

Forests

Restoring the Health of Nova Scotia's Forests

A PANEL OF EXPERTISE REPORT ON FORESTS TO THE STEERING PANEL
February 2010



Forest—*Gerry Lunn*

FOREST PANEL OF EXPERTISE

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EXECUTIVE SUMMARY

Nova Scotia has already surpassed the threshold of ecologically sustainable forest harvesting and is now faced with resolving major restoration issues to sustain viable populations of many forest species. Our forests are much younger, trees are correspondingly smaller, and abundances of high-quality tree species have been replaced by low-grade stands. These changes have created a forest that is more susceptible to the stresses of climate change, such as insects and weather damage; less able to provide the ecosystem services required by society; and less economically valuable.

Without an intelligent shift away from current practices, we will continue to degrade our forest resource, and lose the multitude of social, economic, and ecological benefits that a healthy forest provides.

Forest Panel of Expertise

Nova Scotia land owners agree with the need for a planned forest recovery, but there are divergent opinions on how to make that happen. Issues such as clearcutting, the use of herbicides, the need for riparian zones, and biomass harvesting illustrate this divide. The history of allowing self regulation, under-enforced compliance with existing regulations, and programs that promote even-aged silvicultural methods cannot continue. We must start immediately to make a planned recovery to a sustainable Acadian forest that supports the broad range of uses Nova Scotians called for in Phase I.

With science-based guidance and strong leadership we can restore Acadian forest ecosystems to a healthy state while creating diverse and prosperous forest economies. A shift to a new forestry paradigm is proposed, along with some recommended approaches to guide the Nova Scotia Department of Natural Resources and Nova Scotians toward our vision. Recommendations in this report flow directly from the results of Voluntary Planning's public engagement, stakeholder consultations, and advice from forest researchers.

Five key recommendations will enable the transition away from traditional and ecologically inappropriate sustained-yield production forestry to ecologically based, multi-aged forest management approaches; in essence a paradigm

shift in forest practices that will restore ecological integrity, produce more jobs, and optimize the value of our forest industries throughout the 21st century:

Paradigm: A set of assumptions, concepts, values, and practices that constitutes a way of viewing reality.

Five Key Recommendations

- Adopt an ecologically based, multi-aged forest management paradigm, using uneven-aged harvest approaches that produce various-sized gaps or patches to promote restoration of high-quality, late-successional trees; multi-aged stands; and meet the needs of a wide array of ecosystem components at once.
- Implement the Integrated Resource Management process on Crown lands, entailing pivotal approaches and new management tools that will lead the way to ecosystem-based forestry. Consider some Integrated Resource Management approaches for private lands, using educational tools, and incentives.
- Forest management should take a balanced approach between harvesting and ecosystem objectives that include provisions for landscape connectivity, watershed protection, wildlife, biodiversity, and predicted climate change. This will end a legacy of dry stream beds and shorten the list of endangered species needing old forest habitats.
- Promote strong stewardship and education initiatives to improve the land use relationships of Nova Scotians with their forests.
- Amend forest regulations to stop whole-tree harvesting, phase out clearcutting, and promote uneven-aged management. Whole-tree harvesting has increased during the course of this strategy and appears to be accelerating the decline of forest ecological integrity for minimal profits and few jobs. A return to removing only tree trunks will not occur without regulation.

VISION

Natural Acadian forests will be sustained across a majority of the Nova Scotian landscape. With the exception of the more boreal-like forests of the Cape Breton Highlands, forests will be dominated by shade-tolerant, late-successional tree species that are multi-aged and diverse in structure. Trees will regenerate in small gaps in the forest canopy, the regime under which nearly all Acadian forest flora and fauna in Nova Scotia evolved. This diverse forest will support an equally diverse forest industry, composed of large and small players, and a strong, stable forest-based economy.

1.0 INTRODUCTION

1.1 Forests of Nova Scotia: Their history

In 1605, a vast mosaic of primeval forest surrounded French settlers when they established Port Royal. Nicholas Denys, French Governor of Cape Breton Island and other parts of the Maritimes during 1654 -1688, provides a rare glimpse of the early Acadian forest, a mix of northern boreal and southern temperate tree species. Other early and valuable observations were made by Titus Smith Jr., who surveyed Nova Scotia in 1801 and 1802, followed by the surveys of Fernow (1912), and Loucks (1962), who completed the first forest classification for the Maritime provinces. Together their observations portray a composite image of the characteristic forest types of Nova Scotia, primarily dominated by mature to old-growth, late-successional forests.

These early observers drew attention to frequent catastrophic fires caused by land clearing and other human activities that destroyed huge tracts of forests and, in some cases, permanently altered soil fertility. Titus Smith provides some of the best detail: *"The great influx of inhabitants [to Nova Scotia] in 1783 produced, in the course of a few years, a complete change in the appearance of the forest."* Human-caused fires *"usually rekindled every dry season"* altered the forests to the extent that the *"ground becomes so much exhausted, that it produces only a growth of heathy shrubs"* (i.e., heathland) (Smith 1835).

Ralph Johnson's 1986 *"Forests of Nova Scotia"* and Wilfred Creighton's *"Forestkeeping"* portray a brief, historical overview of forestry, while Fred Veith's 1884 *"Report on the Condition of the Rivers in Nova Scotia in Connection with the Fisheries in that Province"* draws attention to early forestry impacts on aquatic resources. Rivers became the inland means of transporting timber over long distances. Channels were dynamited to break up obstructions and log jams; mill dams blocked upstream fish passage; and mill waste contaminated the waters. River ecosystems have never fully recovered from these assaults. Today clearcutting large areas within watersheds have added new stressors to rivers, causing changes in pH, increased sedimentation, and erratic and reduced water flows. Small streams dry up.

The advent of the pulp-and-paper era beginning in the 1950s saw heavy machinery rolling into the woods. Clearcutting (felling all trees over large areas) became the dominant form of forest harvest. The practice of cutting down complex forest ecosystems and replacing them with softwood plantations, an even-aged “crop,” was championed by governments and industries. Taxpayer-financed government subsidies skewed the economics for companies and private land owners, and encouraged an agronomist approach to forestry (clearcut, site prepare, plant and herbicide), which was applied without landscape planning objectives over the countryside to promote softwood dominance. An excellent summary of this period exists in Elizabeth May’s 2005 *“At the Cutting Edge.”*

Forestry activity over the last 400 years has essentially been a mining exercise. A pattern of unsustainable harvest practices was repeated, using up one forest resource, followed by a shift to another, usually of lower quality and smaller trees, until it too becomes exhausted. *“White pine as the major species was replaced by red spruce and this species by balsam fir”* (Goldsmith 1980). Forests have become less biologically diverse, more simplified in structure, and no longer able to support some wildlife species. Forests of late-successional species such as sugar maple, eastern hemlock, beech, yellow birch, and red spruce, with the capacity of growing to very large dimensions and great ages have been replaced by low-quality, shorter-lived pioneer species of poplar, white and grey birch, balsam fir, and white spruce. The focus continues to be placed nearly entirely on the production and harvest of softwood fibre, failing to incorporate objectives for other forest resources or societal values. Proposals to increase harvests of biomass for electrical generation are certain to cause continued and possibly severe ecological degradation, given the preponderance of private land in Nova Scotia and a recent history of over-harvesting.

The 1986 *“Forestry - A new policy for Nova Scotia”* strategy document contained solid, high-level recommendations for turning industrial forest practices onto a more ecologically sustainable path. Since many of these recommendations were never implemented (see Research Addendum available at www.gov.ns.ca/natr/strategy2010/) but remain applicable today, some of the original concepts find themselves being reiterated 24 years later.

1.2 Ecological forests and forest industries: Working and benefiting together

While the current state of our forest is not glowing by any measure, there is some reassurance in the fact that our forests, and forest-dependent economies, have great potential for restoration. Indeed, much of the work pioneered by the Department of Natural Resources, such as the department’s hardwood and mixed-wood management strategies (McGrath 2009; 2010), and their Forest Ecosystem Classification, equip us with important tools for the transition to a new paradigm of forest management in Nova Scotia.

We are confident that the recommendations in this report will set us on track to achieving the following goals:

- We can restore forest biodiversity by increasing the presence of mature forests across the landscape; we can increase abundances of late-successional tree species; and we can ensure adequate amounts of standing and fallen deadwood habitat. Maintaining biodiversity is the best plan to deal with the impacts of climate change, and the best assurance for continued ecosystem services such as clean water, wildlife habitat, soil maintenance, and flood reduction.
- We can grow high-value trees (valuable species and large sizes) to support an expanded value-added forest products industry, with a particular emphasis on high-quality hardwood. An expanded value-added industry will create many more jobs for every unit of wood harvested.
- We can achieve higher timber yields from many of our forest areas through an increase in uneven-aged management.
- We can create new, rural-based, green forestry jobs through a shift in silviculture (the science of managing forest vegetation to meet human needs) and harvesting practices toward uneven-aged forest management.
- We can better ensure an aesthetically pleasing landscape that is more inviting to visitors to our countryside.
- We can ensure that private woodland owners are supported in carrying out responsible land stewardship.
- We can ensure that our Crown lands demonstrate exemplary management.

As per our terms of reference, our recommendations in this report flow directly from the results of Voluntary Planning's public engagement, which was Phase I of the Natural Resources Strategy 2010 process. The Voluntary Planning report unequivocally states that our current approach to natural resource management is not sustainable, thus the status quo is not an option. Specific results reported by Voluntary Planning include: 1) transitioning away from clearcutting our forests, 2) more transparency and accountability for the Department of Natural Resources, 3) sustained rural viability and a healthy forest industry, and 4) decision-making that is more responsive to public concerns.

Achieving these goals requires intelligence and a conviction to act in the public's best interest. We do not suggest that achieving these goals will be easy, but we are convinced that our recommendations are realistic, and will result in healthier and more resilient forests, increased green jobs, better viability of rural areas, and a more diversified forest industry. In short, we can achieve forest management, and a forest industry in which Nova Scotians can once again be proud.

Nova Scotia must adopt a paradigm shift in forest management for the sake of our children, as well as biodiversity, fresh water resources, and rebuilding a strong forest economy.

Forest Panel of Expertise

This report considers strategic issues relating to Nova Scotia's forests under seven themes: Forest Management, Crown Land Management, Private Land Management/Support for Private Land Owners and Industry-owned Private Lands, Forest Protection, Stewardship and Education, and Legal Framework.

2.0 FOREST MANAGEMENT

Background/Rational

Nova Scotians once harvested forests for ship masts to sail the world. Now we are flattening forests and gathering their twigs to burn for energy. The threshold of ecologically sustainable harvesting has been passed. Between 1958 and 2003, there has been a 97 per cent decline in forests greater than 101 years old, and a 93 per cent decline of forests between 81 to 100 years old (Panno and Colman 2008).

Forests hold a large fraction of Nova Scotia's biodiversity. Forests are habitats for wildlife and many of our rarest plants; they provide the structures for lichens and bryophytes to grow upon; and they support a vast network of fungal assemblages. Forest ecosystems play a significant role in cold-water fish populations and other aquatic components. Intensive forestry practices remove or jeopardize the habitat for the majority of these species. Balanced approaches are sought to address the conflicting demands between restoring forest ecological integrity with forestry demands.

Fundamental changes to forest management are required to halt the downward spiral of both a struggling forest economy and a beleaguered Acadian forest. Forest-related employment has plummeted in Nova Scotia. Wood-products manufacturing employment has fallen to roughly half during the past decade (4,000 jobs in 2000 to 2,250 jobs in 2007). Paper manufacturing employment has declined from approximately 3,000 to 1,700 jobs (years 2000 to 2007 respectively) (Floyd and Chaini 2007). Clearly, forest-related work is in crisis and requires new strategic approaches as both the forest economy and forest ecology decline to new levels.

Healthy, diverse forests provide essential ecosystem services such as clean water, air, and productive soils; and they are more resilient to stressors associated with a changing climate. They do not require costly site preparation or planting. Sound forest management is our ticket to achieving environmental goals and sustainable prosperity.

Objective

Nova Scotia's forests will be restored to a healthy state using ecologically based, sound management practices so they sustain themselves and feature natural diversity of habitats that are fundamental for wildlife populations and other forest components, including provisions for humans.

Issues and Discussion

2.1 The paradigm shift to ecologically based, multi-aged forest management

The forest management practices we have been witnessing in Nova Scotia for the past 50 years follow a production-forestry paradigm, with the single intent of producing softwood. Through the years, as demands for timber resources increased, strong silvicultural practices were introduced to intensify the rate of tree growth, also termed sustained-yield production. This paradigm focused on assuring a continuous supply of timber based on an agricultural model. Foresters were trained to become proficient at tending a few fast-growing conifer species, preferably managed on rotations where harvests are completed in one entry. Growth and yield models are a major tool used to predict timing of optimal timber yields and to calculate the annual allowable cut (or regulated harvest level) of wood volume expected to be available for the mills. Production forestry does not generally consider objectives for biodiversity or ecosystem health.

Boreal forest systems, which tend to feature even-aged softwood growth, may be more suited to the production-forestry model of short, 40-to-80-year harvest rotations. However, it is an ecologically inappropriate harvest system in our highly diverse, long-lived, multi-aged Acadian mixed-wood forests. There has been growing public and scientific concerns over the intensive harvesting associated with production forestry, as the full importance of forest ecosystems and their multifunctional roles are recognized. Natural forests that typically featured long-lived, large-dimension, late-successional, shade-tolerant tree species have become scarcer as production forestry favoured short-lived, shade-intolerant, pioneer species. Production forestry has reduced forest wealth both economically and ecologically by promoting lower-quality trees and less-valuable species.

The way forward: It is now clear that traditional forest management needs to be replaced by a new ecologically based, multi-aged forest management paradigm that embraces more comprehensive forest values and integrates all stakeholders' participation without jeopardizing the character and long-term stability of forest ecosystems (Baskent 2009, Seymour 2007). The Department of Natural Resources has already made commendable progress toward building the foundation of an ecosystem science-based forest management approach for Crown lands. The key strategy is the Integrated Resource Management process, though not yet fully endorsed by the department (see Appendix B).

Paradigm shift: a transformation to a new set of values.

A fully implemented Integrated Resource Management process is a holistic resource management approach, managed by a cross-functional team of foresters, biologists, geologists, geographic information system (GIS) specialists, and other professionals, who plan harvest approaches that encompass broad landscape, ecosystem, and biodiversity considerations, as well as socio-cultural and economic needs. Among the components essential to the Integrated Resource Management process is an understanding of natural disturbance regimes. This is the cornerstone of ecologically based forestry: Adopting the concept that harvesting that operates within the limits of natural disturbance patterns has a much greater chance of maintaining forest ecological integrity and biodiversity (Seymour and Hunter 1999). Emulating natural disturbance regimes, once they have been defined for Nova Scotia landscapes, is an underlying fundamental aspect of the Integrated Resource Management process, and should serve to restore characteristic Acadian forest by:

- increasing intervals between harvests (thus restoring age classes and structures)
- reducing clearcuts, since natural stand-replacement disturbance events were rare
- increasing harvest methods that leave small gaps or patches (helping to restore late-successional, shade-tolerant species)

Strong leadership is required to support the Integrated Resource Management process. Additional employees are required to lead and implement the changes involved with shifting away from the even-aged production forestry mind set.

Recommendations

- Adopt an ecologically based, multi-aged forest management paradigm.
- Implement the Integrated Resource Management process on Crown land, including its full suite of components; among them, the Forest Ecosystem Classification system, Code of Forest Practice, and Long Range Management Frameworks designed for forest operations in each ecodistrict.
- Expand the Integrated Resource Management approach/philosophy to private land management through education and outreach, and information support (e.g., offering information for management planning, spatial information) to those willing to participate.
- Hire additional Department of Natural Resources employees to lead and support the Integrated Resource Management process. Consider a director dedicated to Integrated Resource Management. Soil science and ecology disciplines are required to balance the forestry perspectives.
- Make Integrated Resource Management approaches adaptive to incorporate new information on disturbance regimes and other science information and knowledge as it comes available.
- Additional recommendations in Appendix A. 2.1.

2.2 Age-class restoration

There has been a sharp decline since the 1950s in the percentage of provincial forests aged 61 years and older, resulting in a current dominance of young age classes. This points to unsustainable forest harvest levels, addressed in Section 2.3, Additional forest management strategies. Old-growth forests (greater than 101 years old) barely exist now, at approximately 0.3 per cent of the forest land base (DNR 2008). This is a grave concern, as some forest-dwelling species are completely reliant on old-growth forest. It is paramount to prevent harvests of any remaining old-growth remnant forests. Biodiversity is safeguarded through restoring a significant portion of old forest stands and structures. The exact amounts should be guided by natural disturbance regimes.

Restoring appropriate age-class diversity requires appropriate monitoring methods in order to measure success. Forest inventories currently do not accurately define multi-aged stands and classify mature forests as those that are 40-years old or more.

The dominant forest disturbance in Acadian forests was gap replacement, which resulted in uneven-aged stands. There are a variety of silvicultural systems that emulate gap replacement. Some are referenced in the recommendations. These systems all have in common small gaps that allow shade-tolerant species to establish and grow before the harvest. They also have legacy stands that ensure that other essential forest components requiring closed-canopy conditions and/or limited dispersal capacity can survive. A silvicultural system of particular interest is irregular group shelterwood. To obtain an enhanced portrayal of what forests may resemble under this new, ecologically based, multi-aged harvest system, see the Research Addendum available at www.gov.ns.ca/natr/strategy2010/, (Ecologically Based Multi-Aged Silviculture in the Acadian Forest, Robert S. Seymour, Figures 4-6).

“The irregular shelterwood is the most recent silvicultural system to have been developed and has replaced all the others except the selection system in Switzerland.”

John Mathews 1989

Recommendations

- Promote a greater representation of the formerly characteristic older age classes on the landscape, the exact percentages guided by natural disturbance regime information.
- Create multi-aged stands using silvicultural systems that meet all ecosystem components at once, producing various-sized gaps or patches. Direct consultations with Dr. Seymour, University of Maine, and other forest professionals in eastern Canada could assist the implementation process in Nova Scotia.
- The following types of silviculture would address the previous recommendation: Irregular shelterwood systems (Raymond et al. 2009), particularly irregular *group* shelterwood and expanding gap systems (Seymour 2007) have been successfully implemented in Maine (Seymour 2010 Pers. Com.). Single-tree selection remains a good approach in some situations. Alternating strip cuts with legacy strips, or Light Re-entry Silvicultural Harvesting as described in Salenius (2007) has been successful in New Brunswick (Salenius 2010).
- Promote the return to uneven-aged growth on plantations and other lands where clearcuts have resulted in even-aged forests. See more details in Appendix A: 2.2.
- Refine forest inventory methods to better estimate and monitor forest ages. Forest age-class distributions should be calculated in five-year periods from the earliest data sets available to present times to demonstrate age-class trends.
- Additional recommendations in Appendix A: 2.2.

2.3 Additional forest management strategies

Comprehensive and multi-faceted approaches are needed to adopt an ecologically based, multi-aged forest management paradigm, some key elements of which are illustrated below and also in Appendix A: 2.3. Some concepts are more detailed because adhering only to high-level ideas may leave this strategy vulnerable to failure, as witnessed historically from the solid, high-level ideas delivered in the 1986 *Forestry: A new policy for Nova Scotia* strategy document that were not implemented (see

Research Addendum available at www.gov.ns.ca/natr/strategy2010/).

The total annual forest harvest volume (on both Crown and private lands) is integral to addressing more sustainable forestry in Nova Scotia. The late Dr. Wilfred Creighton, former Deputy Minister, Nova Scotia Department of Natural Resources, issued a pertinent warning over 10 years ago: “*We’re overcutting, seriously overcutting*” (Panno and Colman 2008). There is currently no cap on the annual wood volume harvested on private land, so large volumes can be sold to mills or exported to other provinces and countries, depending on demand. (As Maine transitioned away from clearcuts, it did not reduce harvest volumes, resulting in partial harvests affecting a greater portion of the landscape.)

There have been repeated calls for Forest Stewardship Council certification as the “silver bullet” for guiding sustainable forest practices. While this should be encouraged and can assist ecological forestry practices, it remains a fundamental responsibility of the province to have its own forest management standards and policies in place. Some of the certified forest practices (including Forest Stewardship Council) allow high levels of clearcutting and have not always followed agreed-upon standards. Other third-party certification systems, such as the Sustainable Forestry Initiative, do not meet the requirements to sustain healthy Acadian forests.

Recommendations

- Reduce the annual harvest on both Crown and private lands to conform to the new model of ecologically based forestry. The government will need to devise a mechanism to regulate quantities harvested, perhaps through regulating exports and industry acquisitions.
- Develop a landscape connectivity plan for the province that provides incentives for land owners to participate in its implementation. This could also restore degraded forest landscapes.
- Adopt independent provincial standards for sustainable forest practices on all lands (such as the Code of Forest Practice).
- Encourage Forest Stewardship Council certification on both Crown and private land.

- Update and expand the Best Management Practices manual prepared by the Nova Forest Alliance to reflect new management changes, with an emphasis on silvicultural practices for uneven-aged management; re-engage the Nova Forest Alliance for revisions.
- Additional recommendations in Appendix A: 2.3

2.4 Harvest practices

Nova Scotia's forests have been highly altered and depleted from clearcut harvesting. Clearcutting accounts for over 90 per cent of all harvest practices in Nova Scotia (2007, National Forestry Database). This harvest method diminishes the wealth of our forests in a variety of ways, including the elimination of more valuable tree species, such as sugar maple and yellow birch, and reducing wildlife habitat. It is detrimental to the very soil required to grow the next generation of forest (more details in the Research Addendum available at www.gov.ns.ca/natr/strategy2010/). Clearcutting of hardwood stands is already banned in other provinces, such as New Brunswick and Quebec.

As difficult as it may be for industry to transition away from clearcutting, it can and must be done. Clearcutting in Maine is now 3 per cent of the harvest. Size restrictions for clearcutting were considered but do not work. In Maine, size restrictions resulted in perpetuating a series of large-patch sizes just under the designated size limit for clearcuts (Seymour, 2010).

Over the past 400 years, Nova Scotia has been repeatedly subjected to human-caused wildfires. These recurring stand-replacement types of disturbance have recently been confused with natural disturbance regimes and can erroneously allow continued justification of frequent clearcutting over large areas where the emulation of natural disturbance regimes is adopted. Historical forest ecology research from other Acadian forest regions clearly indicates that stand-replacement events were infrequent and therefore do not support frequent and widespread application of clearcuts (Ponomarenko 2002; 2007; Ponomarenko and Ponomarenko 2000; 2002; 2003; Fraver and White 2005; Crossland 2006; Seymour et al. 2002; Sobey 2002; 2006; Lutz 1997). Furthermore, the primary stand-replacement disturbance agent may be *wind*, not fire. Solid empirical evidence on what the natural frequencies and intensities of various disturbance agents

may be for Nova Scotia is a cornerstone to choosing appropriate harvest prescriptions that emulate natural disturbance.

Partial-harvest practices that emulate gap-replacement disturbances must replace clearcut practices, with a focus on uneven-aged management and restoration of high-quality, late-successional tree species. A range of gap sizes and patches, using a variety of uneven-aged harvest prescriptions can be used to encourage late-successional species. The Department of Natural Resources has made progress in researching appropriate harvest requirements in tolerant stands (McGrath 2007; 2009). Historical ecology research from Maine concluded that under a predominantly gap-replacement disturbance regime, approximately 1 per cent of any given stand is killed and regenerated each year (Seymour et al. 2002; Fraver et al. 2009). This has led to the "One per cent rule" for harvesting. If 10 to 20 per cent of a stand is harvested at 10- to 20-year intervals in small, partially shaded gaps, this will help maintain or restore multi-aged stands with a diverse species composition.

Partial harvesting can generate 100 to 190 per cent more revenue per unit area than clearcutting, depending on the site conditions (Stevenson et al. 1996). Furthermore, employment per unit volume of wood harvested can be approximately equal or up to 370 per cent higher under selection-cutting systems than clearcutting (Erdle and Ward 2008, Lansky 2002, Pannozzo and O'Brien 2001, Stevenson et al. 1996).

The latest harvest method on the Nova Scotia landscape is whole-tree harvesting (taking tops, trunks and limbs; leaving stumps and roots). The wood chips from this type of harvesting are mainly used for biomass electricity generation and also for a burgeoning wood-pellet industry. There are considerable detrimental ecological effects posed by whole-tree harvesting, among them: reduction of soil organic matter, and nutrient depletion. The biomass energy sector is regarded by some as an opportunity for substantial growth in the forest industry, while others see it as a last grab for a declining resource. The issues of whole-tree harvesting and biomass for energy are fully addressed in the Research Addendum, but are generally viewed as harmful to Nova Scotia forests and do not fit within the vision for long-term forest health.

“The soil is the resource that needs to be managed just as much as the [trees] which grow on it.”

Goldsmith, 1980.

Since the Acadian forest has been classified as endangered (Davis et al. 2001), a precautionary principle should be adopted for all harvest prescriptions until restoration of former dominant late-successional species compositions and more diverse structures and age classes are achieved. For these reasons and others, new harvest demands for the biomass industry cannot be adopted at this time.

Many references were made to conserving biodiversity by using a precautionary approach: where there are possibilities of damage, decision-making should favour the prevention of environmental degradation.

Our Common Ground: The Future of Nova Scotia’s Natural Resources

Recommendations

- In January, 2010, this Forest Panel prepared in-depth reports with recommendations regarding clearcutting and biomass harvesting for the Minister of the Department of Natural Resources. These reports and their full recommendations are found in the Research Addendum available at www.gov.ns.ca/natr/strategy2010/.
- Develop a reverse-onus policy and permit system for clearcutting on both private and Crown lands, where justification is required of the absolute need in spite of the ecological implications to conduct clearcutting. The permit system could be administered by the local Integrated Resource Management team. Money from the permits could fund ecologically sustainable silviculture treatments. The permit system would allow clearcutting in cases where stand-replacement events, such as hurricanes and insect infestations occurred.
- Enact legislation to prohibit clearcutting of tolerant hardwood stands and phase in restrictions on clearcutting shade-tolerant, mixed-wood and softwood stands.

- Set targets for reductions in clearcutting whereby the area under clearcut harvest on the landscape would be reduced by a minimum of 50 per cent of current harvests by 2015, followed by further reductions thereafter. (The Integrated Resource Management process, if fully implemented and extended to some degree on private lands should further reduce clearcutting beyond 2015.)
- Ban whole-tree harvesting (taking tops, trunks and limbs; leaving stumps and roots). Exceptions would include Christmas trees, and permanent land-conversion situations, such as lot clearing for housing or road building where it does not have a negative effect on future productivity. Retain branches less than 10 cm in diameter on all harvest sites.
- Limit forest biomass harvesting for electricity to small amounts that have already been committed for the current facilities.
- Restrict the export of raw biomass to ensure domestic use.
- Define natural disturbance regimes specific to Nova Scotia and investigate how harvest regimes can best emulate the types of natural disturbances inherent to Nova Scotia.
- Limit the percentage of annually harvested forest land within a watershed to protect and regulate flows. This may mean that less than 1 per cent could be clearcut within a single year (Lindenmayer and Franklin 2002).

2.5 Special management zones (riparian zones)

The currently legislated 20-metre-wide special management zones (also called riparian zones) on all rivers and streams (authorized under the *Wildlife Habitat and Watercourses Protection Regulations*) were to keep machinery out of the brooks and protect water quality. They fail to adequately protect aquatic habitats and water quality due to a high incidence of blowdown. Tree uprootings on stream edges expose soils. Furthermore, harvesting within these zones to 20 m² basal area can nearly double the amount of trees that blow down compared to unthinned zones (McCurdy and Stewart 2008).

These zones provide rich habitats that are frequented by many wildlife species, and serve as corridors for wildlife movement. Widths of zones should be enlarged to adequately serve more species, as indicated in a wealth of scientific research (see Research Addendum at www.gov.ns.ca/natr/strategy2010/). Wider zones can greatly contribute to the goal of enhancing landscape connectivity.

Recommendations

- Expand special management (riparian) zones to widths of 50 metres, or even 100 metres in places, with no harvesting within them to within 30 metres, where even-aged harvesting is used. Allow flexibility for narrower zones where uneven-aged harvests and canopy cover is maintained. Riparian slopes greater than 10 per cent should have limited activity.
- Make wetlands mapping publicly available so the information can be incorporated into Global Positioning System devices to identify boundaries of sensitive wetlands for planning purposes.

“It is important to understand that a tree cut in the forest has an effect on the fish in the ocean.”

Kerry Prosper, Mi'kmaq Elder
Learning Seminar: Mi'kmaq Ecological Knowledge:
How to Use This Valuable Resource in your Work.
(February 4, 2010)

2.6 Herbicide use

Herbicides are a silvicultural tool with a limited requirement under uneven-aged harvest practices. Costs associated with the traditional clearcutting approach of site preparation, planting, and herbicide application would better be invested in a higher per-hectare labour rate for pre-commercial thinning and Category 7 treatments for uneven-aged management (see Section 4.2: Financial support for private land owners).

Provinces such as Quebec and some Scandinavian countries have already phased out herbicide use. Proponents of herbicides emphasize their benign toxic effects. They also say they need herbicides so the

hardwoods do not outcompete the conifer seedlings they plant. The more important concerns, however, may be the herbicides' indirect effects on soil health that result in the elimination of hardwoods. Herbicides serve to favour conifer crops at the expense of biodiversity.

Recommendations

- Herbicide use should be banned on Crown lands, and discouraged on private lands except in unusual circumstances, such as for controlling invasive exotic plants.
- Government funding for herbicides should be fully eliminated (except for invasive species treatments).

2.7 Research and monitoring

Researching and monitoring the long-term outcomes of a new ecologically based, multi-aged forest management strategy is required to evaluate successes and failures, and to modify approaches if necessary. The scientific community should be closely partnered with the Department of Natural Resources in forestry research and monitoring endeavors. Atlantic Canada has a wealth of universities and colleges. Other organizations, such as the Mersey Tobeatic Research Institute, can mutually benefit in assisting the department with research and monitoring. As stated in Phase I, the public wants more science-based decisions.

A key research objective is to define Nova Scotia's natural disturbance ecology. Historical ecology research is challenging and may draw on a variety of scientific disciplines since it is difficult to distinguish human-induced changes from natural disturbances and much of the physical evidence on which to base conclusions has been lost. Archived information (from both French and British periods) using early letters, shipping records, saw mill records, land surveyor notes and sketches of witness trees and forest descriptions have not been fully explored in Nova Scotia, unlike other provinces (Sobey 2002; 2006, Lutz 2003, Crossland 2006). Ecosystem archaeology is one of the most powerful research approaches that can achieve a near complete picture of early forest types and associated disturbance regimes (indicating former insect infestations, hurricanes, fire, agriculture, species assemblages, and tree diameters). Four national parks within the Acadian forest region have recently employed this research method to assist with developing science-

based, long-term forest management objectives (Ponomarenko 2002; 2007; Ponomarenko and Ponomarenko 2000; 2002; 2003). Dendrochronology (the study of tree growth rings) and fossil pollen methods are also useful.

In addition to the standard forest monitoring programs (e.g., provincial forest inventories, permanent sample plots), monitoring the population responses of some wildlife species may be useful indicators of the success or failure of forest restoration strategies. New monitoring tools, such as satellite imagery analysis and LiDAR (Light Detection and Ranging), are proving effective for monitoring a range of forest components (Cheng and Lee 2009).

Recommendations

- Support forest research by universities, colleges, and scientists.
- Complete research on disturbance regimes using ecosystem archaeology research methods and other approaches (also addressed in the Research Addendum).
- Increase Department of Natural Resources' transparency regarding the reporting and sharing of information on the state of Nova Scotia's forests and the extent and types of harvests. (More details in Appendix A: 2.7.)
- The department should form an external science advisory body to the minister (similar to Species at Risk recovery teams) to provide input on major policy changes and harvest planning, and to ensure more science-based forest management.
- The department should strengthen ties with science-based and community-based conservation organizations and provide staff support and core funding (e.g., Mersey Tobeatic Research Institute).
- Adopt the use of new monitoring tools such as satellite imagery.

2.8 Value-added wood industries

Millions of dollars have been provided to assist large mills that require low-quality trees. There is disproportionately little or no funding for small businesses that emphasize the uniqueness and extremely high-quality wood that the Acadian forest is capable of producing for turning into value-added products.

Value-added wood products are products made from lumber after value has been added by expending labour and other resources to raise the value of a product or service. Examples of products being made in Nova Scotia are boats, cabinets, prefabricated buildings, windows, furniture, and siding.

Mill closures throughout eastern Canada in recent years and an uncertain future for pulp and paper industries points to the pressing need to diversify forest industries through alternative uses of forest resources. Promoting a diversity of small-to-medium sized, value-added forest industries is a sound strategy for safeguarding rural-based, forest-related jobs. These green jobs would produce products of increased per-unit value of harvested wood. Developing the most effective strategies for value-added industries requires breakthrough thinking and creativity that is global in scope. A predominant strategy of developing countries in Asia and elsewhere is to export value-added wood products rather than primary products such as logs, lumber, or wood chips. In Nova Scotia there is little education and training for upper-tier value-added wood products.

Small sawmill operators receive requests for large dimension products and some have orders for rare wood, such as larch and ash, for use in local products. However, they often struggle to find a reliable supply of suitable saw logs. These species are being indiscriminately harvested and chipped by large industry.

Small sawmill operations would be assisted by allowing trees to grow older and to larger diameters. This will complement ecologically based forest management objectives.

Diversification of products and markets is a priority. Beyond pulp and paper, there may be biorefineries that can produce liquid fuels and biobased-industrial chemicals, as well as pharmaceuticals derived from forest products, such as Canada yew and fungi.

Recommendations

- Invest in small- and medium-sized, value-added forest products industries that utilize high-value tree species.
- Create a specific research body or program to explore market opportunities and encourage the value-added industry potential.
- Facilitate sorting yards and better consultation among wood producers, primary industry, and value-added manufacturers to ensure that logs are put towards their highest-value end use.
- Provide incentives/assistance to small mill operations with a niche for high-quality lumber, larger-dimension wood, rarer types of wood, and value-added products.
- Consider facilitating certified wood graders to stamp lumber from small sawmills, thereby increasing market choices.
- Support the vertical integration of the value-added products industry. In this way harvest operations supply to small sawmills that, in turn, provide to value-added factories to manufacture doors, floorings, and other products, with distribution companies that maintain a strong chain to larger markets.
- Continue to explore new uses for forest fibre/alternative forest products and markets.

3.0 CROWN LAND MANAGEMENT

Background/Rationale

Approximately 24 per cent of Nova Scotia's forested land base is owned and administered by the province. Nova Scotians value these public lands for an array of wilderness activities that can be spiritually uplifting, healthful, educational, and life enhancing. A diverse range of wild animals and plants also depends on these lands for habitats and for landscape connectivity, which enables some species to move or disperse through an area.

Currently Crown lands have too many young, early successional forests and small-diameter classes, a condition that severely limits biodiversity and wildlife habitat availability. The 1984 report of the Nova Scotia Royal Commission on Forestry states "there is now a realization of the need to restore the forest."

This scattered land base represents an opportunity for the province to conduct scientific research on forest ecosystem components and processes, and to lead by example in demonstrating how forests can be restored to ecologically healthy and sustainable states that will support a broad range of uses. During Phase II reviews, this panel frequently heard a call for the demonstration of exemplary forest practices on Crown lands.

Objective

Nova Scotia will manage Crown lands in an ecologically sustainable manner for a broad range of public uses and interests. The province will lead by example, using forest management practices that sustain all ecosystem components.

"Crown lands are, in fact, public lands."

Our Common Ground, public consultations

Issues and Discussion

3.1 Crown lease agreements

The 1984 report of the Nova Scotia Royal Commission on Forestry made specific recommendations regarding legislation, leases, and license agreements, some of which date back to 1926 and a very different social setting. Many of these agreements need updating. The tenure agreements potentially impede some of the changes recommended for how Crown lands should be managed to meet a broader range of uses and ecological functions.

Recommendations

- Ensure current commitments (e.g., Forest Utilization License Agreements) are addressed in any application of a new forest strategy, since they are legal and binding.
- Shift Crown land management away from the narrow focus on industrial softwood fibre/logging commitments in tenure agreements towards more comprehensive forest management objectives that address a broad range of public interests.
- Develop a legal and policy framework to allocate Crown wood to value-added wood manufacturers.

3.2 Wildlife and ecosystem services

Mature- to old-growth forests have declined precipitously, along with wildlife species and many other living things that depend on these types of habitats. Crown lands should play an important role with Nova Scotia's Species at Risk Conservation Fund objectives, such as providing habitat and protection for the endangered American martin. Wider special management zones, as discussed in Section 2.5, are also necessary to provide wildlife connectivity, as well as soil maintenance and clean water. Many of our Crown lands are located in headwaters and offer a critical ecosystem service to Nova Scotians in the form of cool, clear water. Other services provided are air cleansing, hunting, fishing, and other outdoor activities that all depend on healthy forests.

Recommendations

- Manage toward restoration of some continuous tracts of late-successional forests and allow these areas to mature (100 to 300+ years of age) in order to function as permanent retention areas to meet specialized habitat requirements of some plants and animals across the working landscape.
- Widen minimum widths of special management zones (riparian buffers) as recommended in Section 2.5 to provide effective aquatic habitat protection, wildlife and plant protection and ecosystem benefits.
- Manage recreational activities, such as off-highway vehicle use, to reduce conflict with higher-level values such as protection of biodiversity.
- Apply specific usage restrictions on Crown lands to restore healthy populations of American martin, as well as to protect other species at risk and other sensitive ecological areas.

3.3 Integrating land use

As discussed in Section 2.1, the province's Integrated Resource Management (IRM) process supports broader ecosystem-based forest management, whereby watersheds, wetlands, wildlife, and other forest species are considered in harvest prescriptions and forest connectivity issues. The Integrated Resource Management process also provides opportunity for public input on land use interests other than forestry.

Finding the balance between competing Crown land interests is challenging. Roads, for example, are useful for forest harvesting, fire protection routes, and public recreation, but they also fragment wildlife habitat and can jeopardize endangered species habitats.

Recommendations

- Fully implement the Integrated Resource Management process, as per recommendations in Section 2.1.
- Crown land management objectives must encompass non-timber uses since these lands, combined with parks and protected areas, offer local nature awareness and wilderness experiences for Nova Scotians.
- Continue to purchase private lands to increase the Crown land base.
- Continue to financially support the Nova Scotia Crown Share Legacy Trust Fund.
- Restrict forestry activities on Crown lands to those that are in keeping with the forest ecosystems that were historically present or characteristic of that particular area.
- Commit to transparency, as called for by Nova Scotians in Phase I.
- Adopt a set of genuine progress indicators to measure the costs and benefits of Crown land management for the public good, and share this information as well.
- Prepare road impact mitigation plans for all remaining unprotected Crown lands.
- Identify existing roads on Crown land for active and passive decommissioning.

3.4 Alternative harvest practices on Crown lands

During Phase I, the public clearly expressed that they want a reduction of clearcutting, especially on public lands. There are concerns that large tracts of forests have been logged for short-term interests of industry with minimal economic gains for the province and at high cost to biodiversity. To address these concerns, there has been a call for placing Crown forest management under the Forest Stewardship Council in hopes of ensuring more sustainable harvest practices.

“Technological development has provided the tools and machinery to speed up forestry operations. Unfortunately, these tools allow us to take too much too fast - often at a pace that is harmful to our waterways and wildlife.”

Kerry Prosper, Mi'kmaq Elder. “Awakening”

Recommendations

- Adopt the types of alternative harvest practices recommended in Section 2.2. These harvest prescriptions are flexible and may also be applied to our boreal conifer forests, since they should not be assumed, without suitable research into their natural disturbance regimes, to be characteristically even-aged (LeBlanc and Belanger 2000).
- Increase stumpage fees as a disincentive for clearcutting where this practice is used during the phase-out period.
- Do not allow the practice of intensive forest management on Crown land based on the proposed triad system (see Section 4.4).
- Consider Forest Stewardship Council certification on all Crown lands, ensuring that forest harvesting meets the highest requirements applicable under either Forest Stewardship Council or a new Crown land policy. In other words, where Crown land forest management policies prescribe a higher standard than the Forest Stewardship Council, then Crown land policy will supersede it (or vice versa).
- Ban herbicide use on Crown lands, except for controlling invasive exotic plants.

3.5 Research

Crown lands are appropriate places for long-term scientific research and monitoring forest ecosystem components and processes.

Recommendations

- Use Crown lands as a secure base for long-term, scientific forest research and monitoring, with objectives of maintaining or restoring ecosystem components and dynamics that are essential to forest health as well as healthy forest industries.
- Open Crown lands to community forestry pilot projects.

3.6 Rights of the Mi'kmaq people

Crown lands are part of Unama'ki, the territory of the Mi'kmaq people, who have an inherent right to use natural resources in their traditional applications.

Recommendation

- Incorporate Mi'kmaq land claims, traditional uses and time-honoured harvest requirements into planning initiatives.

“The spirit of the forest is frequently overpowered and neglected by political mandates, global economics, the push for shareholder profits and by motives of personal and corporate greed. In the Mi'kmaq world, however, we believe that what we do today has consequences for the generations yet to be born. Present day actions can alter the quality of life of our descendants.”

Frank Meuse, “Awakening”

4.0 PRIVATE LAND MANAGEMENT/ SUPPORT FOR PRIVATE LAND OWNERS AND INDUSTRY-OWNED PRIVATE LANDS

Background/Rationale

Approximately 76 per cent of Nova Scotia's forested land is privately owned. Within this segment more than 30,000 individuals own 50 per cent of the private land base, while large corporations hold title to roughly 18 per cent of the remaining private forest land. These lands support some of the best, most productive forests in the province.

The most shining examples of ecologically based forestry practices in the province are carried out on some private woodlots, where generations of woodlot owners have practiced uneven-aged management. Some are recognized each year through the Woodlot Owner of the Year award program. In contrast, the worst cases of unsustainable harvests have often occurred on private lands when large tracts of forests are liquidated for quick cash, leaving barely a shrub.

Land owners and the contractors they hire for forestry work have traditionally had a great deal of freedom to operate on private forested land.

Funding by governments for forest management is available for small private woodland owners. These financial incentives can strongly influence how private woodlots are managed.

Objective

Private woodland owners will manage ecologically intact parcels of characteristic Acadian forest that sustains biodiversity, provides ecosystem services, and may also contribute wood supply to the provincial forest economy, depending on land owner objectives.

Issues and Discussion

4.1 Private land management for healthy forest ecosystems

In order for Nova Scotia to achieve the aims of the *Environmental Goals and Sustainable Prosperity Act* (EGSPA) the collaboration of owners of forested lands is essential. These owners can enact ecologically sound woodland management across the province, and foster wildlife connectivity on a landscape basis.

Private lands also represent the primary source of timber for the forest industry. Hence the forest economy and forest-related jobs are tied to forest management practices on private lands. It is challenging to predict wood supply across this complex land tenure. This is a disadvantage for the mills and is also problematic for managing forests on an ecosystem or watershed basis. It is difficult for the Department of Natural Resources or industry to know precisely how much wood has been harvested within a given area since there is no full accounting system for firewood harvests, unlike pulp and logs, which are accounted for under the Registry of Buyers for the province. Without annual harvest limits, owners can harvest large tracts.

There are a number of forestry myths that need to be addressed through education as we move toward more ecologically based management. There is a well-entrenched idea that planting trees restores the forest environment; that a woodlot, regardless of species composition, can become over-mature, which requires the entire forest to be harvested; and finally that good forestry means leaving no coarse woody debris on a harvest site.

Recommendations

- Extend ecosystem-based management to private lands through promoting aspects of the Integrated Resource Management process, such as the Code of Forest Practice.
- Encourage private land owners to have a private land management plan in place. A commitment to do active forest management is not obligatory, (passive management or managing for biodiversity or ecosystem services could be options), but inventories and setting long-term objectives are worthy endeavors.

- Increase government extension services to include assistance with private land management plans.
- Promote working-forest conservation easements on large tracts of lands, particularly industrial timberlands, through certification or arrangements with a land trust.
- Promote programs, such as the forest bank implemented by The Nature Conservancy in Indiana, to assist small private land owners who do not carry out harvesting themselves to procure revenue from their lands using ecologically based forestry. (More details in Appendix A: 4.1.) The forest bank consolidates smaller woodlots into larger operating units, and then makes annual payments to each owner, based on forest revenues.
- Support the creation of a land conservation centre program and a land acquisition fund; revise legislation to better support private land conservation.
- Develop a strong education and outreach component to provide land owners with information on which silvicultural methods are most appropriate for ecologically based, uneven-aged forestry.
- Encourage the federal government to renew the Group Venture Program for Nova Scotia.
- See Appendix A: 4.1 for more recommendations.

4.2 Financial support for private land owners

A paradigm shift to ecologically based forestry would not be complete without a supporting economic paradigm shift. Currently there is no formal recognition in legislation of ecological goods and services obtained from good management practices on private lands that benefit society as a whole. Private land owners who adopt ecologically based forest management practices provide ecosystem services to Nova Scotians, and their stewardship should be encouraged and rewarded. Land owners must be provided with incentives to ensure that the shift to ecologically responsible land management is not an economic burden.

If we are to value the land and its forest resources, this should be accurately reflected in the tax base, with reductions where good land practices demonstrate a commitment to ecosystem services and the maintenance of

healthy forests. Forest-resource land, taxed at 25 cents per acre, can inadvertently send the message that forests are not valuable.

Other ways to financially support ecologically based forest practices can be through silviculture funding. The *Forest Sustainability Regulations* were introduced in 2000 to ensure a reliable wood supply from private lands, with no ecological objectives built into the framework. The management outcomes of these regulations have been profound, with increased clearcutting and conversion of natural forests to plantations on private woodlots. The regulations provide funding mechanisms (credit values) for several categories of silvicultural treatments. Categories 1 through 6 favour even-aged silvicultural methods. Only one Category supports uneven-aged management: Category 7, (Forest Quality Improvement). The credit values need to be shifted and re-worked to produce more ecologically sustainable outcomes.

Furthermore, the funds and silvicultural credits are managed by Registered Buyers, who work for, or serve, industrial interests and have little interest in allocating funding to uneven-aged management. Industry (i.e., the Registered Buyers) administers the silvicultural assistance program for both private and industrial land holdings (a potential conflict of interest), and takes a 10 per cent administrative fee from all allocations, thereby reducing funds available to small woodlot owners.

Funding guidelines determine the kinds of silvicultural treatments that take place and will be the primary incentives for shifting toward more ecologically based, multi-aged forest harvest systems. Money is generally the key to success.

Recommendations

- Increase the forest-resources tax assessment for land owners who have no land management plan. Land owners who have a land management plan could pay *lower* tax rates when their land practices and forest management plan objectives are ecologically based and providing *ecosystem services* that benefit society. Thus, income tax relief is provided to compensate investment costs associated with making a woodlot more ecologically stable.
- Special management zones (riparian zones) on private lands, to the width of 30 metres or more (or the official new width adopted by the province),

shall have the corresponding acreage reassigned in the tax base so that land owners are not taxed for providing this ecosystem service.

- Broaden the focus of the *Forest Sustainability Regulations* to ensure they address ecological sustainability by:
 - ensuring that credit system/funds are fairly allocated under the *Forest Sustainability Regulations* (see Appendix A: 4.2)
 - re-working the *Forest Sustainability* funding categories and credit allocations to shift the funding emphasis to uneven-aged management (Category 7) and increase the rates paid for uneven-aged management (see Appendix A: 4.2)
 - eliminating government support for herbicides (Category 3), as new harvest practices will reduce their need
 - creating a new category of silviculture funding in the *Forest Sustainability Regulations* for management plans for small woodlot owners
- Make having a land management plan a requirement before small woodland owners can access silviculture funding.
- Correct the disincentive for senior woodlot owners who currently lose their income supplement (i.e., part of their pension) if they derive income from their woodlot.
- Provide private land owners with a means (e.g., a website) to select trusted contractors to carry out silviculture or harvesting on their woodlots (see Appendix A: 4.2).

4.3 Private land forest conversion

Many large blocks of private forest land have been for sale in recent times. Generally they are clearcut harvested and subsequently sold for cottage lots, and other developments. The Buy Back Nova Scotia movement is a public reflection of this reality, and the fear that many large forest areas will disappear in the province.

Forest land conversions to expanding residential developments represents a loss of biodiversity and reduces the available land base that can contribute to a healthy forest economy.

Recommendations

- Prevent private forest land conversion to permanently non-forested lands through government incentives or regulation.
- Require the sale of parcels of land that individually or in total equal or exceed 800 hectares be subject to approvals.

4.4 Intensive forest management and triad systems

Intensive forest management, whereby lands are managed intensively (e.g., plantations) to maximize wood production, is an industry goal with potentially serious ecological implications on the private land base over which there is currently little control. The central question is how to balance land owner rights, and the freedom to adopt forest practices such as intensive forest management, with the ecological responsibilities of land ownership in a fair manner that meets socio-economic expectations.

Some forest industries are suggesting increasing the intensive forest management land base under a triad system to ensure fibre supplies, and to compensate for an increase in protected areas from an existing 8.5 per cent to 12 per cent, as called for under *Environmental Goals and Sustainable Prosperity Act* (EGSPA). The triad system is an approach that divides up the landscape into three categories of various proportions: 1) protected areas, 2) forests under extensive or ecologically based forestry, and 3) intensive forest management. In a sense, Nova Scotia is already managing lands under a triad system, by means of numerous plantations established throughout a less intensively managed forest landscape, with some areas under protection (e.g., national parks). A 3.5 per cent increase in protected areas (some of which are beaches and wetlands) is not a threshold that should trigger an increased intensive forest management approach, especially during the current economic decline for wood products. Current wood supply projections indicate that supply from the existing plantations should meet industry needs.

Intensive forest management is a higher-risk agro-forestry production approach compared to ecologically based forestry. Companies must wait at least 40 to 60 years for a return on plantation investments, banking on unpredictable future market conditions and without knowing the effects of climate change. Furthermore, intensive forest management should not dominate optimal growth sites, as industry may propose, since these rich sites are limited in Nova Scotia and are valuable for high-quality trees and other ecosystem components that are often uncommon or rare. Agriculture already occupies most of the best lands, so intensive forest management on remaining higher-nutrient sites would cause a disproportionate loss to forest biodiversity. The natural forest base should not be relegated to remaining nutrient poor sites.

Recommendations

- Consider a permit system administered by Department of Natural Resources Integrated Resource Management teams for intensive forest management on private land holdings, as per recommendations in Section 2.4.
- Disallow funding incentives for intensive forest management, with the reasons that plantations must be economically viable operations on their own merit in order for industry to invest in them.
- Research and monitor environmental impacts of intensive forest management areas in Nova Scotia.
- Develop a policy on what species will be grown in intensive forest management areas (e.g., hybrid poplars and non-native tree species). Safeguard against invasive alien species and long-term impacts.

5.0 FOREST PROTECTION

Background/Rationale

The Forest Protection branch of the Department of Natural Resources strives to maintain forest health through protecting forests from fire, insect infestations, and pathogens. The frequency and intensity of these stressors are expected to increase with a wide array of climate change effects. New weather patterns may cause droughts and more intensive storms, with associated increases in fire risk. Climate change also brings an increased risk from an anticipated northward migration of insects and pathogens that are currently limited to more southern ranges.

Maintaining or restoring the natural Acadian forest character, including species composition and landscape mosaics, with natural ranges of age classes, structures, and ecological functions may be one of the best ways to enhance the resilience of Nova Scotia's forests to these stressors.

Objectives

Maintain forest health through monitoring and proactive management strategies that maintain or enhance native biodiversity.

Prevent the introduction of non-native populations of vegetation diseases and insects where feasible.

Issues and Discussion

5.1 Forest fire

Fire protection is a fundamental responsibility of the Department of Natural Resources, since fire can quickly destroy forests with large impacts to the forest industry, and also poses significant threat to human life and private property. Local fire departments are often the first line of defense for wildfire. Volunteers and paid fire fighters work co-operatively with the department.

Recommendations

- Continue to suppress forest fires with excellent fire detection using a network of towers and aircraft/helicopter fleet. This is a costly program, but an obvious requirement.
- Support up-to-date fire-behavior prediction systems and other effective technologies to increase fire protection and fire fighter safety.
- Provide increased support to rural volunteer fire departments to ensure that equipment and training is adequate.
- Prohibit recreational off-highway vehicle use in forests during times of open-fire bans.
- Develop criteria for silvicultural treatments that are ecologically appropriate but more resistant to fire.

5.2 Forest pests

Insects and pathogens can originate from native or foreign (i.e., exotic) sources, which, in turn, influence decision-making on the type of intervention response to infestations. Native insects and diseases are intrinsic components of nearly all terrestrial ecosystems, and function as the drivers of forest diversity, aiding cycles of senescence (aging) and renewal, thereby maintaining the dynamics, forest mosaics, and health of ecosystems. Although at times appearing devastating to the forest, insects and disease agents are necessary for the sustainability of forests (CFS 1999). Outbreaks of native pests are often cyclical in nature, and as part of the natural disturbance regime, they do not impose a threat to ecological integrity. However, insect infestations require monitoring to provide early detection and assessment of management options to curb economic losses.

The Department of Natural Resources must address forest pest outbreaks in provincial protected areas. In federally protected areas, such as national parks, outbreaks of native insects follow a clear national policy, and are treated as a natural process necessary to ecological integrity. Exceptions are made in instances where (i) serious adverse effects may occur on adjacent lands or (ii) public health and safety may be threatened. Exotic species infestations generally warrant aggressive eradication efforts, as they may pose irreversible impacts on native forest character.

Invasive exotic pests and pathogens may pose *the single most significant threat to forest resources* as they have the capacity to permanently alter forest ecosystems. Nova Scotia has already witnessed the near complete collapse of the American beech and American elm, after accidental introductions of beech bark disease, and Dutch elm disease respectively.

Some exotic plant species are also becoming a concern to forest ecosystems. An example is glossy buckthorn (*Rhamnus frangula*), which is rapidly spreading through many forests and wetlands in Nova Scotia. It is becoming increasingly more challenging to protect Acadian forest as the rate of species introductions increases, destroying or displacing native species and affecting entire ecosystems.

be included. Members of the public will likely observe new species long before department staff members.

Recommendations

- Maintain or enhance the Department of Natural Resources' effective pest detection and monitoring systems. It is important to have field staff that are well educated in entomology and other required disciplines to detect outbreaks.
- Develop policies and appropriate strategies for dealing with both native and exotic insect and pathogen outbreaks in provincially protected areas. Avoid using insecticides and other pesticides for native pests and pathogens. These products may be toxic to other animals, including humans.
- The Integrated Pest Management team must have field staff available to work with land owners, including Christmas tree growers, to co-ordinate monitoring efforts that will assist in minimizing economic losses and providing advice on interventions.
- Develop proactive approaches to reducing introductions of exotic invasive pests, pathogens, and plants. Response protocols must be in place to guide rapid response and containment/control of new threats to Nova Scotia's forest resources. Continued co-operation with federal agencies, (the Canadian Food Inspection Agency and Canadian Forest Service) will be important due to overlapping responsibilities.
- Have a dedicated staff member appointed to lead multi-faceted approaches for proactively dealing with the issue of invasive exotic species. A strong public education and awareness component must

6.0 STEWARDSHIP AND EDUCATION

Background/Rational

The majority of Nova Scotia's forested land is in private hands. Land owners need to understand why more sustainable, ecologically healthy forests are essential if they are to become sound stewards of the land. Education and outreach programs provided to land owners and the public will help in co-ordinating and enhancing land stewardship efforts.

To paraphrase Thomas Jefferson, "the best defense of democracy is a well-informed citizenry." Public understanding of Acadian forest ecosystems and processes is essential for their informed decision-making, whether that is choosing or supporting appropriate forestry practices.

Objective

Nova Scotians will understand and appreciate the reasons for an ecologically sound land ethic; as a result they will support one.

Issues and Discussion

6.1 Stewardship

Poor forest practices create serious soil erosion, and severe wildlife habitat degradation in Nova Scotia's woods and waters. Phase I found a need for change that cannot be met by legislation alone. A concerted effort by the Department of Natural Resources to increase awareness and understanding about forest ecology and ecosystem-based forestry practices that are suited for Acadian forests would pay large dividends. This is a time when the public (including woodlot owners and forest sector workers) is dealing with shifts in forest management and harvest approaches, rapidly changing forest markets, new restoration objectives, and climate change stressors. A stewardship approach would also restore public confidence in the department, which has been associated with industrial-based softwood fibre interests.

Recommendations

- Revitalize the department's extension service, with emphasis on having local department staff available to assist land owners with practical, ecologically sound advice about forest management.
- Provide education and incentives to help woodland owners make appropriate management decisions. Woodland owner groups and the Nova Forest Alliance could play a role in these initiatives.
- Enhance the web-based tools available to woodland owners.
- Maintain and promote the Woodlot Owner of the Year program.
- Use Crown land management to set an example of stewardship.
- Continue departmental support for the Association of Sustainable Forestry Category 7 outreach program.

"Mother Earth is suffering now...
Mother Earth needs our help."

Lawrence Wells, Mi'kmaq elder
Learning Seminar: Mi'kmaq Ecological Knowledge:
How to Use This Valuable Resource in your Work

6.2 Education and experiential learning

As society becomes more urban, there is an increasing disconnect with nature and forests. Experiential learning in forested environments can prevent nature deficit disorder (as identified in Phase I), and engender a feeling of being a part of the natural world. This will increase the relevancy of forests to urban Nova Scotians.

Recommendations

- Educate young people through experiential learning in the forest.
- Increase the awareness of non-timber forest products that are an ecologically appropriate use of forests. (For example, public education workshops on wild mushrooms could help some individuals earn \$2,000-\$3,000 each year from some woodlands.)
- Ensure that local Department of Natural Resources' staff are well trained and versed in uneven-aged forest management techniques, and that public education and outreach programs about ecologically appropriate harvest techniques are available.
- Use the clearcutting permit process described in Section 2.4 as a source of education funding.
- Investigate the possibility of a woodlot investment fund to provide support for woodlot owner education initiatives and investment support for woodlot infrastructure. (An example would be the purchase of future timber cutting rights so that owners needing to access the financial value of a woodlot today need not harvest immature timber.)
- Collaborate with the Nova Forest Alliance in education and research efforts that have real social and communication benefits.

7.0 LEGAL FRAMEWORK

Background/Rationale

Where education and incentives fail, strong environmental laws are a final resort. During Phase I, Nova Scotians made it clear they wanted stronger enforcement of current regulations as well as new regulations that would better protect forests.

Objective

Nova Scotia will have effective, enforceable, environmental regulations that are applied consistently by a well-directed contingent of Conservation Officers with a strong presence in our forests to adequately protect forest resources.

Issues and Discussion

7.1 Amendments to forest statutes and regulations

A full revision of the regulatory framework for forest management is required to complement the new forest management approaches outlined in Sections 2 to 4 of this document. None of the current acts or regulations adequately supports uneven-aged management strategies. The *Forest Enhancement Act* (amended in 1993) caters to the sustained-yield production model (ecologically inappropriate for Nova Scotia) and calls for the “*doubling of forest production by the year 2025.*” The definition of wildlife under this act refers only to vertebrate species, thereby over-looking the most abundant group of fauna in our forests: invertebrates. The act cannot address, therefore, species such as wood-decaying beetles, which have great importance in forest ecosystems. There have been repeated calls for reworking the *Forest Sustainability Regulations* to provide more balanced support for uneven-aged management and to become ecologically sustainable.

The current *Wildlife Habitat and Watercourses Protection Regulations* (2002) were a good first step to better resource protection, but have not adequately met objectives to protect wildlife habitat, or in some cases, watercourses. Special management (riparian) zones are often too narrow and legacy tree clumps often leave too few trees and are placed in non-representative species compositions. Legacy clump provisions are inadequate for

meeting requirements of some important wildlife species and other forest components with limited dispersal abilities. The regulations do not adequately address coarse woody debris and snags that have suddenly become lucrative for the new wood-chip industry. Moreover, these regulations were devised mainly to address even-aged management regimes and are less relevant to uneven-aged forest management. The forest industry finds the regulations complex and cumbersome to follow. Compliance monitoring of harvest activities, and enforcement of regulations have been inadequate.

Some well-formulated amendments to *Wildlife Habitat and Watercourses Protection Regulations* would greatly improve habitat protection for both terrestrial and aquatic fauna.

Existing environmental laws need to be fairly and consistently enforced. Those regulations that cannot be enforced should be amended or discarded.

Recommendations

- Change forest legislation to render it more practical, understandable, and effectively implemented by land owners and contractors. Red tape should be reduced wherever possible.
- Modify the *Forest Sustainability Regulations* (as outlined under Section 4.2) to ensure they address ecological sustainability.
- Out-dated provincial acts, such as the *Crown Lands Act*, *Forests Act*, and *Wildlife Act* should be amended to address ecologically based, multi-aged forest management practices, and to ensure compatibility between the acts.
- Change legislation to restrict clearcutting. (See Section 2.4 and the Research Addendum available at www.gov.ns.ca/natr/strategy2010/).
- Create biomass harvesting regulations as per Section 2.4 and outlined in the Research Addendum.
- Amend *Wildlife Habitat and Watercourses Protection Regulations* to address uneven-aged harvest prescriptions and wider special management (riparian) zone buffer requirements. Where clearcutting continues, incorporate changes for making coarse woody debris deadwood retention requirements measurable and enforceable. Legacy

tree clump requirements will be modified to meet needs of a wider suite of forest species.

- Revise legislation to better support private land conservation.

7.2 Penalties

Penalties for some resource violations are lower than for other types of offences and therefore may not be an effective deterrent. There are concerns that key forest inhabitants such as the endangered mainland moose are being poached with low risk of apprehension. Timber is stolen from private lands, and violators make financial profits from the proceeds, even if they are found guilty under the court system.

Recommendation

- Increase measures to dissuade timber theft/illegal harvesting. Suggested measures can be found in Appendix A: 7.2.

7.3 Conflicts of interest and jurisdictional confusion

A conflict of interest exists within the Department of Natural Resources: The department has a role as promoter of the forest industry, as well as regulator.

Currently, the Department of Natural Resources, Nova Scotia Environment, and the federal Department of Fisheries and Oceans all have responsibilities related to environmental damage along watercourses. This creates confusion and impedes effective enforcement.

Recommendations

- Department of Natural Resources should abandon its role as a promoter of industry, or move the responsibility for regulating forestry to Nova Scotia Environment.
- Assign watercourse protection to one provincial department.

7.4 Monitoring and enforcement

More government resources need to be allocated towards on-the-ground monitoring to evaluate whether current regulatory measures are meeting their intended goals and targets.

Nova Scotia's Conservation Officers have met with a range of challenges that have resulted in a decline in enforcement efforts and reduced effectiveness. Staff shortages mean an inadequate ability to respond to complaints (officers with too large a territory to respond to all complaints, working alone for extended periods, and carrying too many files). Supervision by directors who do not have an enforcement background is resulting in ineffective direction in the field.

Recommendations

- Increase the number of Conservation Officers to ensure adequate numbers of officers in the field for adequate enforcement of forest management regulations.
- Consider separating the Enforcement Program into its own branch that is streamlined and accountable to both the Department of Natural Resources and Nova Scotia Environment.
- Restructure the line of control to ensure that officers in the field are supported and directed by personnel with enforcement experience.
- Seasonal Conservation Officers should work long seasons (9 months) or full time to guard against out-sourcing to other law enforcement units.
- Conservation Officers and the Enforcement Program need to be held accountable to Nova Scotians. Statistics on charges and warnings on forest regulations and other types of violations should be made public.
- Continue to authorize Conservation Officers to enforce other provincial and federal regulations and acts where such violations are incidental to the primary duties of resource protection enforcement. Officer integrity and safety are compromised if they are unauthorized, for example, to act on liquor or narcotic violations.

8.0 FORESTS PANEL OF EXPERTISE RECOMMENDATIONS

R. BANCROFT AND D. CROSSLAND

1. Adopt an ecologically based, multi-aged forest management paradigm.
2. Implement the Integrated Resource Management process on Crown land, including its full suite of components, among them, the Forest Ecosystem Classification system, Code of Forest Practice, and Long Range Management Frameworks designed for forest operations in each ecodistrict.
3. Expand the Integrated Resource Management approach/philosophy to private land management through education and outreach, and information support (e.g., offering information for management planning, spatial information) to those willing to participate.
4. Hire additional Department of Natural Resources employees to lead and support the Integrated Resource Management process. Consider a director dedicated to Integrated Resource Management. Soil science and ecology disciplines are required to balance the forestry perspectives.
5. Make Integrated Resource Management approaches *adaptive* to incorporate new information on disturbance regimes and other science information and knowledge as it comes available.
6. Promote a greater representation of the formerly characteristic older-age classes on the landscape, the exact percentages guided by natural disturbance regime information.
7. Create multi-aged stands using silvicultural systems that meet all ecosystem components at once, producing various-sized gaps or patches. Direct consultations with Dr. Seymour, University of Maine, and other forest professionals in eastern Canada could assist the implementation process in Nova Scotia. The following types of silviculture would address this recommendation: Irregular shelterwood systems (Raymond et al. 2009), particularly irregular group shelterwood and expanding gap systems (Seymour

- 2007) have been successfully implemented in Maine (Seymour 2010 Pers. Com.). Single-tree selection remains a good approach in some situations. Alternating strip cuts with legacy strips, or Light Re-entry Silvicultural Harvesting as described in Salonijs (2007) has been successful in New Brunswick (Salonijs 2010).
8. Promote the return to uneven-aged growth on plantations and other lands where former clearcuts have resulted in even-aged forests. A more ecologically healthy forest can be gradually restored by a variety of silvicultural methods, such as thinning and planting appropriate seedlings in small gaps or narrow strips, using the residual plantation as a nurse crop to afford protection (Salonijs and Beaton 1997; Salonijs 2007). Areas left uncut can eventually be harvested after regeneration has been established.
 9. Refine forest inventory methods to better estimate and monitor forest ages. Forest age-class distributions should be calculated in five-year periods from the earliest data sets available to present times to demonstrate age-class trends.
 10. Reduce the annual harvest on both Crown and private lands to conform to the new model of ecologically based forestry. The government will need to devise a mechanism to regulate quantities harvested, perhaps through regulating exports and industry acquisitions.
 11. Develop a landscape connectivity plan for the province that provides incentives for land owners to participate in its implementation. This could also restore degraded forest landscapes.
 12. Adopt independent provincial standards for sustainable forest practices on all lands (such as the Code of Forest Practice).
 13. Encourage Forest Stewardship Council certification on both Crown and private land. On Crown lands, ensuring that forest harvesting meets the highest requirements applicable under *either* Forest Stewardship Council or a new Crown land policy. In other words, where Crown land forest management policies prescribe a higher standard than the Forest Stewardship Council, then Crown land policy will supersede it (or vice versa).
 14. Update and expand the Best Management Practices manual prepared by the Nova Forest Alliance to reflect new management changes, with an emphasis on silvicultural practices for uneven-aged management; re-engage the Nova Forest Alliance for revisions.
 15. Develop a reverse-onus policy and permit system for clearcutting on both private and Crown lands, where justification is required of the absolute need in spite of the ecological implications to conduct clearcutting. The permit system could be administered by the local Integrated Resource Management team. Money from the permits could fund ecologically sustainable silviculture treatments and education. The permit system would allow clearcutting in cases where stand-replacement events, such as hurricanes and insect infestations occurred.
 16. Enact legislation to prohibit clearcutting of tolerant hardwood stands and phase in restrictions on clearcutting shade-tolerant, mixed-wood and softwood stands.
 17. Set targets for reductions in clearcutting whereby the area under clearcut harvest on the landscape would be reduced by a minimum of 50 per cent of current harvests by 2015, followed by further reductions thereafter. (The Integrated Resource Management process, if fully implemented and extended to some degree on private lands should further reduce clearcutting beyond 2015.)
 18. Ban whole-tree harvesting (taking tops, trunks and limbs; leaving stumps and roots). Exceptions would include Christmas trees, and permanent land-conversion situations, such as lot clearing for housing or road building where it does not have a negative effect on future productivity. Retain branches less than 10 cm in diameter on all harvest sites.
 19. Limit forest biomass harvesting for electricity to small amounts that have already been committed for the current facilities.
 20. Restrict the export of raw biomass to ensure domestic use.
 21. Define natural disturbance regimes specific to Nova Scotia and investigate how harvest regimes can best emulate the types of natural disturbances inherent to Nova Scotia.

22. Limit the percentage of annually harvested forest land within a watershed to protect and regulate flows. This may mean that less than 1 per cent could be clearcut within a single year (Lindenmayer and Franklin 2002).
23. Expand special management (riparian) zones to widths of 50 metres, or even 100 metres in places, with no harvesting within them to within 30 metres, where even-aged harvesting is used. Allow flexibility for narrower zones where uneven-aged harvests and canopy cover is maintained. Riparian slopes greater than 10 per cent should have limited activity.
24. Make wetlands mapping publicly available so the information can be incorporated into Global Positioning System devices to identify boundaries of sensitive wetlands for planning purposes.
25. Herbicide use should be banned on Crown lands, and discouraged on private lands except in unusual circumstances, such as for controlling invasive exotic plants.
26. Government funding for herbicides should be fully eliminated (except for invasive species treatments).
27. Support forest research by universities, colleges, and scientists.
28. Complete research on disturbance regimes using ecosystem archaeology research methods and other approaches.
29. Increase Department of Natural Resources' transparency regarding the reporting and sharing of information on the state of Nova Scotia's forests and the extent and types of harvests. This reporting should be provided on an ecodistrict level every five years at minimum and on an annual basis where possible. Clearcuts are currently monitored on an annual basis (Beyeler Pers Com.), yet this information is either inaccessible or not made easily available. Forest databases and other information sources are publicly funded and need to be made accessible, with appropriate caveats, to researchers and other members of the public.
30. The department should form an external science advisory body to the minister (similar to Species at Risk recovery teams) to provide input on major policy changes and harvest planning, and to ensure more science-based forest management.
31. The department should strengthen ties with science-based and community-based conservation organizations and provide staff support and core funding (e.g., Mersey Tobeatic Research Institute).
32. Adopt the use of new monitoring tools such as satellite imagery.
33. Invest in small- and medium-sized, value-added forest products industries that utilize high-value tree species.
34. Create a specific research body or program to explore market opportunities and encourage the value-added industry potential.
35. Facilitate sorting yards and better consultation among wood producers, primary industry, and value-added manufacturers to ensure that logs are put towards their highest-value end use under the Association for Sustainable Forestry, woodlot owner groups, or the Nova Forest Alliance.
36. Provide incentives/assistance to small mill operations with a niche for high-quality lumber, larger-dimension wood, rarer types of wood, and value-added products.
37. Consider facilitating certified wood graders to stamp lumber from small sawmills, thereby increasing market choices.
38. Support the vertical integration of the value-added products industry. In this way harvest operations supply to small sawmills that, in turn, provide to value-added factories to manufacture doors, floorings, and other products, with distribution companies that maintain a strong chain to larger markets.
39. Continue to explore new uses for forest fibre/alternative forest products and markets.
40. Ensure current commitments (e.g., Forest Utilization License Agreements) are addressed in any application of a new forest strategy, since they are legal and binding.
41. Shift Crown land management away from the narrow focus on industrial softwood fibre/logging commitments in tenure agreements towards more comprehensive forest management objectives that address a broad range of public interests.
42. Develop a legal and policy framework to allocate Crown wood to value-added wood manufacturers.

43. Manage toward restoration of some continuous tracts of late-successional forests and allow these areas to mature (100 to 300+ years of age) in order to function as permanent retention areas to meet specialized habitat requirements of some plants and animals across the working landscape.
44. Manage recreational activities, such as off-highway vehicle use, to reduce conflict with higher-level values such as protection of biodiversity.
45. Apply specific usage restrictions on Crown lands to restore healthy populations of American martin, as well as to protect other species at risk and other sensitive ecological areas.
46. Crown land management objectives must encompass non-timber uses since these lands, combined with parks and protected areas, offer local nature awareness and wilderness experiences for Nova Scotians.
47. Continue to purchase private lands to increase the Crown land base.
48. Continue to financially support the Nova Scotia Crown Share Legacy Trust Fund.
49. Restrict forestry activities on Crown lands to those that are in keeping with the forest ecosystems that were historically present or characteristic of that particular area.
50. Adopt a set of genuine progress indicators to measure the costs and benefits of Crown land management for the public good, and share this information as well.
51. Prepare road impact mitigation plans for all remaining unprotected Crown lands.
52. Identify existing roads on Crown land for active and passive decommissioning.
53. Adopt alternative harvest practices that are flexible and may also be applied to our boreal conifer forests, since they should not be assumed, without suitable research into their natural disturbance regimes, to be characteristically even-aged (LeBlanc and Belanger 2000).
54. Increase stumpage fees as a disincentive for clearcutting where this practice is used during the phase-out period.
55. Do not allow the practice of intensive forest management on Crown land based on the proposed triad system.
56. Use Crown lands as a secure base for long-term, scientific forest research and monitoring, with objectives of maintaining or restoring ecosystem components and dynamics that are essential to forest health as well as healthy forest industries.
57. Open Crown lands to community forestry pilot projects.
58. Incorporate Mi'kmaq land claims, traditional uses, and time-honoured harvest requirements into planning initiatives.
59. Extend ecosystem-based management to private lands through promoting aspects of the Integrated Resource Management process, such as the Code of Forest Practice.
60. Encourage private land owners to have a private land management plan in place. A commitment to do active forest management is not obligatory, (passive management or managing for biodiversity or ecosystem services could be options), but inventories and setting long-term objectives are worthy endeavors.
61. Increase government extension services to include assistance with private land management plans.
62. Promote working-forest conservation easements on large tracts of lands, particularly industrial timberlands, through certification or arrangements with a land trust.
63. Promote programs to assist private land owners who cannot carry out harvesting themselves, to procure revenue from their lands using ecologically based forestry. A successful example is the forest bank program in Indiana, managed by The Nature Conservancy (<http://www.nature.org/wherewework/northamerica/states/indiana/news/news1473.html>). The forest bank consolidates smaller woodlots into larger operating units, and then makes annual payments to each owner. A professional forester manages each woodlot with an emphasis on biodiversity. This may be especially appropriate for absentee land owners (Floyd and Chaini 2007), and could foster more ecologically healthy managed forests.

64. Support the creation of a land conservation centre program and a land acquisition fund; revise legislation to better support private land conservation.
65. Develop a strong education and outreach component to provide land owners with information on which silvicultural methods are most appropriate for ecologically based, uneven-aged forestry.
66. Encourage the federal government to renew the Group Venture Program for Nova Scotia.
67. Increase the forest-resources tax assessment for land owners who have no land management plan. Land owners who have a land management plan could pay *lower* tax rates when their land practices and forest management plan objectives are ecologically based and providing *ecosystem services* that benefit society. Thus, income tax relief is provided to compensate investment costs associated with making a woodlot more ecologically stable.
68. Special management zones (riparian zones) on private lands, to the width of 30 metres or more (or the official new width adopted by the province), shall have the corresponding acreage reassigned in the tax base so that land owners are not taxed for providing this ecosystem service.
69. Broaden the focus of the *Forest Sustainability Regulations* to ensure they address ecological sustainability by:
 - a) ensuring that funds are fairly allocated under the *Forest Sustainability Regulations*. The Department of Natural Resources or an independent third party could administer all silvicultural funds and Wood Assistance Plans. This could be accomplished through expanding the mandate of the Association for Sustainable Forestry and increasing the number of the association's offices from one to three (one for each Integrated Resource Management region). Alternatively, a third party could consist of three or four private forest consultants located in each of the three Integrated Resource Management regions. These consultants should have strong people-skills; be forest-educated; experienced in silviculture; and live in, and be familiar with the areas in which they work. They could visit harvest operations, provide education to woodlot owners, and act as an independent voice to guide land owners and industry.
 - b) re-working the *Forest Sustainability* funding categories and credit allocations to shift the funding emphasis to uneven-aged management (Category 7) and increase the rates paid for uneven-aged management. Uneven-aged management can be expanded over several categories of treatments and funded to adequately reflect the wider array of treatment and harvest options, possibly requiring the creation of new categories.
 - c) eliminating government support for herbicides (Category 3), as new harvest practices will reduce their need Amend the *Forest Sustainability Regulations* to financially assist with uneven-aged management, while reducing assistance for even-aged practices. Increase the rates paid for uneven-aged management under the regulations' Category 7 to ensure these practices are economically feasible. Some of the funding can come from reduced spending for even-aged treatments, such as by eliminating Category 2 (funding for plantation establishment) and Categories 3 and 4 (funding for herbicides and plantation density control, respectively). Herbicide funding should be phased out slowly since some plantations have been recently established with the assumption that there would be funding for density control, and will need treatment support for a short period of time.
 - d) creating a new category of silviculture funding in the *Forest Sustainability Regulations* for management plans for small woodlot owners.
70. Make having a land management plan a requirement before small woodland owners can access silviculture funding.
71. Correct the disincentive for senior woodlot owners who currently lose their income supplement (i.e., part of their pension) if they derive income from their woodlot.
72. Provide private land owners with a means to select trusted contractors to carry out silviculture or harvesting on their woodlots. One way may be through management of a website where each contractor could provide photos of work completed and a list of previous client references. The website would offer assurances to some private land owners who would like to have wood harvested or improvements carried out in their woodlots, are unable to do the work themselves, but do not know who to trust to provide the service. This would also assist the forest industry by

- facilitating contract harvesting of privately owned forests and supplying wood to mills.
73. Prevent private forest land conversion to permanently non-forested lands through government incentives or regulation.
 74. Require the sale of parcels of land that individually or in total equal or exceed 800 hectares be subject to approvals.
 75. Consider a permit system administered by Department of Natural Resources' Integrated Resource Management teams for intensive forest management on private land holdings.
 76. Disallow funding incentives for intensive forest management, with the reasons that plantations must be economically viable operations on their own merit in order for industry to invest in them.
 77. Research and monitor environmental impacts of intensive forest management areas in Nova Scotia.
 78. Develop a policy on what species will be grown in intensive forest management areas (e.g., hybrid poplars and non-native tree species). Safeguard against invasive alien species and long-term impacts.
 79. Continue to suppress forest fires with excellent fire detection using a network of towers and aircraft/helicopter fleet. This is a costly program, but an obvious requirement.
 80. Support up-to-date fire-behavior prediction systems and other effective technologies to increase fire protection and fire fighter safety.
 81. Provide increased support to rural volunteer fire departments to ensure that equipment and training is adequate.
 82. Prohibit recreational off-highway vehicle use in forests during times of open-fire bans.
 83. Develop criteria for silvicultural treatments that are ecologically appropriate but more resistant to fire.
 84. Maintain or enhance the Department of Natural Resources' effective pest detection and monitoring systems. It is important to have field staff that are well educated in entomology and other required disciplines to detect outbreaks.
 85. Develop policies and appropriate strategies for dealing with both native and exotic insect and pathogen outbreaks in provincially protected areas. Avoid using insecticides and other pesticides for native pests and pathogens. These products may be toxic to other animals, including humans.
 86. The Integrated Pest Management team must have field staff available to work with land owners, including Christmas tree growers, to co-ordinate monitoring efforts that will assist in minimizing economic losses and providing advice on interventions.
 87. Develop proactive approaches to reducing introductions of exotic invasive pests, pathogens, and plants. Response protocols must be in place to guide rapid response and containment/control of new threats to Nova Scotia's forest resources. Continued co-operation with federal agencies, (the Canadian Food Inspection Agency and Canadian Forest Service) will be important due to overlapping responsibilities.
 88. Have a dedicated staff member appointed to lead multi-faceted approaches for proactively dealing with the issue of invasive exotic species. A strong public education and awareness component must be included. Members of the public will likely observe new species long before department staff members.
 89. Revitalize the department's extension service, with emphasis on having local department staff available to assist land owners with practical, ecologically sound advice about forest management.
 90. Assist woodland owner groups and/or the Nova Forest Alliance to provide training workshops on best management practices, uneven-aged management silviculture, enhancing natural forest regeneration, and quality hardwood management.
 91. Enhance the web-based tools available to woodland owners.
 92. Maintain and promote the Woodlot Owner of the Year program.
 93. Use Crown land management to set an example of stewardship.
 94. Continue departmental support for the Association of Sustainable Forestry Category 7 outreach program.

95. Educate young people through experiential learning in the forest.
96. Increase the awareness of non-timber forest products that are an ecologically appropriate use of forests. (For example, public education workshops on wild mushrooms could help some individuals earn \$2,000-\$3,000 each year from some woodlands.)
97. Ensure that local Department of Natural Resources' staff are well trained and versed in uneven-aged forest management techniques, and that public education and outreach programs about ecologically appropriate harvest techniques are available.
98. Investigate the possibility of a woodlot investment fund to provide support for woodlot owner education initiatives and investment support for woodlot infrastructure. (An example would be the purchase of future timber cutting rights so that owners needing to access the financial value of a woodlot today need not harvest immature timber.)
99. Collaborate with the Nova Forest Alliance in education and research efforts that have real social and communication benefits.
100. Change forest legislation to render it more practical, understandable and effectively implemented by land owners and contractors. Red tape should be reduced wherever possible.
101. Out-dated provincial acts, such as the *Crown Lands Act*, *Forests Act*, and *Wildlife Act* should be amended to address ecologically based, multi-aged forest management practices, and to ensure compatibility between the acts.
102. Create biomass harvesting regulations.
103. Amend *Wildlife Habitat and Watercourses Protection Regulations* to address uneven-aged harvest prescriptions and wider special management (riparian) zone buffer requirements. Where clearcutting continues, incorporate changes for making coarse woody debris deadwood retention requirements measurable and enforceable. Legacy tree clump requirements will be modified to meet needs of a wider suite of forest species.
104. Revise legislation to better support private land conservation.
105. Increase measures to dissuade timber theft/illegal harvesting.
106. Department of Natural Resources should abandon its role as a promoter of industry, or move the responsibility for regulating forestry to Nova Scotia Environment.
107. Assign watercourse protection to one provincial department.
108. Increase the number of Conservation Officers to ensure adequate numbers of officers in the field for adequate enforcement of forest management regulations.
109. Consider separating the Enforcement Program into its own branch that is streamlined and accountable to both the Department of Natural Resources and Nova Scotia Environment.
110. Restructure the line of control to ensure that officers in the field are supported and directed by personnel with enforcement experience.
111. Seasonal Conservation Officers should work long seasons (9 months) or full time to guard against outsourcing to other law enforcement units.
112. Conservation Officers and the Enforcement Program need to be held accountable to Nova Scotians. Statistics on charges and warnings on forest regulations and other types of violations should be made public.
113. Continue to authorize Conservation Officers to enforce other provincial and federal regulations and acts where such violations are incidental to the primary duties of resource protection enforcement. Officer integrity and safety are compromised if they are unauthorized, for example, to act on liquor or narcotic violations.

Appendices to the Recommendations:

114. Share databases that indicate environmentally and culturally sensitive sites that exist in a variety of external sources (e.g., The Nova Scotia Museum of Natural History, First Nations sites) with forest managers to assist in planning while safeguarding vulnerable elements.
115. Job descriptions of biologists/ecologists will place them outdoors on a regular basis, in direct contact with the resources they oversee and also with the people affected.
116. Implementing the *Old Forest Policy for Crown Land* (Stewart and Neily 2008) would currently protect a minimum of 8 per cent of Crown land old-growth in each of the 39 ecodistricts defined under the Ecological Land Classification. The policy should be reworked and supported by scientific research, with percentages adjusted much higher, since an estimated 50 per cent of the pre-European settlement forest supported late-successional old-growth forest types (Mosseler et al. 2003).
117. Promote single-tree selection harvests through incentives. There remains a place for this harvest technique in our Acadian forest, though high-grading should be avoided.
118. Retention of legacy forest stands should be encouraged throughout the working forest landscape as a precautionary measure for safeguarding species for which we have limited knowledge.
119. Adequate amounts of representative forest structures, such as coarse woody debris, must remain on site following harvest practices across the landscape to ensure habitat protection for a suite of ecosystem components.
120. Make forest management more accountable for maintenance of soil health.
121. Increase protection for breeding bird habitats especially during the breeding season (mainly during the May-June period). Many songbirds and other species are undergoing rapid decline; forest harvesting during the breeding period destroys hundreds of nests, contrary to the *Migratory Birds Convention Act*.
122. Develop new management and stewardship strategies (and infrastructure capabilities) to properly assess potential harvest sites. Specific harvest methods will be prescribed based upon actual site assessments.
123. Reclassify industrial forest terms such as “seed tree release” and “variable retention harvests” as “clearcuts with minor retention of trees” to end the semantics. More accurate descriptions for harvest practices thwart public deception and accurately communicates harvest practices.
124. Climate change effects should be included in planning future forest management.
125. Disease resistant clear beech should be left unharvested on the landscape wherever they occur so that they may cross with other healthy beech to assist in restoring this once dominant deciduous tree and important mast producer to the Acadian forest.
126. Implement a permit system for all forest contractors who operate on private lands. The contractor would be required to post a performance bond, of a cost to vary with the scale of the harvest. The bond will be held in escrow by the Department of Natural Resources and returned to the permit holder after the logging operation is completed, provided no infractions have been detected. If the department withholds bonded money due to an infraction of regulations and resulting environmental damage, the onus is on the permit holder to contest the department’s decision. This will provide a powerful deterrent against illegal cutting and an improved enforcement mechanism.
127. Support forestry worker training on ecologically based, multi-aged silviculture.
128. Provide a more thorough accounting of all wood removed from private holdings, including firewood, to guide long-term predictions on the forest ecology and wood supply. Make results public.
129. Ensure that silviculture funding for private land provided under the *Forest Sustainability Regulations* is spent on private lands and not on industrial-held lands in a limited company.

130. Review whether funding for land owners with more than 2,000 hectares (who are currently excluded under the *Forest Sustainability Regulations*) should receive assistance with uneven-aged management treatments. (Unsustainable forest practices on some of these large land parcels are of concern, and may be assisted under the regulations.)
131. Consider requiring forestry contractors to carry proof of permission from private land owners. Truckers should carry official slips of proof of where the wood was obtained.
132. Violations of environmental laws should cause loss of hunting and fishing privileges. Drivers license renewals could be revoked until such time that fines are paid. (There is a lot of noncompliance with regards to paying fines.)

9.0 GLOSSARY

Acadian forest region

The Acadian forest region stretches primarily from New York through New Hampshire, Vermont, and Maine and includes all the provinces of New Brunswick, Nova Scotia, and Prince Edward Island. It is a transition forest that contains a diverse collection of trees, shrubs, and other plants. The Acadian Forest Region is characterized by the presence of red spruce, yellow birch, balsam fir and sugar maple.

Agronomist

A scientist who specializes in the science of utilizing plants for food, fuel, feed, and fibre.

Annual allowable cut

The volume or area that may be harvested annually under existing regulations.

Association for Sustainable Forestry

The Association for Sustainable Forestry provides small private woodland owners with the financial means to implement forest improvement work on their properties. The association works with silviculture contractors, woodland owner groups, and individuals to allocate and monitor the silviculture funds available through the provisions of the *Nova Scotia Forests Act*.

http://www.asforestry.com/sus_forest_pg1.htm

Biodiversity

Also referred to as biological diversity, it is the variety and interconnectedness of life, including all species of plants, animals, and other organisms, the genes they contain, and the ecosystems and ecological processes of which they are a part.

Biomass harvesting

The harvesting of forest wood products for use in the production of heat or energy.

Biorefineries

A facility that integrates biomass conversion processes and equipment to produce fuels, power, heat, and value-added chemicals from biomass. The biorefinery concept is analogous to today's petroleum refinery, which produces multiple fuels and products from petroleum.

Boreal forest

The northernmost and coldest forest zone in the Northern Hemisphere is the boreal forest, forming a continuous belt

1,000 km in north-south width across North America, Europe, and Asia. It is the most extensive vegetation zone in Canada and covers significant areas of every province and territory. Its forest and woodlands in Canada are usually dominated by needle-leaf evergreen trees, including black and white spruce, jack and lodgepole pine, and balsam fir; by needle-leaf deciduous American larch; or by small-leaf deciduous trees, including paper birch, trembling aspen, and balsam poplar.

Source: www.thecanadianencyclopedia.com

Bryophytes

Non-vascular land plants. Includes mosses and liverworts.

Buy Back Nova Scotia

A coalition of foresters, fishermen, hunters, hikers, conservationists, ATVers, bicyclists, birders, canoeists, campers, cross-country skiers, photographers, and writers working together to urge Nova Scotia's municipal and provincial politicians to purchase the JD Irving lands.

www.buybacknovascotia.ca

Category 7 (Forest Quality Improvement)

One of the silviculture categories under the *Forest Sustainability Regulations*. This category includes three sub categories; a) Crop Tree Release, b) Crop Tree Pruning, and c) Selection Management.

Clearcut

The cutting of all trees larger than seedlings and small saplings of a new reproduction stage to leave an area of land looking "clear." Normally, roots and stumps are left intact, and a layer of slash covers the ground (School of Forest Resources 1975).

Clearcutting: a stand in which essentially all trees have been removed in one operation (Helms 1998).

Clearcutting: The harvesting of all trees in a single cut from an area of forest large enough so that the "forest influence" is removed from the majority of the harvested area (Kimmins 1992).

Clearcuts may also include "seed tree release" and "variable retention" harvest methods. Seed-tree is a method of regenerating a forest stand in which all trees are removed from the area except for a small number of seed-bearing trees that are left singly or in small groups. Variable retention leaves either clumps of trees or canopy trees thinly dispersed throughout the harvest site. The outcome of these methods is the same: They create even-aged stands.

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Kimmins, J.P. 1992. *Balancing act - environmental issues in forestry*. Univ. B.C. Press, Vancouver, B.C.

Closed canopy

A forest canopy that is dense enough that the tree crowns fill or nearly fill the canopy layer so that light cannot reach the forest floor directly.

Code of Forest Practice

A framework for the implementation of sustainable forest management (NS DNR 2004) is intended to guide the actual operational planning and activities on Crown land.

Credit values

Funding for a variety of silviculture treatments made available to private land owners under the Forest Sustainability Regulations.

Dendrochronology

The scientific method of dating based on the analysis of patterns of tree-rings.

Ecodistricts

There are 39 ecodistricts in Nova Scotia, that are characterized by distinctive patterns of vegetation, landform, and ecological processes. These provide the landscape units used for tactical planning.

Ecological Landscape Analysis (Classification)

Provides an hierarchical mapping of the province's forest ecosystems. This includes interpretation of the dominant natural disturbance regimes and potential climax forests at the ecosection level of classification.

Entomology

The scientific study of insects.

Environmental Goals and Sustainable Prosperity Act (EGSPA)

EGSPA sets Nova Scotia on a course to be a world leader by having one of the cleanest and most sustainable environments by 2020. It brings together key government objectives to improve air, land, and water quality and to address climate change.

www.gov.ns.ca/nse/egspa/

Even-aged management

Silvicultural systems in which stands have an even-aged structure, e.g., clearcutting method, coppice method, seed tree method.

Forest bank

A forest bank consolidates smaller woodlots into larger operating units, and then makes annual payments to each owner, based on forest revenues.

Forest Ecosystem Classification

The Forest Ecosystem Classification provides a site-level description of ecosites, vegetation communities, and soil types designed for operational level planning.

Forest Stewardship Council (FSC)

The Forest Stewardship Council sets forth principles, criteria, and standards that span economic, social, and environmental concerns about the practice of sustainable forestry worldwide. The FSC system includes stakeholders with a diverse array of perspectives on what represents a well-managed and sustainable forest. FSC standards for forest management have now been applied in over 57 countries around the world.

www.fsc.org.

Forest Utilization License Agreements

According to the *Crown Lands Act*, "The Minister, with the approval of the Governor in Council, may enter into a forest-utilization licence agreement for the purpose of ensuring the best possible utilization of the forests of the Province and the timber thereon with a person who owns or operates a wood processing facility in the province or who undertakes by agreement with the Minister to construct and operate a wood processing facility in the province."

Geographic information system (GIS)

A system that captures, stores, analyzes, manages, and presents data that are linked to location; the merging of cartography and database technology.

Genuine progress indicators (GPI)

Genuine progress indicators are indicators and measures of progress. They assess the economic value of non-market social and environmental assets not generally valued in the conventional economic statistics.

Glossy buckthorn (*Rhamnus frangula*)

An invasive alien plant, originally from Europe.

Integrated Resource Management (IRM)

A planning and decision-making process (used on Crown Land) that involves the co-ordination of resource management policies, programs, and activities, so that long-term sustainable benefits are optimized and conflicts among resource users are minimized.

Irregular group shelterwood

"Irregular" refers to the variation in tree heights and ages that form the new stand, resulting from partial harvesting. Small groups of overstory trees are harvested, leaving various sized openings equivalent to one or more tree lengths, and allowing the remaining canopy to "shelter" the natural regeneration. The opening size will depend on the regeneration requirements of the preferred tree species and other resource objectives. (If the openings become larger than several tree lengths, they may approach the clearcut environment.) (Nyland 1996, Kimmins 1992).

LiDAR (Light Detection and Ranging)

An optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target.

Long-Range Management Frameworks

A Long Range Management Framework is the final outcome of the ecological analyses and design stages that is used as a guide to help make natural resource management decisions on Crown land. There is one Long Range Management Framework written for each ecodistrict.

Mersey Tobeatic Research Institute

A non-profit co-operative with a vision to advance collaborative research, monitoring, and management that promotes sustainable use of resources and biodiversity conservation in the Southwest Nova Biosphere Reserve.

www.merseytobeatic.ca

Natural disturbance regimes

The concept that describes the pattern of disturbances that shape an ecosystem over a long time scale. A natural disturbance regime is distinguished from a single disturbance event because it describes a spatial disturbance pattern, a frequency and intensity of disturbances, and a resulting ecological pattern over space and time. The specific natural disturbance regime is closely associated with the natural community in which it occurs.

Nova Forest Alliance

The Nova Forest Alliance (NFA) is a partnership of land owners, researchers, industry, First Nations communities, environmentalists, educational institutions, forest community areas, forest professionals, and government committed to finding sustainable solutions for forest communities in Nova Scotia and Prince Edward Island.

<http://www.novaforestalliance.com/default.asp?cmPageID=77>

Paradigm

Paradigm: A set of assumptions, concepts, values, and practices that constitutes a way of viewing reality.

Pathogens

A biological agent that causes disease to its host.

Pioneer species

Species that colonize previously uncolonized land, usually leading to ecological succession. Pioneer Species are the first organisms to start the chain of events leading to a livable biosphere or ecosystem.

Precautionary principle

A principle that states: Where there are possibilities of damage, decision-making should favour the prevention of environmental degradation.

Registry of Buyers

A registry of individuals and businesses who acquire primary forest products for processing into secondary products, export, sale as firewood, or production of energy.

Riparian zones

Lands beside waterways that have a disproportionately high amount of use by wildlife. Riparian zones connect the landscape for wildlife, protect aquatic habitats and offer terrestrial habitats.

Senescence

Senescence is biological aging; the change in the biology of an organism as it ages after its maturity.

Silviculture

The science of managing forest vegetation to meet human needs.

Sustainable Forestry Initiative (SFI)

Launched in 1994, SFI Inc. is an independent, non-profit organization responsible for maintaining, overseeing and improving a sustainable forestry certification program that is internationally recognized and is the largest single forest standard in the world.

The SFI 2010-2014 Standard is based on principles and measures that promote sustainable forest management and considers all forest values. It includes unique fibre sourcing requirements to promote responsible forest management on all forest lands in North America.

<http://www.sfiprogram.org/>

Species at Risk: Nova Scotia Species at Risk Conservation Fund

Established under the *Nova Scotia Endangered Species Act* to assist the funding of projects related to species at risk.
<http://www.gov.ns.ca/natr/wildlife/sarfund/>

Triad system

An approach that divides up the landscape into three categories of various proportions: 1) protected areas, 2) forests under extensive or ecologically based forestry, and 3) intensive forest management.

Uneven-aged management

A management system of a forest stand, or forest type, in which intermingling trees differ markedly in age. The differences in age in an uneven-aged stand are usually greater than 10 to 20 years.

Woodlot Owner of the Year award

This recognizes and rewards land owners for outstanding stewardship of their woodlots. It was developed to encourage woodlot owners to practice sustainable woodlot management and to increase public awareness of the importance of private woodlots in Nova Scotia and good woodlot management.

<http://www.gov.ns.ca/natr/extension/woya/>

10.0 APPENDICES

Appendix A: Appendices to the Recommendations

2.0 FOREST MANAGEMENT

2.1 The paradigm shift to ecologically based, multi-aged forest management

Recommendations

- Share databases that indicate environmentally and culturally sensitive sites that exist in a variety of external sources (e.g., The Nova Scotia Museum of Natural History, First Nations sites) with forest managers to assist in planning while safeguarding vulnerable elements.
- Job descriptions of biologists/ecologists will place them outdoors on a regular basis, in direct contact with the resources they oversee and also with the people affected.

2.2. Age-class restoration

Recommendations

- Promote restoration to uneven-aged growth on plantations and other lands where former clearcuts have resulted in even-aged forests. A more ecologically healthy forest can be gradually restored by a variety of silvicultural methods, such as thinning and planting appropriate seedlings in small gaps or narrow strips, using the residual plantation as a nurse crop to afford protection (Salonius and Beaton 1997; Salonius 2007). Areas left uncut can eventually be harvested after regeneration has been established.
- Implementing the *Old Forest Policy for Crown Land* (Stewart and Neily 2008) would currently protect a minimum of 8 per cent of Crown land old-growth in each of the 39 ecodistricts defined under the Ecological Land Classification. The policy should be reworked and supported by scientific research, with percentages adjusted much higher, since an estimated 50 per cent of the pre-European

settlement forest supported late-successional old-growth forest types (Mosseler et al. 2003).

- Promote single-tree selection harvests through incentives. There remains a place for this harvest technique in our Acadian forest, though high-grading should be avoided.

2.3 Additional forest management strategies

Recommendations

- Retention of legacy forest stands should be encouraged throughout the working forest landscape as a precautionary measure for safeguarding species for which we have limited knowledge.
- Adequate amounts of representative forest structures, such as coarse woody debris, must remain on site following harvest practices across the landscape to ensure habitat protection for a suite of ecosystem components.
- Make forest management more accountable for maintenance of soil health.
- Increase protection for breeding bird habitats especially during the breeding season (mainly during the May-June period). Many songbirds and other species are undergoing rapid decline; forest harvesting during the breeding period destroys hundreds of nests, contrary to the *Migratory Birds Convention Act*.
- Develop new management and stewardship strategies (and infrastructure capabilities) to properly assess potential harvest sites. Specific harvest methods will be prescribed based upon actual site assessments.
- Reclassify industrial forest terms such as “seed tree release” and “variable retention harvests” as “clearcuts with minor retention of trees” to end the semantics. More accurate descriptions for harvest practices thwart public deception and accurately communicates harvest practices. (See Clearcutting, in the Research Addendum at www.gov.ns.ca/natr/strategy2010/.)
- Climate change effects should be included in planning future forest management.

- Disease resistant clear beech should be left unharvested on the landscape wherever they occur so that they may cross with other healthy beech to assist in restoring this once dominant deciduous tree and important mast producer to the Acadian forest.

2.7 Research and monitoring

Recommendation

- Increase Department of Natural Resources' transparency regarding the reporting and sharing of information on the state of Nova Scotia's forests and the extent and types of harvests. This reporting should be provided on an ecodistrict level every five years at a minimum and on an annual basis where possible. Clearcuts are currently monitored on an annual basis (Beyeler Pers Com.), yet this information is either inaccessible or not made easily available. Forest databases and other information sources are publicly funded and need to be made accessible, with appropriate caveats, to researchers and other members of the public.

4.0 PRIVATE LAND MANAGEMENT/SUPPORT FOR PRIVATE LAND OWNERS AND INDUSTRY-OWNED PRIVATE LANDS

4.1 Private land management for healthy forest ecosystems

Recommendations

- Promote programs to assist private land owners who cannot carry out harvesting themselves, to procure revenue from their lands using ecologically based forestry. A successful example is the forest bank program in Indiana, managed by The Nature Conservancy (<http://www.nature.org/wherewework/northamerica/states/indiana/news/news1473.html>). The forest bank consolidates smaller woodlots into larger operating units, and then makes annual payments to

each owner. A professional forester manages each woodlot with an emphasis on biodiversity. This may be especially appropriate for absentee land owners (Floyd and Chaini 2007), and could foster more ecologically healthy managed forests.

- Implement a permit system for all forest contractors who operate on private lands. The contractor would be required to post a performance bond, of a cost to vary with the scale of the harvest. The bond will be held in escrow by the Department of Natural Resources and returned to the permit holder after the logging operation is completed, provided no infractions have been detected. If the department withholds bonded money due to an infraction of regulations and resulting environmental damage, the onus is on the permit holder to contest the department's decision. This will provide a powerful deterrent against illegal cutting and an improved enforcement mechanism.
- Assist woodland owner groups and/or the Nova Forest Alliance to provide training workshops on best-management practices, uneven-aged management silviculture, enhancing natural forest regeneration, and quality hardwood management.
- Encourage Forest Stewardship Council certification.
- Support forestry worker training on ecologically based, multi-aged silviculture.
- Provide a more thorough accounting of all wood removed from private holdings, including firewood, to guide long-term predictions on the forest ecology and wood supply. Make results public.
- Ensure logs are sorted for highest-value end-uses under the Association for Sustainable Forestry, woodlot owner groups, or the Nova Forest Alliance.

4.2 Financial support for private land owners

Recommendations

- Ensure that funds are fairly allocated under the *Forest Sustainability Regulations*. The Department of Natural Resources or an independent third party could administer all silvicultural funds and Wood Assistance Plans. This could be accomplished through expanding the mandate of the Association for Sustainable Forestry and increasing the number of the association's offices from one to three (one for each Integrated Resource Management region). Alternatively, a third party could consist of three or four private forest consultants located in each of the three Integrated Resource Management regions. These consultants should have strong people-skills; be forest-educated; experienced in silviculture; and live in, and be familiar with the areas in which they work. They could visit harvest operations, provide education to woodlot owners, and act as an independent voice to guide land owners and industry.
- Uneven-aged management under Category 7 of the *Forest Sustainability Regulations* can be expanded over several categories of treatments and funded to adequately reflect the wider array of treatment and harvest options, possibly requiring the creation of new categories that support uneven-aged management.
- Amend the *Forest Sustainability Regulations* to financially assist with uneven-aged management, while reducing assistance for even-aged practices. Increase the rates paid for uneven-aged management under the regulations' Category 7 to ensure these practices are economically feasible. Some of the funding can come from reduced spending for even-aged treatments, such as by eliminating Category 2 (funding for plantation establishment) and Categories 3 and 4 (funding for herbicides and plantation density control, respectively). Herbicide funding should be phased out slowly since some plantations have been recently established with the assumption that there would be funding for density control, and will need treatment support for a short period of time.

- Provide private land owners with a means to select trusted contractors to carry out silviculture or harvesting on their woodlots. One way may be through management of a website where each contractor could provide photos of work completed and a list of previous client references. The website would offer assurances to some private land owners who would like to have wood harvested or improvements carried out in their woodlots, are unable to do the work themselves, but do not know who to trust to provide the service. This would also assist the forest industry by facilitating contract harvesting of privately owned forests and supplying wood to mills.
- Ensure that silviculture funding for private land provided under the *Forest Sustainability Regulations* is spent on private lands and not on industrial-held lands in a limited company.
- Review whether funding for land owners with more than 2,000 hectares (who are currently excluded under the *Forest Sustainability Regulations*) should receive assistance with uneven-aged management treatments. (Unsustainable forest practices on some of these large land parcels are of concern, and may be assisted under the regulations.)

7.0 LEGAL FRAMEWORK

7.2 Penalties

Recommendations

- Increase measures to dissuade timber theft/illegal harvesting.
- Consider requiring forestry contractors to carry proof of permission from private land owners. Truckers should carry official slips of proof of where the wood was obtained.
- Violations of environmental laws should cause loss of hunting and fishing privileges. Drivers license renewals could be revoked until such time that fines are paid. (There is a lot of noncompliance with regards to paying fines.)

Appendix B: INTEGRATED RESOURCE MANAGEMENT IN NOVA SCOTIA

The Department of Natural Resources has broad responsibilities for a wide range of Crown resources, including timber and forests, wildlife, wildlife reserves, endangered species, fire and pest protection, provincial parks, beaches, and mineral resources. The province is 80 per cent forested, and forestry activities dominate most of the land base (NSDNR, 1999a). As a result, many planning tools and systems have a strong forestry focus.

In the 1990s, Nova Scotia developed an Integrated Resource Management (IRM) process that promotes synergy among the management of multiple values, and encourages the modification of forestry practices for use as efficient tools to meet other management objectives (e.g., conservation, habitat). This has increased management options, reduced conflict, and lessened the mitigation required to sustain sensitive values (NSDNR, 2003).

IRM is a three-tiered (1. strategic, 2. tactical, 3. operational level) planning system led by Department of Natural Resources' IRM teams, which are composed of professional and technical experts from minerals, forests, recreation, wildlife, and parks.

Currently, many of the ecosystem planning tools are completed or sufficiently advanced to be in use. These include:

- Nova Scotia's Ecological Land Classification, which provides the hierarchical ecological framework for planning (Neily, et. al., 2003).
- A forest modeling system capable of tracking multiple values at various spatial and temporal scales.
- Forest Ecosystem Classification guidebooks, which provide site level descriptions of ecotypes, vegetation types, and soil types (Keys, et.al. 2003).
- Policy guidance and regulations.

Other elements of the framework include:

- Natural disturbance regime and potential climax forest interpretations, developed to provide knowledge of pre-European conditions and processes (Neily, et.al, 2006).
- A hierarchical vegetation classification, which is evolving to integrate existing forest and non-forest classifications and inventories.

The **Strategic** planning phase (tier 1) used extensive public consultation to produce a spatial zoning of management priorities, and a comprehensive list of values and objectives from multiple sectors. IRM teams currently rely on these products to assess proposals and plan operations while the other planning levels are developed.

The **Tactical** phase (tier 2) is divided into two stages of landscape level planning: analysis and design.

- Ecological analyses are currently underway in each of the 39 ecodistricts defined in the Ecological Land Classification. These will guide planning on Crown land, and will be provided as a resource for private land managers.
- The design stage for Crown land will employ multi-stakeholder consultation to work with Department of Natural Resources' IRM planning teams. Plans at the tactical level will use a conservation emphasis class zoning to indicate the intensity and type of management activities desired for Crown land.

A Long Range Management Framework is the final outcome of the ecological analyses and design stages that is used as a guide to help make natural resource management decisions on Crown land. There is one Long Range Management Framework written for each ecodistrict.

The **Operational** planning phase (tier 3) will employ the province's forest ecosystem classification to develop ecologically based prescriptions that are compatible with the conservation emphasis class zoning.

Effective resource management policies in Nova Scotia require sharing and co-ordination among the three major ownerships: Crown, large private, and small private. Multi-stakeholder involvement and co-ordinated research and planning is another critical component. Progress on these fronts is occurring with the sharing of ecological tools and classifications, and the growing influence of environmental certification programs. This has been further enhanced by the emergence of partnership organizations, such as the Nova Forest Alliance (Canadian Model Forest Network & Forest Communities Program) in central Nova Scotia; Mersey Tobeatic Research Institute and associated Southwest Nova Biosphere Research Association in western Nova Scotia; and the Collaborative Environmental Protection Initiative in eastern Nova Scotia. Many other community partnerships have also developed and will play an important role in the future development of IRM.

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