



Nova Scotia's

Code of Forest Practice

*A framework for the Implementation of
Sustainable Forest Management*

Interim Guidelines For Crown Land

Working Paper FOR 2008-1



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Introduction

The Code of Forest Practice principles has provided a framework of new direction for the wide range of activities that are and will be happening in Nova Scotia's forests. They are based on the concept of sustainable forest management which greatly expands the range of priorities for forest use across the province, while at the same time considers the long term well being of the forest environment.

The principles set the overall framework, however, specific direction is required to guide the actual planning and activities in the forest environment. These guidelines intend to provide specific direction for each of the principles in the framework document. While the principles are relevant at a broad forest level, the guidelines can be implemented at a landscape or stand level. The guidelines are set out in separate guidebooks for each of the four broad principle areas; Forest Ecosystems, Forest Products, Wildlife Habitat and Integrated Forest Use. Within each of the guidebooks, specific guideline statements direct the forest owner, manager or operator to implement the general principles from the framework document.

The direction provided by the guidelines is mandatory on Crown lands that are administered by Natural Resources, and will be implemented in the planning and design process for the development of Integrated Resource Management (IRM) plans for each of the Eco-districts in Nova Scotia. Private landowners are also encouraged to follow the guidelines on their own properties.

Manuals and technical references are also being developed to assist the forest owner and operator in the implementation of forest practices that meet the requirements of these guidelines. The Forest Ecosystem Classification Manual for Nova Scotia currently under development is an example of a site-based management guide that will be available for all forest users.

The Code of Forest Practice principles, guidelines and technical manuals will provide general direction and practical guidance for the sustainable management of a range of forest uses and values to benefit present and future generations of Nova Scotians.

Guidebook 1 - Forest Ecosystems

Foreward

Nova Scotia's Code of Forest Practice is being developed on three levels:

1. "A Framework for Implementation of Sustainable Forest Management", which has been published as Report FOR 2004-8 by the Government of Nova Scotia;
2. four Guidebooks, of which this document is Guidebook 1; and
3. a series of technical manuals which will include detailed requirements for specific activities associated with sustainable forest management (SFM).

The Code is mandatory for application on Crown land and recommended application on private land. Many of the Guidebook provisions are applicable at the landscape level; that is, at the scale of thousands of hectares, while others are meant for application at the stand level. Owners of large forest properties are encouraged to apply both the landscape and stand level provisions of the Guidebooks, whereas owners of small forest properties are encouraged to implement the stand level provisions.

Introduction

This Guidebook provides direction for forest management practices in the context of sustaining ecological processes. Ecosystem based management strives to balance economic, social, and ecological goals within a single management process. In conducting ecosystem based management, it is important to ensure that bio-diversity is conserved, ecosystem functions are maintained, contributions of all areas and uses of the landscape are considered, and actions are guided by a strong land ethic.

The primary ecological goals addressed in this Guidebook include bio-diversity conservation and ecosystem productivity and resilience. This will be accomplished primarily by addressing critical elements of landscape structure and composition. The overriding goal is to produce forest ecosystems that are resilient to global stresses such as climate change, atmospheric pollution, and land use pressures.

After several centuries of increasing settlement and timber harvests, Nova Scotia remains predominantly forested. Ecosystem based management works with both nature and society to generate a future forest with all the values we treasure. Forest management practices must be designed to respect the vital relationship between ecological integrity and long term social and

economic prosperity. In addition to adherence to all applicable laws, ecosystem based management strives to produce healthy, natural forest ecosystems by conserving their bio-diversity, productive capacity, natural conditions, resilience, and ecological processes. An adaptive management approach is used to redirect management strategies, if warranted, as key uncertainties are reduced.

Forest Health and Diversity

1.1 Code Principle: *Forest management practices will be designed and conducted to conserve and enhance the health and natural diversity of Nova Scotia's forest ecosystems.*

In forest ecosystems, trees are the major form of life upon which overall bio-diversity depends. In turn, the particular species and communities of trees on a site are dependent upon the climate, the underlying physical environment - land form, soil, and drainage and the natural disturbance regimes. The native bio-diversity of Nova Scotia's forest has adapted to a range of disturbance regimes that have created forest patches of various sizes and configurations. An ecosystem approach that strives to provide suitable habitat conditions for all native species is preferred. The more that managed forests resemble the forests that developed under natural disturbances such as wind, fire, diseases and insect epidemics, the greater the probability that bio-diversity and ecological processes will be maintained.

Landscape Level Guidelines

Ecosystem based management at the landscape level involves determining spatial priorities and goals for forest composition. Natural disturbance ecology thus needs to be reflected in SFM. With this approach, the critical landscape elements requiring consideration include:

- spatial pattern and age distribution of forest types;
- stand sizes and shapes
- successional stages of forest types; and
- internal stand structures.

Some ecosystems have been heavily affected by land uses such as agriculture and settlement. The remaining forest in these areas is fragmented with diminished ecological integrity. The composition and structure of stands managed intensively for wood fibre production tend to be less complex than in natural stands. However, with special attention to the spatial arrangements of land uses, intensive forestry and other resource development can be compatible with the maintenance of biological diversity and ecological integrity.

Ecological landscape analysis (ELA) will be used to support sustainable forest management in the province. ELA includes resource inventories, characterization of land use intensities, and interpretation of ecological functions. ELA thus helps resource managers develop plans for resource

conservation across ecological land units that may be divided by jurisdictional and land tenure boundaries.

- 1.1.1 Landscape level management plans will strive for a distribution of stand conditions; spatial pattern, size, type, composition and age, that is representative of the range of local natural variability.
- 1.1.2 Ecological Landscape Analysis will be used to identify the spatial pattern, size, type, composition and age of stands across eco-districts.
- 1.1.3 Four levels will characterize forest management intensities:
 - forest conservation reserves;
 - extensively managed forests;
 - intensively managed forests; and
 - forest conversions.
- 1.1.4 The distribution and amount of extensively and intensively managed forests, by eco-district and eco-section, will be assessed to help plan management actions to sustain the natural ecological functions identified in the ELA.

Stand Level Guidelines

Stand level bio-diversity is influenced greatly by timber harvest and silvicultural actions. If these activities are designed with a natural disturbance focus, then the likelihood of maintaining ecological balance and viability is increased. The following stand attributes should be considered when prescribing forest management treatments:

- downed coarse woody debris (for wildlife habitat and site enrichment);
- snags and cavity trees (for wildlife habitat);
- tree species composition (for habitat and site productivity); and
- vertical structure (for habitat).

Forest management practices should seek to establish forest communities suited to the ecosystem conditions. Natural regeneration provides native species that are genetically adapted to the site. Supplemental planting with native species of appropriate provenance can assist in restoring natural forest composition. Use of off site and exotic species can affect natural forest bio-diversity adversely if they are more aggressive than the native species. Intensively managed forests tend to be less complex than extensively managed forests.

Overall stand health in a working forest may require a program of protection from injurious agents such as insects, diseases, and fire. Prevention programs may protect ecological conditions and reduce economic and social impacts of the injurious agents. However, some timber damaging agents are ecologically important and their role should be considered in designing a protection program.

- 1.1.5 Extensive forest lands will be managed for resource production using techniques that mimic natural disturbances and sustain natural ecosystem structure and function. Management strategies will be based on the provincial Forest Ecosystem Classification (FEC)¹.
- 1.1.6 Silviculture methods that promote regeneration of native species typical of the ecosystem will be used in extensively managed forests.
- 1.1.7 Tree species diversity will be maintained or restored to the natural range of variation by using the FEC guiding forest management prescriptions to reach the appropriate species compositions in extensively managed forests.
- 1.1.8 Extensive forest management does not include use of off site and exotic tree species for reforestation and stand conversion.
- 1.1.9 Forests will be protected from significant losses to fires and pests through integrated management strategies.

Ecological Land Classification

1.2 Code Principle: *Forest management practices will be planned and conducted according to the Ecological Land Classification system for Nova Scotia (NSDNR, 2003)*

Ecosystem based management is accomplished at two scales: (i) the landscape, where direction is provided at a coarse scale, and (ii) the stand, the scale at which management practices are applied on the ground. The provincial Ecological Land Classification (ELC) provides the framework for landscape level planning. It can be supplemented with data and inventories for forests, wildlife, parks and protected areas.

Stand level management requires that forest practices incorporate natural ecosystem characteristics. The FEC is an excellent tool to provide this direction. Ecological issues at the stand level are addressed by identifying the ecotype, vegetation type and soil type. Site, soil, and productivity

¹ *The provincial FEC is currently under development and is scheduled for completion in 2008. Interim guidance is provided by the Forest Ecosystem Classification for Nova Scotia's Model Forest (2003; K. Keys, P. Neily, E. Quigley, and B. Stewart).*

guidelines will ensure that ecosystem function and long term productivity are maintained while managing resource uses.

Landscape Level Guidelines

1.2.1 The ELC will be used to characterize landscape spatial structure, natural disturbance processes and forest composition.

Stand Level Guidelines

1.2.2 The provincial FEC, an extension of the ELC, will be the stand level operational guide for applying ecosystem-based management.

1.2.3 Areas planned for silviculture treatments, including timber harvest, will have a pre treatment assessment (PTA) prepared that describes site, and forest conditions.

1.2.3.1 The PTA will serve as a basis for stand level management plans.

1.2.3.2 Stand level management plans will be compatible with the eco district plans.

Wildlife Habitat

1.3 Code Principle: *Forest management practices will be planned and conducted to protect habitat for species at risk.*

1.4 Code Principle: *Forest management practices will be designed and conducted to conserve and enhance habitat for Nova Scotia's wildlife species.*

Guidelines for provision of habitat for all forest dwelling wild species, including species at risk, are presented in Guidebook 3 - Wildlife Habitat.

Protected Areas

1.5 Code Principle: *Forest management practices will recognize the contribution of protected and wilderness areas in preserving the natural forest heritage within Nova Scotia.*

Bio-diversity conservation requires protected areas where natural processes are allowed to occur with as little human intervention as possible. At a landscape scale, large representative areas provide opportunities for the continuance of natural processes in the dominant regional ecosystems. Smaller protected areas can be selected to conserve sensitive and unique sites.

Stand Level Guidelines

- 1.5.1 Forest resource access will be placed strategically in management areas adjacent to boundaries of provincial wilderness areas and parks to minimize conservation impacts.

Air, Water and Soil

- 1.6 Code Principle:** *Forest management practices will be designed and conducted in a manner that maintains and enhances the quality of air, water and soil in Nova Scotia.*

In addition to direct effects of timber harvest, especially intensive treatments, forest management has significant indirect impacts. The creation of access roads has the potential to affect nutrient budgets, microclimates, and hydrology beyond the normal ranges of variation found in natural forests. Such impacts may impair ecological structures and functions within forests as well as beyond (e.g., nutrients and sediments in rivers and lakes).

Landscape Level Guidelines

- 1.6.1. Road and trail layout will be designed to minimize the impact of associated construction activities on soil, site quality and water regimes.
- 1.6.2 Designated watersheds will have no more than 25% of the area in a state of recent (5 years or less) forest timber harvest.
- 1.6.3 Forest management within designated municipal water supply areas will require Source Water Protection Plans designed to protect water supplies.
- 1.6.4 Forest managers will use low road densities achieved through strategic planning of new and temporary access, road decommissioning, and timber harvest scheduling.

Stand Level Guidelines

Forest operations can significantly affect site productivity, which is a function of nutrient and moisture availability. Some timber harvest systems can degrade a forest site through biomass removal, soil compaction, forest floor loss, and soil erosion. These impacts can lead to reduced nutrient pools and impaired moisture regimes.

- 1.6.5 Timber harvest and biomass removal from a site will remain below rates that would impair long term site productivity.
- 1.6.6 All timber harvest and silviculture operations will comply with ground disturbance guidelines

established within the FEC for each soil type.

- 1.6.7 Access roads, landings and borrow pits will be located to minimize the area taken out of forest production

Climate Change

- 1.7 **Code Principle:** *Forest management will be designed and conducted with consideration of the potential effects of climate change, and opportunities to maintain and enhance forest carbon sinks.*

Forest practices can contribute to the mitigation of climate change impacts by ensuring healthy growing forests in Nova Scotia. Appropriate management strategies need to be undertaken to ensure that forest ecosystems can adapt to climate change. Maintenance of natural bio-diversity (i.e, species, ecosystem and genetic diversity) should enable appropriate ecosystem responses to a changing climate. Forest practice should not compromise the ability of forest ecosystems to adapt to future changes.

Landscape Level Guidelines

- 1.7.1 Opportunities for carbon sequestration will be considered in forest management planning.
- 1.7.2 Forest management decisions will consider potential future impacts of climate change on bio-diversity, forest productivity, and water quality.

GLOSSARY

Age Class

Age classes of the dominant tree species.

Establishment - influx of new growth following a stand initiating disturbance, and characterized by a high diversity of forbs, shrubs, and tree regeneration.

Young stem exclusion - young developing tree canopies characterized by vigorous self thinning, crown differentiation, and competitive exclusion of many individuals.

Mature - stands dominated by upper canopy trees with full differentiation into dominance classes. Canopy gaps are soon closed by neighbouring tree growth.

Multi-age (old growth) - over story exhibiting a variety of crown sizes and canopy densities. Canopy gaps are persistent, promoting multi-layered under story development and recruitment to the over story.

Designated Watersheds

Watersheds and water supply areas that are specifically designated in legislation or policy.

Ecotype

The ecotype defines site productivity as related to the moisture (very dry to wet) and nutrient (very poor to very rich) regimes.

Ecological Land Classification (ELC)

The classification system developed and adopted for use in sustainable forest management in Nova Scotia.

Ecological Landscape Analysis (ELA)

A procedure for integrated resource management planning that provides a comprehensive description and mapping of ecosystem conditions and functions.

Extensive Forests

Forests where natural patterns and ecosystem functioning are maintained while managing for multiple resource uses. These lands include those protected from the ravages of fire and insects. Natural regeneration is used to provide the next forest as part of natural succession. Natural forest characteristics are maintained throughout the rotation including species diversity (over and under story), stand structures (coarse woody debris and snags), patch size (indicative of the natural disturbance), and site and soil productivity.

Extensive Management

A management approach where the primary objective is to maintain natural forest patterns while maintaining multiple resource uses. Extensive forest management excludes use of herbicides for vegetation control, use of exotic tree species or off site native tree species in reforestation programs, use of genetically modified organisms, and stand conversion.

Forest Conversion

A process in which natural forest landscapes are replaced by other land uses, affecting natural habitats and bio-diversity.

Forest Conservation Reserve

Reserve lands which meet bio-diversity conservation goals through preservation of natural conditions and processes and are specifically designated through legislation, legal and policy mechanisms.

Forest Type

An ecosystem classification of trees and associated vegetation species.

Early - forest communities dominated by pioneer species that are usually short lived and dependent upon stand initiating processes for renewal.

Mid - forest communities composed of a mixture of pioneer and climax species, often reflecting a transition to climax domination as stand development progresses.

Late - forest communities dominated by climax species which are usually long lived and reflective of late stages of stand succession associated with the dominant natural disturbance regime.

Intensive Forests

Forests where tree growth is maximized through management inputs focussed on increasing fibre production. These forests are protected from fire, insects and competing vegetation. Fibre based forest management generally eliminates or reduces the duration of development processes, particularly those associated with long rotation old forest conditions. Management practices often result in non natural succession.

Intensive Management

A resource use focussed management approach that maximizes resource use within regulatory limits pertaining to environmental issues such as site productivity, soils and water quality, and wildlife habitat.

Natural Disturbances

Frequent stand initiating - disturbances occur more frequently than the average lifespan of the dominant tree species and are of sufficient intensity to destroy most of the existing trees,

thereby promoting the establishment of a new forest within a relatively short period.

Infrequent stand initiating - the time between disturbances is usually longer than the average lifespan of the dominant species, thereby supporting intervening periods where processes of canopy gap formation and understory development occur in mature forests. After disturbances, enough living legacies are retained to produce stands of at least two age classes (cohorts).

Gap replacement - an absence of stand initiating disturbances supports the development of a dominant over story that is sustained through dynamic processes of canopy gap formation, under story development and over story recruitment. Gap formation ranges from individual tree mortality to periodic gap forming events that are rarely of a stand initiating intensity. Gap disturbances result in the development of an uneven aged stand structure.

Restoration

Restoration of degraded ecosystems can be accomplished over time by managing the forest to create, or recover, the required ecosystem elements. There are groups of native species that are obligate to, or strongly associated with, particular seral stages of native forest types.

Soil Type

The soil type is based on similar soils differentiated by texture, organic matter content, drainage and depth that provide general features of ecological and/or management-related significance.

Source Water Protection Plans

Specific mandatory requirement for designated water supply areas in accordance with the Water Protection Act and regulations.

Vegetation Type

The vegetation type is a recognizable community of plants, both over story and under story species. Vegetation types reflect environmental site conditions and past disturbances.

Guidebook 2 - Forest Products

Foreword

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Introduction

The forest products industry plays a prominent role in Nova Scotia's economy, accounting for much economic activity and employment. Many communities across the province rely heavily upon the forest for their economic vitality and way of life. A long term sustainable wood supply will ensure that these economic benefits are maintained for present and future generations. A future wood supply in which quantity and quality are maintained or increased provides the resource stability necessary for appropriate forestry investments. Sustainable harvests are a function of both the growing stock, as determined by the species, volumes and wood qualities described in the forest inventory, and the estimated forest growth rates. A long term sustainable wood supply meets present needs without adversely affecting future requirements.

This Guidebook focuses on forest practices needed to ensure a sustainable supply of timber products. Non-timber forest values are also important, and these values are covered by the other three guidebooks, "Forest Ecosystems", "Wildlife Habitat" and "Integrated Forest Use".

Proper management for timber products must work within a framework that satisfies both timber and non timber values. For example: ecosystem integrity, wildlife habitat, and recreation opportunities must also be supplied from our forests. An acceptable mix of benefits helps balance these varied forest values. Finding this mix inevitably involves tradeoffs among values. When an achievable and

desirable array of values are identified, objectives and action sets to achieve them are incorporated into a forest management plan.

Management plans for provincial Crown forests will designate portions of the forest land base for different management intensities. Some forest areas will be reserved for preservation in a natural state where extractive uses are not allowed. Other portions of the forest will be managed in a way that approximates natural processes while managing for multiple uses, including timber production and herein called extensive management. Timber production in these areas may be limited in order to satisfy non timber values. The remaining forest may be subject to intensive management focused on timber production. Whatever the management intensity, forest practices will be conducted to improve the forest's ability to produce future benefits.

Sustainable Harvests

2.1 Code Principle: *Forest management practices will be designed and conducted to secure a long-term sustainable harvest of forest products.*

It is important that forest practices are implemented that ensure a long term sustainable supply of timber products. Wood supply modeling is undertaken to determine what long term harvest levels can be maintained. Effective silviculture programs designed and carried out are key to achieve growth rates that support forecasted harvest levels. Monitoring and protection are needed to prevent insects, diseases, fire and other events from significantly impacting the expected future wood supply. Silviculture monitoring tracks results and enables managers to improve and correct ineffective practices.

Guidelines

Timber Harvest

To ensure sustainability of forest products, harvest levels must not exceed the forest's ability to grow wood. To accomplish these goals, analyses must be performed, plans identified and practices implemented to achieve sustainability targets. Silviculture programs must be formulated to achieve the desired supply of timber products.

- 2.1.1 The supply of timber products will be sustained by implementing appropriate timber harvest plans and forest management practices.
- 2.1.2 Harvests will be conducted to minimize risk of tree mortality due to biotic and abiotic factors.
- 2.1.3 Harvested forests will be renewed in a timely fashion to produce high stocking of trees of commercial value.

Forest Protection

Hurricanes, insects, diseases and fires can impact forests over large areas and thereby affect sustainable wood supplies. Integrated pest management and protection methods are currently used to lessen the impact of these devastating occurrences. Rapid response to natural threats is required to effectively minimize risks to the long term sustainable supply of timber products.

- 2.1.4 Forests will be monitored for potential risks of insects, diseases, wind and fire which may adversely affect the future wood supply.
- 2.1.5 An integrated protection plan will be developed and implemented to mitigate the risk to future wood supply from large scale disturbances.
- 2.1.6 Appropriate pest and fire protection measures, which may include biological or chemical means, will be undertaken to ensure forest health and vigour.
- 2.1.7 In the event of a large natural disturbance, timber harvest efforts will be redirected towards salvaging merchantable timber in the affected areas.

Forest Projection and Monitoring

Sustainable forest management plans require predictions based on the best available information on the state of the forest, how it grows, and the success rates of various silvicultural operations. The accuracy of this information must be continuously improved. Forest operations must be monitored to determine if objectives are met and if adjustments need to be made to ensure future success.

- 2.1.8 Long term forest growth, timber yield and silviculture operations will be monitored to improve analysis accuracy and forest growth projection reliability.
- 2.1.9 Growth projections will be updated regularly to improve their accuracy.
- 2.1.10 Silviculture activities will be assessed regularly for growth results.
- 2.1.11 Accurate forest inventories will be maintained and the latest information used in forest management planning.

Productivity, Quality and Value

- 2.2 **Code Principle:** *Forest management practices will be designed and conducted to improve productivity, quality and value of forests and forest products.*

Forest management practices can increase both the quantity and quality of timber produced in a forest. The choice of appropriate methods depends on the management intensity assigned to a stand, the stand characteristics, and the quantity and quality of timber desired. Pretreatment assessments prescribe appropriate management activities that consider these factors. Silviculture must be properly and efficiently planned, applied, monitored and maintained to ensure success.

Guidelines

Productivity

Effective management of forest stands for timber production can achieve significant increases in the mean annual increment (MAI) of desired commercial species. Productivity increases can be achieved with full stocking and scheduling harvests to match the time of maximum MAI. Further increases can be obtained using properly timed and implemented pre commercial thinning, successful regeneration or reforestation to native species, and planting of non native species such as Norway spruce.

- 2.2.1 The productivity of forest land allocated to timber management will be increased through properly designed and implemented silviculture.

Harvest and Regeneration

Regeneration strategies can help ensure the recruitment of new seedlings to fully populate harvested areas. Timber harvests can be designed and implemented to provide natural seeding of preferred high quality species. Where natural seeding is not possible or desirable, sites can be reforested with improved stock of suitable species.

- 2.2.2 Timber harvests will be scheduled to achieve increased productivity.
- 2.2.3 Appropriate harvest systems will be used to encourage natural regeneration to preferred crop trees to attain adequate stocking.
- 2.2.4 Harvested areas will be planted or seeded if adequate natural stocking of a preferred crop trees cannot be established.
- 2.2.5 Planting stock from tree improvement programs appropriate to Nova Scotia forest conditions will be used to achieve future productivity increases.

Vegetation Management (Stand Release)

Regenerating trees, managed for desired commercial value, often need tending to ensure that they do not become over run with competing vegetation such as raspberry bushes, grasses or other species. If competition is ignored, the young crop trees could die or have stunted growth due to shading. Competing vegetation frequently must be controlled to allow the crop trees to achieve their potential

growth. Various approaches are used to release crop trees from non crop tree or vegetation competition; for example, shelter wood and selection harvests provide shade which can help control competing vegetation, or in even aged stands chemical, mechanical and manual methods can release the crop trees from dense shade conditions.

2.2.6 Appropriate vegetation management will be undertaken when survival or growth of crop trees is hindered by competing vegetation.

Density Management

Successfully regenerated stands may be further enhanced through the spacing of crop trees. This decreases the time it takes for trees to reach merchantable size. Pre-commercial thinning in softwoods and hardwoods is a common spacing practice. The resulting stand will develop larger crop trees with fewer non commercial stems and therefore will be more cost effective to harvest commercially. Thinning can improve stand quality by selecting crop trees of better quality, vigour and species.

2.2.7 Stand density management will be conducted to increase crop tree diameter growth.

2.2.8 High quality commercial crop trees will be selected during density management activities.

2.2.9 Areas with the highest potential for increased productivity and commercial timber value will be given priority for density management treatments.

Commercial Thinning

Additional increases in productivity can be achieved by commercial thinning conducted at the proper timing and intensity. Effective commercial thinning can generate revenue while improving the quality, growth, species composition and efficiency of future harvests. Commercial thinning also allows for wood supply increases due to accelerated harvesting schedules. Careful choice of stands for commercial thinning is crucial because thinned stands may become more prone to wind damage.

2.2.10 Commercial thinning will be conducted in appropriate stands to leave vigorous and healthy crop trees.

2.2.11 Commercial thinning will be timed and at intensities to ensure stand stability and long term value.

Quality

Timber quality in Nova Scotia must be improved if we are to realize the potential for high quality timber products and value added facilities. Trees of appropriate species with straight, clear boles of merchantable size are required. Historically, Nova Scotia's forests have been degraded by harvest

practices that removed only the best trees and left the poorer ones to regenerate. This must be reversed by altering practices and rehabilitating productive forest land through stand management. Immediate attention to improving wood quality increases the long term outlook for marketing Nova Scotia's forest products.

2.2.12 Silviculture activities will be designed to improve timber quality attributes.

2.2.13 Regeneration systems will favour establishment of preferred high quality species.

2.2.14 Forest management systems will be designed and implemented to produce trees of the size and quality necessary for a wide range of potential end uses.

Value

Forest management systems must strive to produce the highest possible timber value for Nova Scotia's landowners and citizens. This means careful attention to all phases of woodland operations including forest growth and development, design of harvest treatments, and timber product merchandising and sorting. Maximizing product value also requires fully utilizing all the merchantable wood harvested.

2.2.15 Management and harvest activities will strive to maximize wood product value from Nova Scotia's forests.

2.2.16 The amount of merchantable roundwood left on the harvest site will be minimized, excluding wood left to meet requirements for bio-diversity and soil organic matter.

2.2.17 Harvested roundwood at roadside will be shipped before forest product value is reduced by rot or defects.

Local Ecological Conditions

2.3 Code Principle: *Forest management practices will incorporate the best available knowledge of local ecological conditions, including soil, climate, water, terrain, vegetation and wildlife habitat, in the planning process for roads, harvesting systems and silviculture activities.*

To protect the environment while producing timber, it is important that all forest ecosystem components be considered in every forest operation. The soils, climate, water, terrain, vegetation and wildlife must be considered and protected in every operation, including roads, harvests and silviculture.

Guidelines

All Operations

Management activities will be carried out so that long term ability of forest sites to produce timber will not be compromised. A key element here is to minimize conversion of forest sites to non forest conditions. Additionally, soil fertility, structure and function must be maintained to ensure that the sites will support future timber growth. It is also important to remove and dispose of litter and toxic materials properly.

- 2.3.1 Degradation of productive forest land as a result of forest operations will be minimized.
- 2.3.2 Site characteristics responsible for forest productivity; soil fertility, structure and processes, will be maintained.
- 2.3.3 Measures will be taken to ensure proper storage, handling and disposal of fuels, oils, lubricants, and other hazardous materials during forest operations.
- 2.3.4 No garbage will be left on forest sites.

Roads

Forest roads and trails provide necessary access for management activities. Road building plans must consider impacts on forest ecosystems. For example, improperly placed and constructed roads could introduce silt into streams and damage fish habitat. Ecological information on areas where roads will be built is vital for reducing environmental degradation.

- 2.3.5 Roads will be placed in locations that provide efficient access while minimizing road density and negative impacts on water quality, fragmentation of wildlife habitat, and other values.
- 2.3.6 Forest roads and water crossings will be planned, built, maintained and decommissioned to meet appropriate standards and all legislative requirements.
- 2.3.7 The amount of forest land converted to roads, landings, loading areas and other non forest conditions will be minimized.

Timber Harvest

Timber harvesting often requires sophisticated equipment and the use of this equipment must consider potential ecological damage; for example, sensitive soils could be damaged by rutting during wet periods. Site conditions should be considered when scheduling operations. Harvest operations must be flexible and consider climatic events.

- 2.3.8 Environmental damage due to timber harvest activities will be prevented.
- 2.3.9 Timber harvests will be scheduled for appropriate times and use the methods and equipment necessary to avoid environmental damage and site degradation.
- 2.3.10 Sufficient forest biomass to maintain future site productivity will be kept on site.

Silviculture

Silviculture includes a wide variety of activities that manipulate stands or sites to meet management objectives. They include site preparation, pre commercial thinning, reforestation, weeding, and others. These activities must be designed and carried out to prevent damage to the environment.

- 2.3.11 Environmental damage resulting from silviculture activities will be prevented.
- 2.3.12 Non crop vegetation that does not interfere with crop tree growth will be maintained.
- 2.3.13 Pesticides and herbicides will be used only when deemed necessary to prevent crop tree mortality or growth loss.

GLOSSARY

Bio-diversity

Biological diversity or the variety, distribution and abundance of different plants, animals and microorganisms. In this context it mainly refers to the variety, distribution and abundance of different tree species.

Exotic Species

An introduced non native tree species.

Forwarding

The process of moving felled wood from the location where it was harvested to the roadside to be trucked to a processing facility.

Integrated Resource Management (IRM)

IRM is a planning process which evaluates crown land for all potential land uses such as minerals, forestry, recreation, energy, wildlife, and parks. Each parcel of land has been recommended for management under one of three categories.

- Category 1 is assigned to crown land which is available to all resource uses and includes lands for which a low level of conflict among competing uses is anticipated.
- Category 2 is assigned where land use conflicts have been identified. The purpose of this category is to ensure that all values are taken into account in the planning process. For example, areas where mainland moose are present are categorized as Category 2 lands. This does not mean that all activity will be excluded in these areas; however, resource development will be under certain restrictions.
- Category 3 is assigned to lands allocated to special uses; other resource activities may be limited, modified, or denied. Examples of this category include Provincial Parks, Wilderness Areas, Nature Reserves.

Partial Harvest

A harvest, where only part of the stand is cut.

Reforestation

A process of establishing a new crop of trees by planting or seeding.

Silviculture

Activities undertaken to control the characteristics of a forest stand or site to help meet forest management objectives.

Sustainable Harvest

Harvest levels that ensure that timber supply does not become depleted at any time in the future.

Taper

The amount that a tree bole narrows from the stump to the merchantable top. The greater the taper, the less volume is realized for a given bole length.

Guidebook 3 - Wildlife Habitat

Foreword

Nova Scotia's Code of Forest Practice is being developed on three levels:

1. "A Framework for the Implementation of Sustainable Forest Management", which has been published as Report FOR 2004-8 by the Government of Nova Scotia;
2. four Guidebooks, of which this document is Guidebook 3; and
3. a series of technical manuals which will include detailed requirements for specific activities associated with sustainable forest management.

The Code is mandatory for application on Crown land and recommended for application on private land. Many of the Guidebook provisions are applicable at the landscape scale; that is, at the scale of thousands of hectares, while others are meant for application at the stand level. Owners of large forest properties are encouraged to apply both the landscape and stand level provisions of the Guidebooks, whereas owners of small forest properties are encouraged to implement the stand level provisions.

Introduction

In the context of the Code of Forest Practice, wildlife means any wild species living in the Nova Scotia environment. Given that more than three quarters of the Nova Scotia landscape is forested, it is clear that forests are important as wildlife habitats. Most issues associated with forest wildlife habitat are addressed in Guidebook 1 on Forest Ecosystems. This guidebook focuses on additional general forest bio-diversity considerations as well as special wildlife habitats and species at risk.

Forest Communities

- 3.1 Code Principle** *Forest management practices will be designed and conducted to maintain or restore the natural range and structure of forest communities to benefit the wildlife species of Nova Scotia.*

Forests are tree dominated ecosystems, and as such are composed of communities of living organisms and their abiotic environment. The kinds of plants and animals in the forest community depend to a large extent on the species of trees that make up the forest. From beneath the soil surface to above the tree canopy; mammals, birds, reptiles, amphibians, insects, plants, lichens, mosses, fungi and other organisms all respond to conditions created by the trees. In turn, the trees respond to climate, soil, topography and time, as well as to the other organisms in the forest. As trees age, their physical

characteristics change (bark texture, trunk diameter, dead limbs and cavities). Some forests change in species composition through the process of succession. For most species, the tree organism relationship is flexible: they can live with a variety of tree species and ages. However, sometimes an organism depends on only one species of tree or trees of a certain age. Either way, changes to the tree composition and structure result in changes in the community of animals and other plants.

Centuries of human activity have significantly changed Nova Scotia's forests natural patterns. For example, timber harvesting has increased the abundance of early successional species like Balsam fir and aspen while stands of climax spruce and hemlock have become less abundant. Human settlement and agriculture have significantly reduced the amount of hardwood interval forests with their rich associations of plants. More subtle changes resulted from introduced diseases like Dutch elm disease and beech canker that have eliminated or greatly reduced these species.

Current forests also differ in stand structure from natural forests. Younger forests mean smaller trees with fewer opportunities for cavity using animals. Frequent timber harvests have resulted in fewer snags and less coarse woody debris, thus reducing the abundance of many species of vertebrates, micro-organisms and insects, as well as mosses, liverworts and some plants including trees.

Human settlement has also fragmented the forest with roads, urban development and utility corridors. Besides reducing total forest habitat, these non forest areas block the dispersal of some animals (e.g. moose and turtles) leading to genetically isolated populations that risk local extirpation. Frequent timber harvests and forest fragmentation also mean fewer large patches of similar forest type to supply certain animal (e.g. marten) and bird (e.g. goshawks and ovenbirds) species with their food and reproduction needs.

To ensure a rich forest bio-diversity, it is best to maintain and restore the natural forest composition and structure. Nova Scotia's Ecological Land Classification identifies the climax forest type and the natural disturbance regime of each eco-district. Forest management techniques that will move the forest along the appropriate successional pathways are generally beneficial for wildlife. This would approach the conditions under which our native plants and animals have evolved. The animals associated with each seral type will populate the habitats as they develop. This approach should also recover the plant species composition and forest stand structure that is natural to the site.

Many ecological processes operate at the landscape scale and therefore do not respect property ownership lines. Consequently, small forest areas should be managed with an eye to the larger landscape, enabling connectivity so ecological processes can continue and species can disperse and colonize. Small stands should also integrate with the larger landscape of seral stages to develop the appropriate amount and arrangement of wildlife habitats by ecological area.

Landscape Level Guidelines

3.1.1 Forest managers will attempt to create and maintain large forest patches and connections among them, avoiding fragmentation by roads and rights-of-way.

Stand Level Guidelines

3.1.2 Timber harvest operations will provide for appropriate abundances and distributions of canopy openings, legacy trees, dead trees, and cavity trees.

Significant Wildlife Habitats and Species at Risk

3.2 Code Principle: *Forest management practices will be planned and conducted to respect significant wildlife habitats in Nova Scotia forests.*

Some forests have special features more important to certain wildlife than similar forests nearby. Such special areas are called significant wildlife habitats. A significant wildlife habitat is:

- one of only a few in the province, or
- used by rare plants or animals (species at risk and species of conservation concern), or
- used by large concentrations of significant wildlife species.

These significant habitats include raptor nests, heron colonies, deer yards, turtle nesting areas, rare plant locations, important fish spawning areas and many more. Department of Natural Resources (DNR) has gathered records of significant wildlife habitats and mapped them for the province. The map is publically available to help guide forest managers and others to assist in conservation of significant wildlife habitats. Information about the locations of rare species may also be gathered from the Atlantic Canada Conservation Data Centre (ACCDC).

It is important that forest managers and operators have a good knowledge of wildlife species using the forests being managed. DNR regional biologists can provide helpful information about wildlife habitats and any special precautions needed to protect the value of a forest site. Most significant habitats should be dealt with on a case-by-case basis since each has special features that affect the appropriateness of various conservation measures.

Habitat conservation does not demand that all significant habitats be reserved exclusively for wildlife. Instead, it asks that the land be used wisely so that habitats and their associated wildlife values are maintained. This requires an understanding of the habitat requirements of plants and animals to include them in forest management plans. In some cases, wildlife habitat conservation may suggest that a portion of a site be set aside for wildlife. More often, it will require that work be scheduled at one season rather than another, or that economic, recreational, or other activities take place in such a way that rare specimens will not be destroyed.

Conservation of most significant habitats is voluntary but some habitats are protected under Nova Scotia's Endangered Species Act. The Act allows the Minister of Natural Resources to designate for protection the core habitat considered essential for the long term survival and recovery of endangered or threatened species. When possible, this will be on Crown lands. Where private lands are involved,

designation and protection require agreement with the landowner.

Stand Level Guidelines

3.2.1 Forest managers will consult the following information sources as they develop and implement forest management practices that protect rare species and habitats:

- (a) DNR's Significant Species and Habitats Database, available at DNR district or regional offices, or the DNR website at "www.gov.ns.ca/natr/wildlife/Thp/disclaim.htm";
- (b) ACCDC's database on species locations, available at the ACCDC offices in Sackville, NB, or the ACCDC website at www.accdc.com.

Guidebook 4 - Integrated Forest Use

Foreword

Nova Scotia's Code of Forest Practice is being developed on three levels:

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2. four Guidebooks, of which this document is Guidebook 4; and
3. a series of technical manuals which will include detailed requirements for specific activities associated with sustainable forest management.

The Code is mandatory for application on Crown land and recommended for application on private land. Many of the Guidebook provisions are applicable at the landscape scale; that is, at the scale of thousands of hectares, while others are meant for application at the stand level. Owners of large forest properties are encouraged to apply both the landscape and stand level provisions of the Guidebooks, whereas owners of small forest properties are encouraged to implement the stand level provisions.

Introduction

Nova Scotians have a wide range of values, needs, interests and activities that are dependent on the forest environment. Our forests are a storehouse of standing timber, a living legacy to natural biodiversity, and a key component of a vibrant cultural diversity. They comprise almost 80 percent of Nova Scotia's land base.

We have relied on our forests for centuries. In the past, timber was used to make things like buildings, houses, ships, wharves, barrel staves and for heating purposes. Today we use timber for other products such as pulp, paper, engineered and value added wood products. We continue to look to forests for economic and social reasons. However, the list of forest based products and uses also includes many new activities and practices.

Natural resources benefit many individuals and communities. Sustainable forest management balances ecological, social, and economic aims. This helps maintain rural communities and the forest environment. Integrated forest use (IFU) develops sustainable solutions where no single use jeopardizes other values, ecosystems remain functional, and the contribution of all areas and uses of the landscape and forest stands are considered.

To secure a vibrant and healthy economy, safeguarding the natural capital of Nova Scotia's

ecosystems is essential. This means securing a sustainable future for all components of forest ecosystems. The guidelines presented below provide direction for planning, managing and creating value for non-timber forest uses at both stand and landscape scales.

Non timber forest products (NTFPs) are used in a variety of ways, such as in foods, health and personal care products, landscape and garden applications, and decorative and aesthetic products. NTFP harvests complement eco-tourism and other community based economic development while allowing traditional forest uses such as hunting and trapping. Non timber forest uses go beyond physical products and include activities, functions and services such as ecosystem features, scenic values, recreation, and scientific and educational uses, among others (see Table 1).

Table 1: Non-timber forest products and uses described in this guidebook.

Non-timber Forest Uses and Values	Addressed at the Landscape Level	Addressed at the Stand Level
Tourism and Viewscapes	X	X
Protected Areas	X	X
Recreation and Leisure	X	X
Education and Learning	X	X
Biochemicals		X
Food/Forage		X
Crafting		X
Aesthetics and Spiritual Experiences	X	X
Hunting, Fishing and Trapping	X	X
Culture and Heritage	X	X

Balance of Interests and Values

4.1 Code Principle: *Forest management practices will be designed and conducted to balance the economic, cultural, social, and environmental interests and values of all Nova Scotians.*

The non timber forest products and uses identified in Table 1 include economic values such as

tourism, trapping and recreation. Cultural values of importance to Nova Scotians include conserving ecological features of historical significance, providing traditional hunting and fishing opportunities, and maintaining sites for teaching traditional ecological knowledge. Forests also play a significant role in meeting the social needs of Nova Scotians. For example, the aesthetic beauty of a vibrant natural environment creates a sense of well being. Forests can also reduce traffic noise in a residential neighbourhood.

Environmental values and interests are numerous and diverse. They include, wilderness areas, clean water and air, and opportunities for learning about nature. Forest managers and users need to conduct forest based activities in a way that balances all these values and creates opportunities to meet such diverse interests. The **Integrated Resource Management (IRM)** planning process for Crown lands tries to achieve a balance among these many and varied interests and values. Private landowners and managers can also strive for balance by developing management plans that include non-timber objectives.

Guidelines

4.1.1 Forest management will contribute to and be guided by IRM plans at the eco-district level.

4.1.2 Forest management plans will incorporate forest practices for multiple values.

Structure and Diversity for Integrated Uses

4.2 Code Principle: *Forest management practices will be designed and conducted to consider structure and diversity elements required for the integration of public interests.*

Guidelines for forest management practices that focus on non timber forest uses are appropriate at both the landscape and stand levels. The guidelines direct forest managers and operators to create or protect both general and specific features to meet the needs of various forest users in all their timber management activities.

The ecological, social and economic characteristics that define non timber forest uses are complex. Thus, management guidelines and practices will be developed in collaboration with landowners, industry operators, non government organizations, government departments and other stakeholders.

Guidelines

Tourism and Viewscapes

Tourism benefits from views of healthy forests, leaving visitors with favourable impressions of environmental stewardship. Such positive impressions are vital to a successful tourist industry.

Forest management activities that maintain views of healthy forests are required.

- 4.2.1 Where scenic vistas are important, forests will be managed for diverse canopy structures without large visible clearcut harvest areas.

Protected Areas

Forest management activities bordering areas that have been protected under federal and provincial policies and legislation, and municipal bylaws need to consider possible impacts to the integrity of the specific areas designated for protection.

- 4.2.2 Forest practices bordering protected areas will be designed and conducted in consultation with protected area managers.

Recreation and Leisure

Some of the many forest based recreation and leisure activities in Nova Scotia are:

- (a) trail activities including walking, hiking, running, biking, ATV use, snowmobiling, cross-country skiing, horseback riding, observing nature;
- (b) water based activities including canoeing, kayaking, sailing, motor boating, fishing and water sports;
- (c) back country activities including hiking, camping, mountaineering, foraging, wilderness experience and nature observation;
- (d) cottage ownership which may include all the above as well as sense of place, peace and tranquility, privacy, view potential; and
- (e) wildlife related activities including birding, wildflower appreciation and nature photography.

Although forest conditions, features and structures can be managed at the stand level, management for recreation and leisure based activities must also consider requirements at the landscape level.

- 4.2.3 Forest managers will consider the lawful use of recreational trails in designing and implementing forest practices.
- 4.2.4 Forest managers will consider the impacts of forest practices on permanent and seasonal dwellings.

Education

Learning in and from forests has been important through the ages. At all scales, forests are central to traditional ecological knowledge, environmental awareness, scientific research, and environmental monitoring. Diverse forest ecosystems provide a “natural” classroom for ecological, developmental and cultural education.

- 4.2.5 Forest managers and operators will co-operate with education and extension institutions to provide learning opportunities associated with forest ecosystems and forest practices.
- 4.2.6 Aboriginals and other people who hold traditional ecological knowledge will be invited to share it in forest planning and educational forums.

Bio-chemicals

Some forests have significant potential to support species that can provide useful bio-chemical products. Pharmaceuticals, botanicals, and industrial chemicals are all examples of such products. Some of these are medicinal or nutritional plant extracts while others are aromatic and essential oils.

- 4.2.7 Specific forest practices will be developed and implemented to maintain or enhance forest ecosystem conditions required for the production of significant bio-chemical products.

Food and Forage

Production of maple products, fiddleheads, wild mushrooms, and berries, and cultivation of ginseng and wild garlic are but a few of the ongoing activities in Nova Scotia’s forests. Managing forest ecosystems suitable for the growth and harvest of these wild foods are of interest to many Nova Scotians.

- 4.2.8 Forest management practices will be developed in consultation with local groups and individuals to identify and maintain specific forest sites used for harvesting wild foods.

Crafting

Forests provide a variety of materials used by individuals and businesses in floral arrangements and crafts. These materials include branches and twigs, foliage, bark peels, cones, flowers, and berries and can be used fresh, dried or preserved. The demand for these materials has been growing as the sale of crafting supplies has expanded. Harvest and collection of organic materials from forests creates new environmental impacts on our forest ecosystems.

- 4.2.9 Forest practices will be developed cooperatively with crafts persons and businesses to ensure that existing and potential products can be developed and managed in a sustainable manner.

Aesthetics and Spiritual Experiences

People value forests for positive sensory experiences. The look, sound, smell, taste and feel of forest ecosystems can be critical to people's mental health and personal satisfaction. Forests are also important for artistic endeavours as well as spiritual experiences.

- 4.2.10 Forest management plans will identify places of aesthetic and spiritual importance and provide mechanisms to protect them.

Hunting, Fishing, and Trapping

Nova Scotians across the province harvest fish and game. Hunting, fishing and trapping are of great importance for recreational, cultural and economic purposes, especially for rural people but also for urban dwellers. Forest management practices have considerable potential impacts on wildlife populations, and guidelines for such practices are described in the Wildlife Habitat guidebook.

Culture and Heritage

Cultural and heritage values can be found in and experienced through historical markings, artifacts, fossils, minerals, landscape settlement patterns and use. First Nations' people traditional values and spirit are one with the forest. Traditional knowledge has a valuable role in identifying and managing culturally important forest uses. These uses include harvesting products such as berries, birch bark and wild rice, and maintaining forest sites for traditional ceremonies, pictographs and seasonal habitation.

- 4.2.11 In cooperation with cultural stakeholders and Aboriginal people, forest managers and operators will identify culturally important sites and design and implement forest management practices to protect them.