan. Also, towns within the district and individuals with a known interest in the management of the local forest are contacted and encouraged to attend. A presentation is delivered at the meeting which describes the Newfoundland Forest Service's planning framework, and the roles and responsibilities of the planning team, individuals, organizations and resource managers (Appendix IX). Those interested in participating on a planning team are asked to leave their name, address and phone number, so they can be contacted when the first

planning team meeting will occur.

2. All provincial and federal departments, who may have an interest in the management of forests in a district are sent an official letter by the Newfoundland Forest Service informing them of the creation of a district planning team and requesting their participation. The primary government departments contacted are:

a) Department of Forest Resources and Agrifoods:

- Inland Fish and Wildlife Division
- Agriculture Branch

b) Department of Tourism and Culture:

- Historic Resources Division
- Natural Areas and Parks Division
- Outdoor Product Division

c) Department of Environment and Labour:

- Environmental Assessment Division
- Water Resources Division

d) Department of Government Services and Lands:

- Crown Lands Division

e) Department of Mines and Energy:

- Minerals and Land Management Division

f) Department of Fisheries and Oceans:

- Habitat Management Branch

- Coast Guard

3. After the general public, non-government organizations and provincial/federal departments have indicated their interest in participating on a planning team, the district manager arranges for the first official meeting.

It is important for planning team members to understand how a team is established. From this understanding they can evaluate who has volunteered to participate and if all interests are represented. It is important for planning teams to assess themselves and determine if other values need representation at the table. The planning team should take leadership to ensure their team is representative of all interests, even to the point of searching for people to represent an interest.

GROUND RULES

Ground rules provide structure and clarity to the process and help avoid inefficient or ineffective discussions. An initial set of shared expectations and understandings will provide the foundation on which to base further discussions. The ground rules specify why there is a planning team, how the planning team will make decisions, what happens when they cannot agree, what are the limitations of the plans, who participates, and the administrative procedures such as meeting schedules (see sample ground rules in Appendix X). The first duty of a planning team is to develop its ground rules. The following are major components that should be incorporated into ground rules:

1. Specify who participates on the planning team and in what capacity.

2. Define the administrative structure of the planning team (i.e. meetings, dates, notice of meetings, how meetings will be run, who is responsible for minutes).
3. Define what the planning team is to accomplish.
4. Define consensus and when consensus is reached (this can be a partial agreement or an agreement to disagree).
5. Identify what to do when consensus is not possible.
6. Provide standards of conduct and behavior.
7. Explain confidentiality around information and general discussion.
8. Establish who will be responsible for contact with the media.
9. Clarify how information is shared between planning team members.

MAKING DECISIONS

Legal decision-making authority rests with the provincial government. However, the involvement of residents in resource management improves these decisions. In recent years, consensus decision-making has gained acceptance in resource management planning. Consensus is defined as general agreement of all parties. Participants may not like every part of the agreement, but they are able to live with the total package.

Consensus for planning teams may be reached with different levels of agreement. When planning teams cannot reach a consensus, then the district manager will develop a solution that will be included in the plan. Any planning team member may prepare a written statement on an issue. The district manager's recommendation

will reference all dissenting statements and append them to the plan.

While unanimous agreement may be the ideal, it will be difficult to achieve in all circumstances. Consensus depends on good will and a positive attitude among planning team participants; it is essential that everyone involved works toward agreement. Figure 14 defines a scale of different levels of agreements that may be useful to planning teams in defining their decision-making process.

PERSONAL CONDUCT OF PLANNING TEAM MEMBERS

For an successful planning team experience, there needs to be personal rules of conduct for participants. Such guidelines give direction to these teams in how to work together as a group. Suggested rules of personal conduct are:

1. All participants agree to use a consensus seeking decision-making process. The primary purpose of this rule is to motivate the participants to look for areas of agreement versus where they differ. The decision-making process will be based on the following ten principles of consensus defined by the National Roundtable on the Environment and Economy (1993).

   Principle 1. Purpose Driven - People need a reason to participate in the planning process.

   Principle 2. Inclusive not exclusive - All parties with a significant interest in the issue should be involved in the process.

   Principle 3. Voluntary Participation - The parties who are affected or interested participate voluntarily.

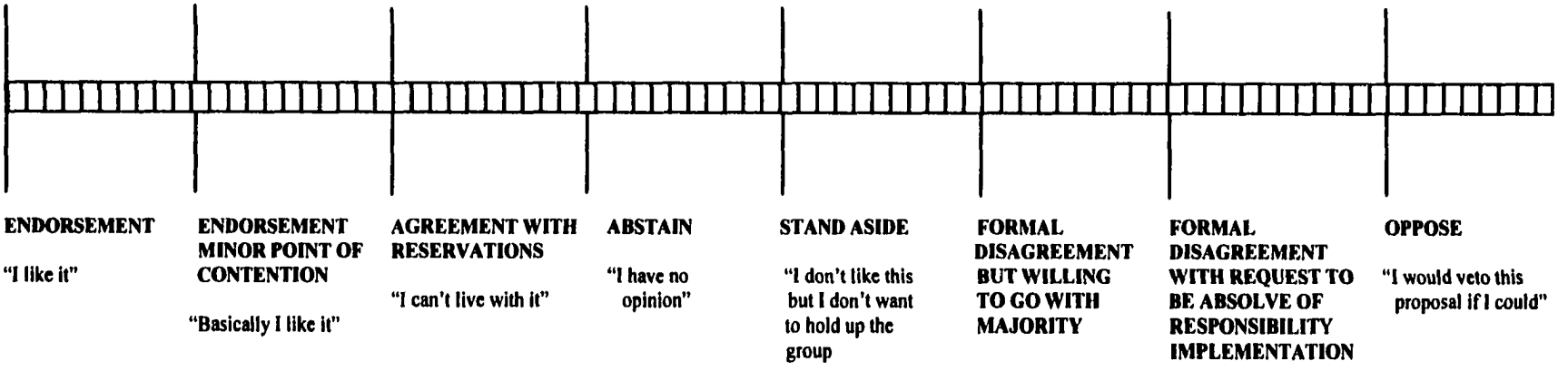

Figure 14. Scale describing different levels of agreement.

Principle 4. Self Design - The parties designing the consensus process.

Principle 5. Flexibility - Flexibility should be designed into the process.

Principle 6. Equal Opportunity - All parties must have equal access to relevant information and the opportunity to participate effectively throughout the process.

Principle 7. Respect for Diverse Interests - Acceptance of the diverse values, interests and knowledge of the parties involved in the consensus process is essential.

Principle 8. Accountability - The parties are accountable both to their constituencies and to the process that they have agreed to establish.

Principle 9. Time Limits - Realistic deadlines are necessary throughout the process.

Principle 10. Implementation - Commitment to implementation and effective monitoring.

2. No personal attacks against any member of the planning team.
3. During all meetings and discussions, participants will be steered toward that commonality of purpose which is to assist the district manager to prepare a forest ecosystem strategy document and a five-year operating plan.
4. The record of meetings will consist of a list of general topics that were discussed and the decisions made.
5. Maintain strict confidentiality regarding the ideas expressed and the positions taken by individual members.

6. The planning team will assess the extent of any disputes, identify sub-issues that may be at the root of the disagreement, and collect verifiable information and data as needed. All participants in the process will contribute verifiable facts to the best of their ability.

7. Planning team members agree to actively listen to each other.

8. Planning team members agree to be specific and ensure meaningfulness.

9. All relevant information is to be shared.

10. Planning team members agree that if we get stuck, we move on. We won't allow ourselves to get bogged down.

Planning team members need a clear understanding of the decision-making authority. The Minister of Forest Resources and Agrifoods has offered the planning teams the opportunity to reach consensus on local planning; however, where the team cannot agree, the district manager will make a recommendation in the plan for the Minister to consider.

VALUES, GOALS, INDICATORS, OBJECTIVES

The information for this chapter is from two sources:

1. Criteria for Sustainable Forest Management. A Practical Guide to Using Criteria and Indicators in Newfoundland and Labrador. Western Newfoundland Model Forest 1999.
2. Criteria and Indicators of Sustainable Forest Management in Canada. Progress and Problems in Integrating Science and Politics at the Local Level. P. N. Duinker 2000.

This section discusses how the planning team directs their effort towards a healthy forest that supports the broadest possible range of values. The establishment of values, goals, indicators and objectives for SFM assists in accomplishing this task by providing a systematic way to determine values and goals (for the spectrum of ecological, economic and social considerations) and to measure progress through indicators and objectives. In order to develop and effectively use the values, goals, indicators and objectives framework, it is important to have a common understanding of the key terms.

VALUES

Values answer the question why are forests important to you. While some of these values may seem obvious, its worthwhile to acknowledge the tremendous

diversity of reasons that people have for finding a forest important (e.g. water quality and quality regulation, recreation, timber, wildlife).

GOALS

A goal is a direction for a value and answers the question what do we want to do? A goal tells us the direction we want to go in order to support a certain value (e.g. produce a continuous non-declining flow of quality wood to meet mill needs). Some goals may never be fully achieved, but this means they are likely to remain valid for a long time.

INDICATORS

Indicators are a measurable variable relating directly to one or more values (e.g. timber m^3/yr., harvest volume/carbon sequestration kg/ha/yr., net carbon flux/biodiversity, age-class structure of the forest). Good indicators should be:

1. Measurable: The validity of high quality data should be a factor in selection.
2. Predictable: If an objective is to be set for a particular indicator, it should be possible to predict with reasonable accuracy the future level for that indicator.
3. Relevant: An indicator should tell you something significant about the value.
4. Understandable: Indicators should be simple, clear and easy to understand.
5. Valid: Indicators should be consistent with a scientific understanding of the value being described, should be technically valid (objectively obtained, documented, comparable and reproducible).

6. Practical: The effort required to collect the information for the indicator should be reasonable and consistent with the overall usefulness of the indicator.

OBJECTIVES

CSA (1996) describes an objective as a "clear, specific statement of expected quantifiable results to be achieved within a defined period of time related to one or more goals. An objective is commonly stated as a desired level of an indicator."

Figure 11 illustrates that there are strict relationships among values, goals, indicators and objectives. For each value there is a goal statement and one or more indicators. For each indicator, there is one objective statement. The value is satisfied if the goal is reached, and the goal is reached if all the objectives are met.

A four step framework is recommended to guide a planning team in establishing values, goals, indicators, objectives.

Step One: Form Public Involvement Process

Establish an effective public involvement process. The creation of a district planning team is the public involvement mechanism for SFM in the province.

Step Two: Decide on Values and Goals

Each planning team is to decide on values and goals for the forest management district. A starting position will be a review of values and goals in other plans and conducting an analysis of their appropriateness to their district. After the review, the planning team then establishes their own values and goals.

One important outcome of this process is that participants should be willing to

recognize and accept the validity of all values/goals. This is not always easy to accomplish, but if some time isn't spent at the outset to reach agreement on the values/goals to be included, then there is a real risk of running into serious roadblocks later. It is not necessary that all participants actively support all goals but simply to acknowledge that they are valid goals for other interests participating in the process.

Step Three: Select Appropriate Indicators

Indicators from existing plans and documents should be used as a checklist where the same values and goals have been determined by the planning team. It is important, however, that each planning team develops and takes ownership of its own set of indicators.

Quantitative indicators are preferred to qualitative indicators because they have less room for interpretation and make it easier to compare future forecasts against actual results, thereby providing learning. There are cases, however, when it may not be possible or feasible to use quantitative indicators. In these cases it is better to find other appropriate indicators rather then picking meaningless ones just because they can be expressed in numerical terms. For example, a quantitative indicator like "number of people attending public meetings" may be a measurable indicator, but doesn't say anything meaningful about the extent of public involvement in forest management. It may be more useful to gather descriptive information about the extent to which public involvement has had a noticeable impact on actual on-the-ground practices.

Step Four: Develop Objectives

The Planning Team should be actively involved in setting objectives, which is

the process of determining what will actually be done in order to meet the goals and support the values. Each objective must have the following characteristics:

Simple

Measurable

Achievable

Repeatable

Timelines

The elements described in the four steps are important components to be incorporated into the district forest management plan report and the five-year operating plan.

THE FUTURE - FORECASTS AND SCENARIOS

Forests are dynamic systems which change through time either by natural forest succession or human interventions. However, because change in the boreal forest is sometimes slow, the forest is considered static. For example, a forest develops through the successional phases from renewal (regeneration), pole, (mature) to maturity (growth stages) which in a natural process takes 80 to 150 years, depending on species, climate and site conditions. The natural disturbances of fire, insects, and wind are interventions that keep these ecological successional processes functioning (i.e. a natural disturbance returning the forest to the stage of re-establishing the successional cycle). Human intervention, through timber harvesting returns a forest to the initial phase of forest succession. However, it is acknowledged that harvesting does not mimic natural disturbances in spatial arrangement on structure after disturbance. The challenge for the forest manager and planning team is to blend in other ecological considerations (stand structure, spatial and temporal distribution) with the human intervention.

Sustainable forest management involves forecasting changes that will occur in a forest, remembering that any actions or natural disturbance taken today will influence forest development for the next 80 to 150 years. This progression of a forest stand through its successional stages can be forecasted (predicted) using computer simulation models. This is achieved by separately forecasting the development of forest stands into the future and assimilating these into one forest level forecast.

The use of computer models simulates what could happen with available management tools and allows for consideration of the probable impacts of these futures before actions are implemented in the forest. While models are simplifications of forest dynamics, they provide a mechanism to analyze the implication of management actions on the future forest. The advantage of computer models is that they produce alternative forecasts, based on the data used to quantify forest stand succession and management strategies. Each forecast reflects the defined initial conditions for the forest, the specified rules of change for forest stand dynamics and the responses for the proposed management actions.

To describe how such forecasting of future forecast conditions occurs, an adaptation of Duinker and Doyon (1998) is used:

1. Select a forest projection model (computer-based forest simulation model). (Newfoundland and Labrador use the model Woodstock (Stanley)

   The data inputs for the model will be:

   - yield curves and succession rules;
   - forest inventory; and
   - forest management strategies.

2. The forest projection model will generate forecasts of the forest inventory under alternative management strategies and assumptions about forest yield development and succession. It will also determine the long-term sustainability of timber harvesting at various timber harvesting planting and thinning levels.

3. In each management strategy and set of assumptions tested, the forest projection

model will generate a spatially explicit forecast of the forest inventory. Where developed, wildlife habitat suitability models will evaluate the forecasted forest inventory for the habitat potential of the wildlife specified.

4. The forest landscape pattern and wildlife suitability forecasts for each strategy tested will be analyzed, compared and evaluated, leading to a retesting of management strategies. This process continues until an acceptable management strategy is achieved.

Computer simulation models provide planning team members the opportunity to develop alternate management scenarios using different harvest, planting and thinning combinations. Also, planning team members can influence the land base available for timber management designations and the assumptions required for some forest parameters such as regeneration success after harvesting.

The Newfoundland Forest Service currently use the Woodstock forecasting model (developed by Remsoft Inc. of Fredericton, New Brunswick) for wood supply analysis. Efforts are underway to develop models to forecast changes to landscapes, and access pine marten habitat and population estimates. These additional forecasting tools are essential to applying SFM in Newfoundland and Labrador.

MONITORING AND EVALUATION DURING IMPLEMENTATION

Monitoring is often neglected in conventional approaches to management, yet it is critical to learning and improving SFM. Monitoring allows you to assess how actions actually affect indicators. This information then allows you to evaluate the effectiveness of alternative actions, adjust data inputs into simulation models and take corrective action.

In the five steps of SFM described in the conceptual primer, step four applies to monitoring and evaluation. Duinker (1997) stated that a rigorous effective monitoring program in forest management is required. In SFM such a monitoring program will have these components:

1. To monitor if the actions prescribed in the plan are implemented as agreed by the planning team.
2. To determine if the ecological impacts in the forest are as predicted in the plan and used in the modeling exercises.
3. To establish a monitoring program for indicators with planning teams members being responsible to ensure data is available.

Upon completion of the plans, the planning team establishes a monitoring committee. The role of the committee is to develop a monitoring program based on the five-year operating plan. This is a crucial role, as many commitments are stated in the plans and the forest is predicted to respond a specific way. The primary functions of

the monitoring committee are to:

1. Monitor plan implementation for consistency with commitments in the plan.
2. Monitor if the predicted ecological future actually occurs.
3. Submit recommendations for plan changes to the agency responsible for management.

The management agencies will assist the monitoring committee by having a program established to measure the ecological predictions against actual forest indicators. Also, through the Newfoundland Forest Service headquarters in Corner Brook, an inventory design will be implemented to measure indicators on a provincial and district basis.

CONCLUSION

This guide has captured the essence of SFM which CSA (1996) defined as management to maintain and enhance the long-term health of forest ecosystem while providing ecological, economic, and cultural opportunities. The objective in writing the guide was to improve planning team members understanding of the forest management planning process, and how to more effectively contribute to the discussions in preparing the forest management plan report and a five-year operating plan. The intent was not to train people to become forest managers, but to enhance their understanding of the concepts and complexity of managing forests.

Concepts for managing forests has been revolutionized in the past ten years and has been evolving for the past fifty years. It is expected that new concepts pertaining to forest management will continue to evolve into the future. This evolution will continue to be influenced by legislation, policy, management tools, and society's values. Consequently, citizen guides such as this one, will need to be periodically revised to reflect the emerging thoughts in managing forests.

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APPENDICES

(Below are Appendices that would be included in the actual guide)

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