



State of the Forest

Report 1995-2005

Nova Scotia Forests in Transition

Prepared by
Nova Scotia Department of Natural Resources

Report FOR 2008-3


NOVA SCOTIA
Natural Resources

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Jorg Beyeler
Director, Forestry Division

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A Message from the Minister

As Minister responsible for Natural Resources, I am pleased to release to the public the first State of the Forest Report which was mandated to be completed for the 10-year period ending in 2005. This report is a compilation of forest and forestry information that is collected by the department to monitor and report on the changing condition of Nova Scotia's forests. This report is the result of consistent work by department staff to monitor activities in the forest, natural changes in the forest, and the impacts of policy and legislative requirements.

Significant to Nova Scotia forests in the past 10 years was the robust economy for forest products on international markets until the Canadian dollar significantly strengthened towards 2005. All sectors of the forest industry, including small woodlot owners, benefitted from the strong markets, particularly for softwood lumber. Nova Scotia has also made great strides in ecological management planning systems for Crown and private lands. The decade will also be known for the significant improvement in constructive dialogue among diverse forest interest stakeholders to advance sustainable forest management in Nova Scotia. The Nova Forest Alliance partnership has played an effective role to breakdown many of the communication barriers among the diverse stakeholders with interest in Nova Scotia forests. Two major events, the discovery of the Brown Spruce Longhorn Beetle and Hurricane Juan, have both been devastating to Halifax and the forests of central Nova Scotia during this decade.

The State of the Forest Report attempts to describe the general condition of our forest today, what events, natural or man-made, that have affected Nova Scotia's forests throughout the decade, scientific advances that have been implemented, legislative changes and their impacts, and measures that are attempting to conserve our biodiversity legacy into the future. It provides vital information to interested stakeholders and all Nova Scotians about a resource that covers nearly 80 per cent of our province.

With the many transitions that are described in this report, I am hopeful that Nova Scotia is moving in a positive direction to create a healthy, productive, and diverse forest environment for our future generations.

Therefore, I urge Nova Scotians to read the report, particularly in light of the upcoming public consultations to develop a new forest strategy for the province, and to express their views in this important process to direct our future efforts to improve Nova Scotia forests.

David Morse

David M. Morse, Minister

Executive Summary

Forestry and forests in Nova Scotia have experienced a considerable transition from 1995 to 2005. With the rapidly increasing demand for softwood forest products and the termination of the federal-provincial silviculture funding agreements in 1995, long-term wood supply sustainability was the major issue of the time. Those concerns resulted in the strategy elements outlined in the department white paper titled *Towards Sustainable Forestry*. During the period ending in 2005, many of the elements of the strategy were implemented, including the amendments to the Forests Act and the enactment of the Registration and Statistical Return Regulations, the Forest Sustainability Regulations, the Wildlife Habitat and Watercourses Protection Regulations, the Code of Forest Practice principles, and the establishment of a Forest Technical Advisory Committee.

These initiatives have reaffirmed a private land silviculture program implemented by the forestry sector that will achieve long-term wood supply requirements. In addition, all harvest operations in forests have requirements to protect watercourses and leave specific features to support wildlife.

The transition to implement these new requirements have taken time, but are now firmly in place on all forest lands in the province.

The forest industry sector enjoyed strong economic conditions during the 10-year period. Increasing export demand and higher product prices resulted in positive growth in the forest products sector, record wood harvests, and higher stumpage prices to landowners. Silviculture programs, now linked to the annual harvest occurring, also increased to record levels, exceeding 40 000 hectares per year in the last four years.

Results of forest inventory data are showing that forest area has increased 4 per cent to 4.275 million hectares, annual forest growth including all removals increased marginally, and total merchantable wood volumes exceeds 400 million cubic metres in Nova Scotia. Forest age determinations have shown a reduction in area of forests older than 60 years during the period.

This period can also be characterized by a significant transition towards ecosystem-based forest management in Nova Scotia. Ecological land classification systems and management guides have been developed to initiate the process. Integrated resource management planning is creating the shift to ecosystem-based management on Crown lands. Public and environmental pressures have been effective in creating a slow transition to implementing selection management for uneven-aged forest management, particularly on private lands. The demand for and implementation of forest certification by the industrial forest sector has also resulted in a greater requirement to conduct ecosystem-based forest management on industrial lands.

All these developments have coincided with increased dialogue among the many varied and sometimes opposing stakeholders with interests in Nova Scotia forests. A significant

contributor to the improved multi-stakeholder dialogue process has been the Nova Forest Alliance Model forest partnership, since its inception in 1997.

Two events that had a major impact on Nova Scotia forests during the period were Hurricane Juan in 2003 and the discovery of the brown spruce longhorn beetle in 1999. Hurricane Juan has been the most devastating climate disturbance in many decades and severely damaged forests in a 600 000 hectare area in central Nova Scotia. The impact of the brown spruce longhorn beetle relates more to the possible future threat if not contained to the Halifax region or eradicated altogether. Quarantine and containment measures by the Canadian Food Inspection Agency have restricted harvests and wood flows in the affected beetle-zone area.

The issue of climate change and future adaptation requirements started to emerge during the period. A national initiative to model Canada's future carbon emission status was completed and determined that Nova Scotia's forests currently store 1.6 million tonnes of carbon per year more than it emits into the atmosphere.

This initial state of the forest report has attempted to document the most significant changes that have occurred in Nova Scotia forests between 1995 and 2005, and also to establish some baseline parameters to measure progress made in future status reports.

Forests Update: 1995–2005

Forests and activities in forests are constantly changing, and 1995 to 2005 was a period of dramatic developments in Nova Scotia. This summary highlights some of the key initiatives that have affected our forests from a management, growth, and production perspective. Developments in new planning process and regulations during the period are also described.

Towards Sustainable Forestry, 1997–2005

Following several years of development and consultations, the government adopted a Forest Strategy in 1997 that outlined the priorities for action over the next five years. As a result of the Forest Strategy, the department enacted an amended Forest Act in 2000 and created three new regulations: the Registration and Statistical Returns Regulations, the Forest Sustainability Regulations, and the Wildlife Habitat and Watercourses Protection Regulations. The department also established a Forest Technical Advisory Committee to assist the Minister in meeting the targets of the Forest Strategy.

The department has also completed the first stage of a comprehensive Forest Code of Practice. It released the principles document in 2004, “A Framework for Implementing Sustainable Forest Management in Nova Scotia,” and is currently developing the guideline section of the Code of Forest Practice. A harvest site registration system was not acted upon and the last element, State of the Forest Reporting, is realized with this document.

Regulated Silviculture Programs on Private Lands

Providing assistance and incentives to encourage forest management on small private wood lots had been a government priority for many years. With the end of a 20-year period of co-operative federal-provincial programs of wood lot management funding in 1995 and with increased pressure of wood demand from the forest products industry, the department amended the Forests Act and implemented the Forest Sustainability Regulations requiring a silviculture program on private lands. The regulations came into effect in 2000 and required silviculture to be conducted according to the annual wood usage from private lands. Since implementation, the regulations have achieved 100 per cent compliance and exceeded the requirements on both the industrial and small private forest lands.

Establishment of a Nova Scotia Model Forest

In 1997, a multi-stakeholder Nova Scotia steering committee applied for and was successful in the establishment of the Nova Forest Alliance organization in Phase II of the CFS Model Forest program. The Model Forest is located between Halifax and Truro with an office in Stewiacke, and has operated successfully for eight years promoting,

developing, and researching sustainable forest management for Nova Scotia. A diverse partnership of over 40 stakeholders has worked together successfully to

- complete research projects, best management practices, and ecological classifications systems
- hold conferences and workshops
- create demonstration areas, surveys, and many avenues for multi-stakeholders dialogue across Nova Scotia

Changes to Hardwood Usage in Nova Scotia

During the late 1990s, annual hardwood use expanded from less than 400 000 cubic metres to more than 800 000 cubic metres range in five years. The harvest remained at almost 900 000 cubic metres for five years and dropped to 660 000 cubic metres in 2005. Most of the increase was attributed to pulp chip products for export from Nova Scotia. At the same time mill capacities to saw high quality hardwood logs were expanded to make use of higher volumes of logs generated from hardwood harvests.

The dramatic increase of fossil fuel prices in the last five years has increased demand for local firewood and generated much discussion about expanding commercial power and heat generation beyond current waste biomass energy production.

Strong demand and tight supply of high quality hardwood has led to a renewed interest in managing for the tolerant hardwood species such as sugar maple, yellow birch, white ash, and red oak. To facilitate this need, the Forest Sustainability Regulation implemented a requirement to conduct silviculture for hardwoods at a rate of \$0.60 per cubic metre of hardwood harvested in Nova Scotia. This requirement has resulted in the completion of almost \$3 million of silviculture activity in hardwood management since 2000.

Establishment of Wilderness Areas

The process to establish a network of protected wilderness areas on Crown land started in the early 1990s by the Department of Natural Resources (DNR) and culminated in the proclamation of the Wilderness Areas Protection Act in 1998. Under the act, 31 areas of outstanding and natural wild spaces were established on Crown land across the province. This commitment protects approximately 295 000 hectares, which comprises about 20 per cent of Crown land and 5 per cent of all Nova Scotia.

The Wilderness Areas are managed by the Department of Environment and Labour in partnership with the Department of Natural Resources and through agreement with other organizations. Currently, management plans are being developed for the designated Wilderness Areas.

Since the establishment of the original Wilderness Areas, two new sites have been created at Gully Lake and Eigg Mountain.

New Regulations Protecting Wildlife Habitat and Watercourses

In January 2002, the province enacted regulations to protect watercourses and habitat features for wildlife during forestry operations. The regulations apply to all lands, Crown and private, and have three major requirements: leaving buffer strips along watercourses, leaving legacy trees in clumps, and leaving coarse woody debris in all types of forest harvesting and management activities. Before these regulations, these habitat features had only been required on Crown land.

The implementation of these regulations has significantly changed harvest practices on private lands and, while compliance has been challenging for small private landowners, the results of these changes will improve the ecological and environmental condition of Nova Scotia forests.

Establishing Ecosystem-based Forest Planning Systems

In Nova Scotia, an ecosystem-based approach is being incorporated within the Integrated Resource Management (IRM) planning framework for all natural resources and values on Crown lands. This planning system is currently under development for all Crown lands in Nova Scotia. The Ecological Land Classification (ELC) and the Forest Ecosystem Classification (FEC) are two tools that have been developed for the purpose of implementing ecosystem-based management in Nova Scotia. The ELC enables planners to frame land-use for resource management within the context of the larger forest landscape. The FEC provides managers the information they need to incorporate stand-level ecological values when managing forest resources. Over the long term, ecosystem-based management will consider non-timber and timber benefits along with other social and economic benefits, while incorporating the best available scientific and traditional knowledge. Applying the ecosystem-based approach will be accomplished on Crown lands through the implementation of the IRM plans according to the Code of Forest Practice.

Implementing Mandatory Reporting of Annual Wood Harvesting in Nova Scotia

The department has been tabulating annual primary forest products usage from Nova Scotia forests for many decades from a voluntary survey. Concerns about the long-term sustainability of the forest resource resulted in the enactment of the Registration and Statistical Returns Regulations in 2000. These regulations now require all buyers and exporters of Nova Scotia primary forest products to register annually and report all wood being harvested from Nova Scotia forests. Since enactment, compliance in meeting the requirements of the regulation has exceeded 95 per cent, and the department continues to publish an annual report of forest products usage with much greater confidence than in the past.

Hurricane Juan and the Brown Spruce Longhorn Beetle

The province's forests have experienced two major events that have had a significant impact over the last 10 years. In 1999 the brown spruce longhorn beetle was detected at Point Pleasant Park in Halifax. This introduced insect has been found to cause mortality in red spruce as well as other spruce species. A concentrated effort has been undertaken by the Canadian Food Inspection Agency (CFIA) and the department to contain and eradicate this introduced pest. The second major event to strike the province was Hurricane Juan in late September 2003.

Hurricane Juan severely damaged a 600 000 hectare area that included Halifax, Truro, and the central counties of Nova Scotia. In addition to extensive property damage, the forests of the hurricane-damage zone also suffered significant blowdown damage and losses. For two years following the hurricane there has been an intensive effort to salvage downed and damaged timber before mortality rendered the wood un-useable. It has been estimated that in excess of two million cubic metres of wood was damaged and most since harvested.

Major Changes to the Forest Industry in Nova Scotia

During the last 10 years a major shift continued to change the forest industry sector from primarily a pulpwood market to a studwood and log market that produces wood chips for the pulp and paper sector. This meant upgrades and expansions to many sawmill operations in the province to process small diameter logs, with pulp grade wood chips becoming a major secondary product from most mills. In addition, demand for other by-products such as bark, sawdust, and shavings also increased and changed wood waste from a cost for disposal to a revenue source for sawmills. Production of lumber products have expanded over the last 10 years from 353 million foot board measure (fbm) to 751 million fbm. At the same time the number of sawmill businesses have dropped from 322 in 1995 to 235 in 2005. There has been a major shift to larger mills with very high tech and efficient production facilities to compete in the global lumber markets.

Implementing Forest Certification Systems in Nova Scotia

The move towards independent certification of forest lands in Nova Scotia expanded rapidly during the last 10 years. Three certification systems — Canadian Standards Association (CSA), Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC) — are being considered and attained by various forest companies, landowner organizations, and individual landowners. Forest certification has become the new imperative to meet changing demands of large global purchasers of forest products, to achieve recognition of sustainable forest practices, and to practice sound environmental management of forest land.

Larger forest companies such as Bowater, J.D.Irving, Neenah, StoraEnso, Louisiana Pacific, and Group Savoie have opted for the American SFI system. StoraEnso has also

been certified by CSA and is pursuing the FSC designation.

Woodlot owner groups are either working towards FSC certification or participating in the development of the Pan-Canadian Standard for acceptance by the other three systems.

Various individual woodlots including the Pictou Landing Reserve lands have become FSC certified in the past few years.



Land Use

The total area of Nova Scotia including land and water is estimated at 5.53 million hectares (ha) or 13.6 million acres. Of the 5.53 million hectares approximately 607 810 hectares are covered by fresh water and wetlands. This area does not include Bras D'or Lake which is about 107 200 hectares. As indicated in Table 1, 4.3 million hectares is classed as being forested, or 77 per cent of the total. Forest land includes area covered in trees, abandoned fields that have regenerated as forest, or areas with trees visible on aerial photography. Forest land also includes harvested areas that are regenerating or for which there is no sign of conversion to non-forest use such as agriculture or urban development. Agriculture land, including blueberry fields, is estimated at approximately 243 000 hectares, one quarter of the 912 000 hectares reported as agricultural land in the 1912 land use survey carried out by Fernow et al.

The total forest land area estimate for Nova Scotia has increased from 4.1 million hectares of 4.275 million hectares since reported in the 1994 Forest Management Strategy report.

TABLE 1 Primary land use from air photo interpretation and satellite imagery, 1994–2002

Land Use	Hectares	Per cent
Forest and Forestry	4 275 000	77
Non-Forest	210 760	4
Agriculture	243 780	4
Water and Wetlands	607 810	11
Urban	143 930	3
Road and Rail	46 083	1
Total	5 527 360	100

The area reported for roads (44 173 ha) and rails (1910 ha) includes standard right-of-way corridors for all paved roads but not loose surface roads. Road and rail right-of-ways (ROW) may include forest land depending on their location. For inventory mapping purposes ROW widths vary from a minimum of 20 metres to a maximum of 100 metres. Rail corridors include active and abandoned lines. The non-forest category listed above includes pipeline routes and electric transmission corridors, barren land such as the Guysborough barrens, gravel pits, beaches, and brush land.

Forest land is not all available for forestry operations due to legislation that has placed restrictions on forest lands for specific purposes. A significant portion of forest land is protected by legislation as provincial parks, federal parks, Special Places, and Wilderness Areas. A large percentage of Crown land also has restrictions on land use where the priority activity is related to wildlife management, recreation, and biological diversity purposes and includes areas such as park reserves, game sanctuaries, and wildlife management areas. Table 2 lists the area of Crown land that has been protected by legislation where no forestry activity can be conducted.

TABLE 2 Partial listing of public land protected areas in Nova Scotia

Protected Area Class	Area (Ha)	% of Total
Provincial Parks	15 380	3
Federal Parks	132 160	30
Wilderness Areas	295 020	67
Total	442 560	100

The total figure of approximately 443 000 hectares of protected Crown land, provincial and federal, represents approximately 26 per cent of the total Crown provincial and federal land area in Nova Scotia and approximately 8 per cent of the total land area in Nova Scotia. These percentages for protected land are considered minimum values because other land on Crown and private is reserved by policy and not by legislation.



Forest Land Ownership

The majority of Nova Scotia's land and water is privately owned due in part to land grants made to encourage settlement during the 18th and 19th centuries. Since 1990 the province has re-acquired approximately 350 000 hectares of land to bring the total Crown holdings to approximately 1.5 million hectares or 28 per cent of the total (Table 3). This figure does not include land owned by municipalities across the province. Over 50 per cent of the land in Nova Scotia is owned by small private landowners, which includes parcels of 2000 hectares or less (Table 3, Figure 1). The industrial land category refers to industrial forest use where the land is managed for forestry purposes by large industrial forest companies. Federal land, the majority of which is held in the two national parks, comprises 3 per cent of the total land and water area.

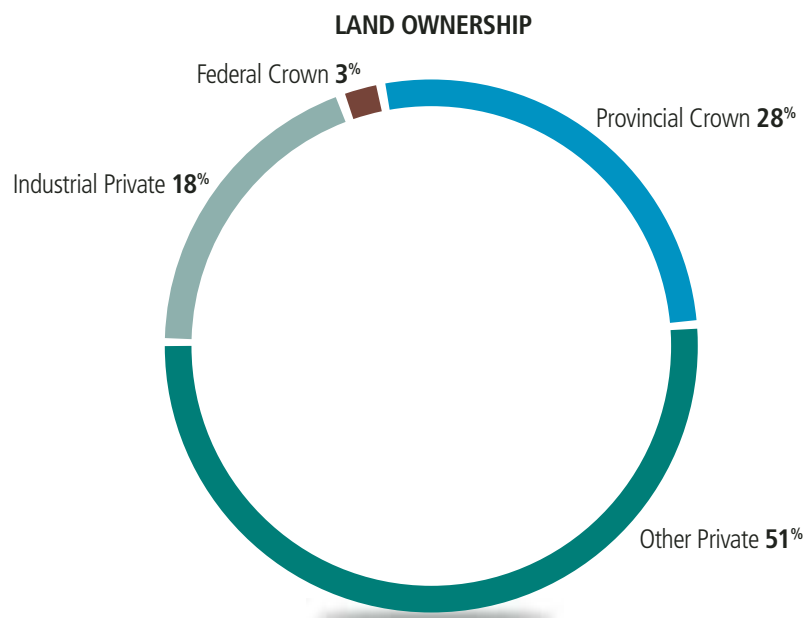
TABLE 3 Land and water ownership category

Owner Category	Area (Ha)	% of Total
Provincial Crown	1 530 340	28
Federal Crown ¹	156 240	3
Industrial Private	980 270	18
Small Private ²	2 860 510	51
Total	5 527 360	100

1. Includes First Nations Lands

2. Includes municipal government lands and un-granted lands

FIGURE 1 Land ownership in Nova Scotia



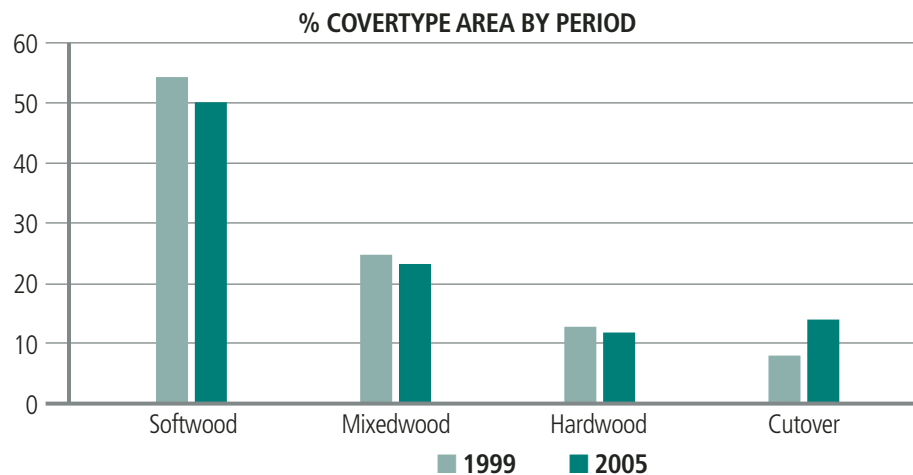
Forest Composition and Growth

The forests of Nova Scotia contain a diverse mix of species growing over a broad range of soil and climate conditions. From shallow, acidic moist soils at high elevations to deep, well-drained rich soils in valleys, populations of trees find and optimize their growth to many types of conditions. A stand of trees may be described by a grouping of uniform species with similar attributes. These stands are uniquely identified by delineating them on a map or photograph. They can then be described many ways; for example, in terms of species, height, age, density, or even history. DNR has two main data sources for describing the forest composition in Nova Scotia. First, aerial photographs are used by interpreters to delineate all the forest stands and accurately define area. They also estimate other attributes like the major species and average height. A second data source comes from measurements collected at permanent sample plots (PSPs) in the forest. Forest technicians can accurately record information like individual tree species, ages, product, and height along with other attributes such as woody vegetation species and non-timber variables such as drainage and coarse woody debris. Combined, these two systems provide valuable information to describe the composition of Nova Scotia's forests.

Forest Coverture

The forest coverture for Nova Scotia is determined using the aerial photo interpretation process that updates the changes to the forest from new photos on a 10-year cycle. Over the past 5 years, the softwood coverture component has dropped from 54 per cent to 50 per cent, and regenerating harvest areas have increased from 8 per cent to 14 per cent (Figure 2). Mixedwood and hardwood coverture components have remained relatively unchanged (Figure 2).

FIGURE 2 Change in Nova Scotia forest coverture using aerial photo interpretation, 1999–2005



Forest Merchantable Volume

The merchantable volume of Nova Scotia forests is determined using a spatial database compiled from interpretation of province-wide Aerial Photos (GIS) and independently from a network of 3200 permanent sample plots (PSP). Results for total volumes between the two methods for 1998 and 1999 are very similar (Table 4). Total merchantable volume increased by 2.6 per cent resulting from a 16 per cent increase in hardwood merchantable volume and a 3.3 per cent decrease in softwood volume over the five-year period (Table 4).

TABLE 4 Nova Scotia softwood and hardwood merchantable volume in thousand cubic metres computed by two methods

Species Type	GIS - 1999	PSP - 1998	PSP - 2003
Hardwood	121 399	121 574	141 062
Softwood	271 931	272 404	263 351
Total	393 330	393 978	404 413

Forest Growth

The change in merchantable volume of Nova Scotia's forests is shown in Table 5. Four values — accretion, ingrowth, mortality, and harvest — were measured in 1995 and again in 2005 to calculate the difference between growth and removals. Growth includes accretion, which measures new growth of existing trees, and ingrowth, which measures new trees that have become merchantable during the period. Removals includes mortality and harvest.

Table 5 summarizes the growth and removal in Nova Scotia's forests over the last 10 years. Softwood removals were 4 per cent higher than growth, while hardwood volumes increased 32 per cent compared to removals during the past 10 years (Table 5).

TABLE 5 Change in merchantable volume of Nova Scotia's forests in m³/ha/yr, 1995–2005

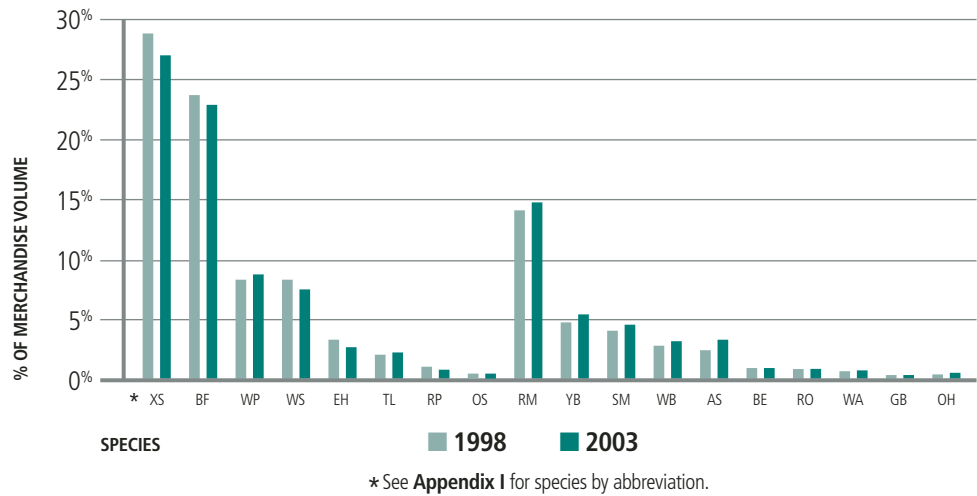
Provincial	Accretion	Ingrowth	Mortality	Harvest	Growth	Removal	Net
Softwood	1.84	0.19	0.86	1.24	2.03	2.10	-0.08
Hardwood	0.78	0.06	0.25	0.31	0.84	0.56	0.27
Both	2.62	0.25	1.11	1.56	2.87	2.67	0.20

Species Composition

Figure 3 presents the percentage of major softwood species and hardwood species in 1998 versus 2003. The bar chart illustrates that hardwood is increasing, with all major hardwood species gaining since 1998, while softwood is decreasing, led primarily by spruce, balsam fir, and eastern hemlock. Other softwoods, like white pine and larch, are

increasing. Good demand and prices for softwood lumber resulted in increased harvests of spruce and fir species on many private lands until 2005.

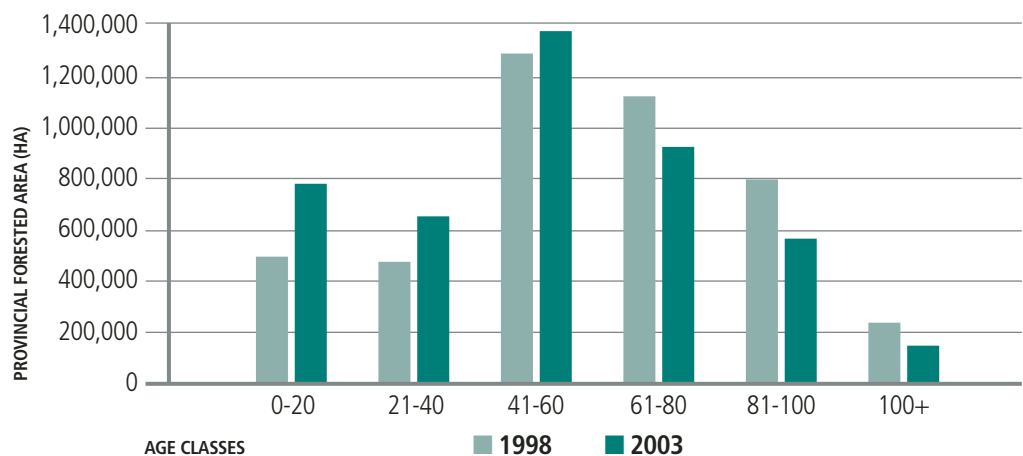
FIGURE 3 Change in percentage merchantable volume by species during last five years



Forest Age

Between 1998 and 2003 there was a trend of decreasing forest area over 60 years old (Figure 4). Forest area in the younger age classes, particularly 0–20 and 21–40 years, were increasing across Nova Scotia (Figure 4). Increased harvesting on private land during this period resulted in many older stands being replaced by young natural stands and plantations.

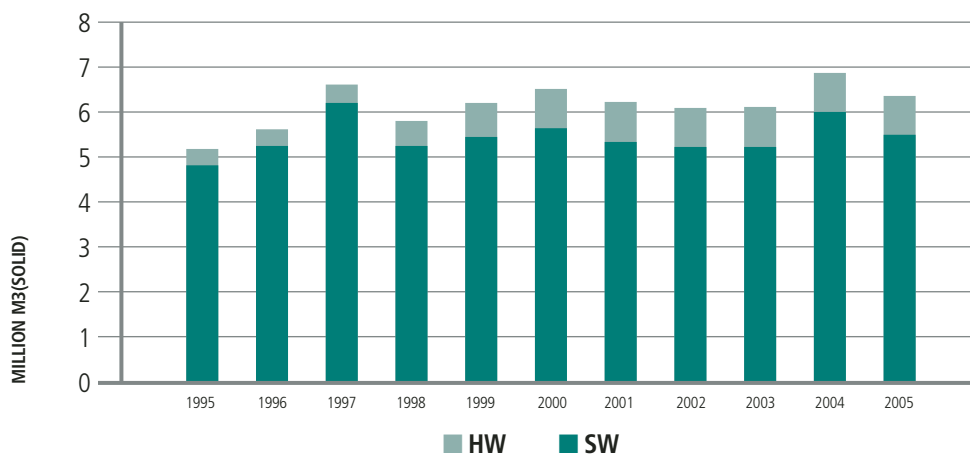
FIGURE 4 Change in forest age class from 1998 to 2003 using PSP data



Harvest and Wood Supply, 1995–2005

During the 10-year period, harvest of primary forest products from Nova Scotia's forests can be described by two trends. For the first 5 years, total harvest increased from approximately 5 million cubic metres to over 6 million cubic metres (Figure 6). Since 2000, the harvest has remained at a level of approximately 6 million cubic metres, except for 2004, when the salvage from the effects of Hurricane Juan occurred. Hurricane Juan increased the total harvest in 2004 by approximately 800 000 cubic metres to a record of 6.9 million cubic metres. The harvest of softwood products remained consistently above 5 million cubic metres per year except for 1995. The harvest increased approximately 20 per cent during this 10-year period (Table 6).

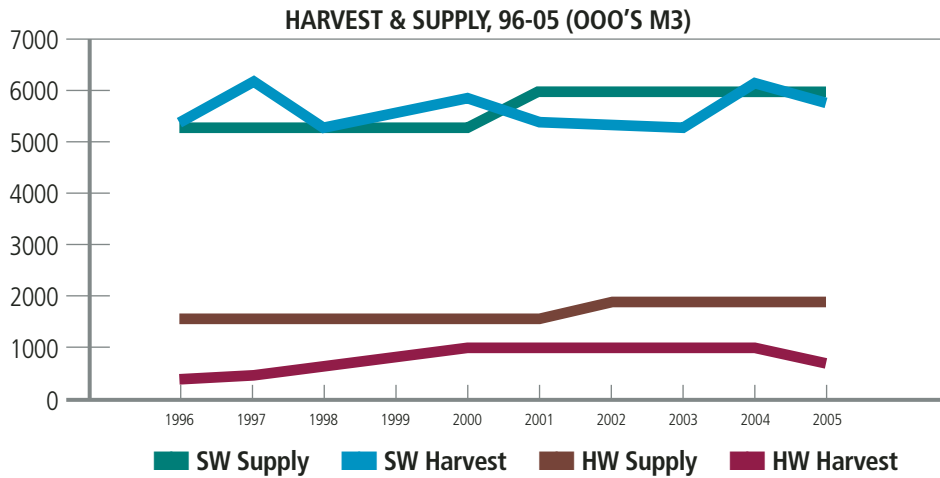
FIGURE 6 Primary forest product acquired in Nova Scotia



Harvest statistics have been collected by government since the 1930s, but most recently by the Registration and Statistical Returns Regulation under the Forest Act and reported annually by the department. The 2005 report indicates that 5.6 million cubic metres of softwood and 660 000 cubic metres of hardwood were acquired during the 2005 calendar year. Hardwood harvest levels increased dramatically from 348 000 cubic metres in 1995 to almost 900 000 cubic metres from 1999 to 2004 (Figure 6). This can be attributed primarily to an increase in demand from the export market for hardwood chips.

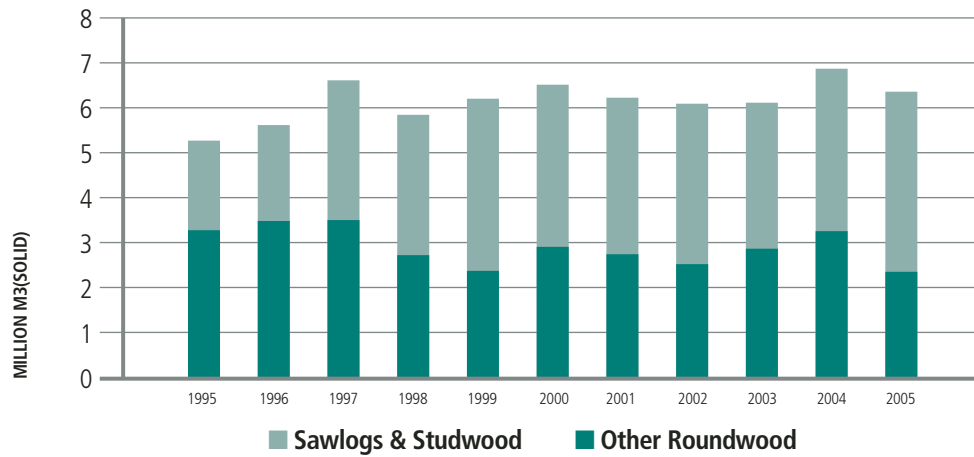
During the past 10 years, 99 per cent of the available softwood supply was harvested from all land tenures. In 3 of the 10 years, the harvest exceeded the supply, but overall the harvest remained within sustainable limits for the period (Figure 7). The harvest demand for hardwood over the same period was 45 per cent of the forecasted sustainable supply, and remained consistently well below the annual growth of the hardwood resource (Figure 7). The main issue with hardwood, not reflected in the harvest-supply result shown in Figure 7, was the difficulty in meeting sawmill demand for quality hardwood sawtimber during the period. A large portion of the hardwood supply not utilized consisted of low-quality pulp grade volumes.

FIGURE 7 Comparison of Nova Scotia softwood and hardwood harvest and sustainable wood supply levels, 1996–2005



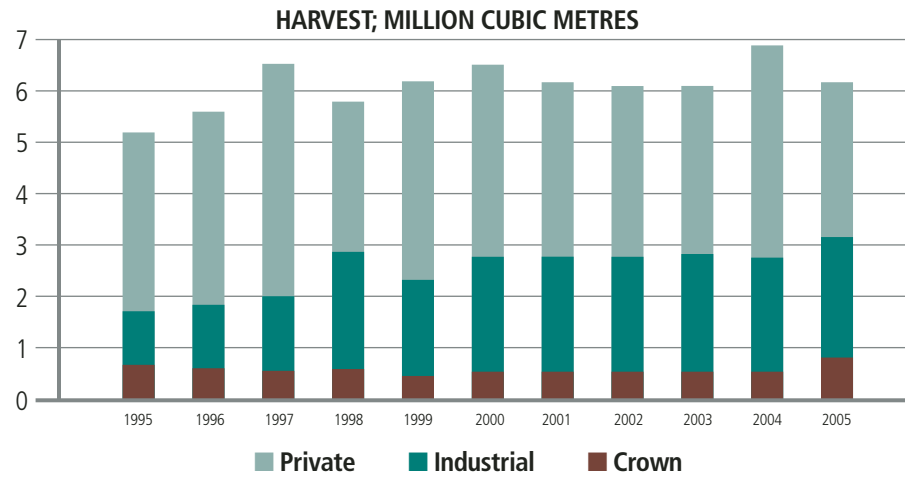
During the period, there was a consistent shift from harvesting for pulpwood to harvesting studwood and sawlog roundwood volumes (Figure 8). Most wood harvested now goes to sawmills, where it is sorted by product to obtain the best value. Pulpwood chips and other residues are then shipped to pulp mills and other users such as heat and energy generating facilities.

FIGURE 8 Primary forest product acquired by product, 1995–2005



By 2005 more than 60 per cent of the harvest consisted of sawlogs and studwood compared to about 40 per cent of the harvest in 1995 (Figure 8). During the past 10 years, a change is also occurring in the origin of harvest from private land sectors. Harvest from small private lands has been declining and being replaced by wood from industrial lands (Figure 9). Harvesting on Crown lands remained steady at approximately 10 per cent of the total Nova Scotia harvest except for 2005 where it increased to 13 per cent (Figure 9).

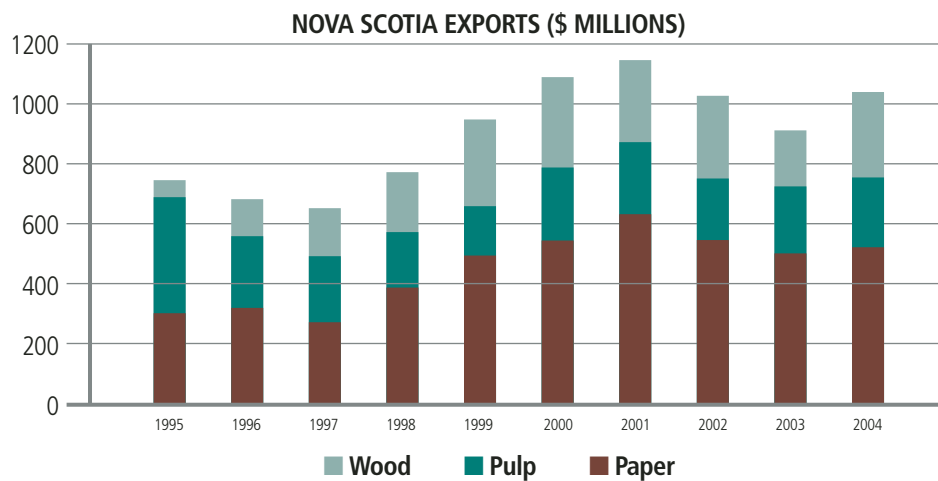
FIGURE 9 Primary forest product acquired by ownership class, 1995-2005



Economic Value of Forest Industry

The value of the forest products industry to the Nova Scotia economy increased during the period 1995 to 2005. As shown by the value of key exports (Figure 10), most of the increase occurred in the first five years and remained quite steady until 2004. The contribution of the forest industry to the Nova Scotia economy remains very significant with the total impact of \$700 million to the provincial GDP, providing employment to approximately 11,000 people employed and generating exports exceeding \$1 billion or 17 per cent of Nova Scotia export trade. However, towards the end of the period the sector was experiencing slower growth due to the difficulty in the global forest products industry.

FIGURE 10 International exports of forest products from Nova Scotia, 1995–2004 (\$millions)(Source; The Economic Impact of the Nova Scotia Forest Industry, APEC, 2005)



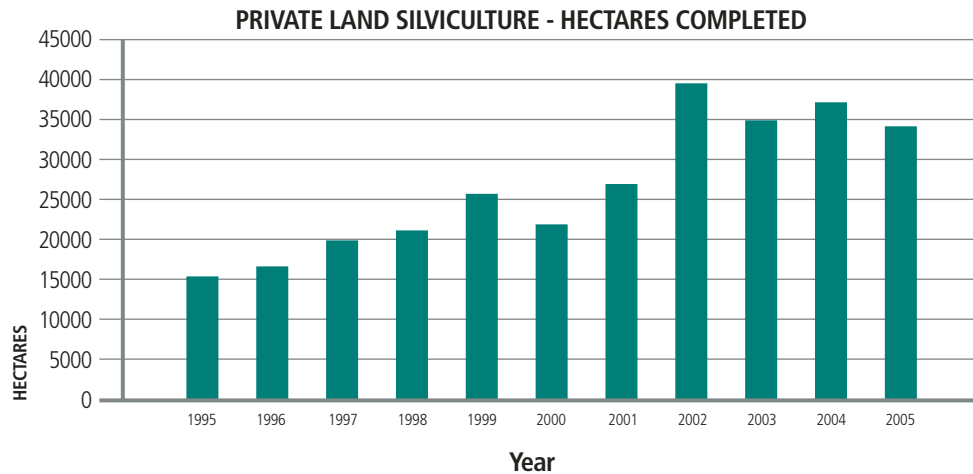
Important changes occurred during the decade, including the expansion in lumber production, the completion of the Super-Calender paper mill at StoraEnso in Port Hawkesbury, and increased exports of hardwood pulpwood and chips. The softwood lumber dispute created a significant trade issue with the United States throughout the decade and was still not resolved by the end of 2005.

Private Land Forest Management

There was a considerable change to private land silviculture programs from 1995 to 2000. Federal-provincial funding agreements for private woodlot silviculture came to an end in 1995, and from 1995 to 1999, DNR funded and administered a \$3 million private woodlot silviculture program. In addition, during that period several large companies — StoraEnso, Bowater, MacTara, Freeman, and Ledwidge Lumber — initiated their own private woodlot silviculture programs in conjunction with Sustainability Agreements with DNR.

Since the Forest Sustainability Regulations were enacted in 2000, silviculture on private lands is now required according to the wood harvested annually from small private and industrial lands. During the first five years of the regulations, silviculture has been conducted primarily through Registered Buyer administered programs. The Registered Buyer silviculture treatments that occurred on small private woodlots were partially funded through Sustainability Agreements with DNR. Additional private woodlot silviculture was completed by the Association of Sustainable Forestry through funding contracts with DNR. Silviculture treatments are also being conducted independently by contractors and landowners to be sold to potential buyers for credit under the regulations.

FIGURE 11 Private land silviculture area completed from 1995 to 2005



A total of 172 278 hectares of completed silviculture has been submitted through the regulatory program in the past five years (Figure 11). Silviculture on private lands prior to the regulations averaged 20 000 hectares per year compared to 34 000 hectares per year from 2000 to 2005 (Table 6).

Silviculture activity was predominantly focused on even-aged management for softwoods at 98 per cent, with 2 per cent conducted in uneven-aged management in both softwood and hardwood stands (Table 6). Silviculture activity on private lands in Nova Scotia continues to be focused on plantation management at 73.1 per cent with 25.4 per cent in natural stand management (Table 6). Commercial thinning is being conducted in both natural and plantation stands.

TABLE 6 Completed silviculture on private land by treatment category in 2005

Category	Silviculture Treatment	Completed Area (ha) 2005	Per cent of Total Area
1	Natural Regeneration Establishment	3 042	8.7
2	Established Plantation	10 585	30.3
3	Early Competition Control	11 318	32.4
4	Density Control & Release Plantation	3 653	10.4
5	Density Control & Release Natural	5 067	14.5
6	Commercial Thinning	515	1.5
7	Forest Quality Improvement	759	2.2
Total Area		34 939	100



Crown Land Forest Management

Crown land area has been increasing in the last 10 years and now totals 1 530 340 hectares or 28 per cent of Nova Scotia. The mandate and responsibilities of the Department of Natural Resources is very broad, and Crown land resource management is undergoing a significant change with the development and gradual implementation of Integrated Resource Management (IRM).

The department defines IRM as “a planning and decision-making process that involves the coordination of resource management policies, programs, and activities so that long-term sustainable benefits are optimized and conflicts among resource users are minimized.” The department has completed the strategic level process and is now working to develop Long Range Management Frameworks and tactical plans for each of the province’s 39 ecodistricts.

Forestry activities are conducted within the context of the IRM process and legal agreements for forest products harvesting and forest management. During the past five years, there were 26 formal agreements in place for a total annual timber allocation for harvest of 1 100 000 cubic metres per year (Table 7). Actual harvest from Crown lands in the past five years averaged 605 000 cubic metres, or 55 per cent of annual harvest allocations (Table 7). Crown land annual harvest of wood products averaged 10 per cent of provincial harvest from 28 per cent of the total provincial forest landbase.

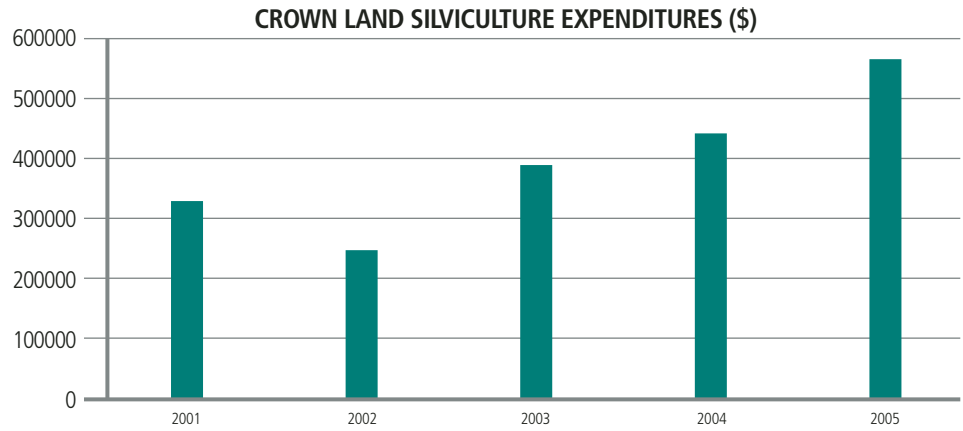
TABLE 7 Summary of annual allocation by agreements and actual harvest, 2001–2005

Agreement Description	Agreement Type	No. Of Agreements	AAC (m ³)	Mean Annual Harvest (m ³)
Forest Utilization	Volume	24	250 000	103 000
Licence & Management	Area Based	2	850 000	502 000
Total		26	1 100 000	605 000

Annual stumpage revenue received for wood harvested from Crown lands during the period 2001–05, averaged five million dollars with a mean of \$8.25 per cubic metre from all roundwood products.

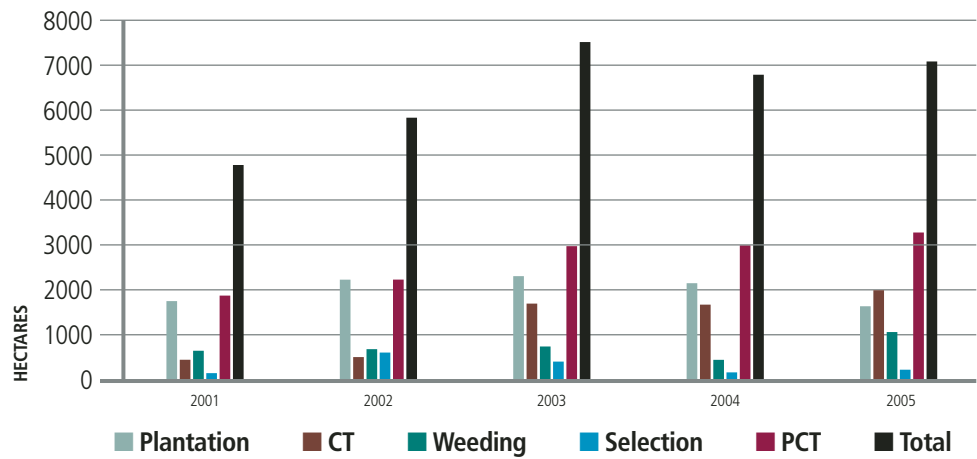
Silviculture work is completed on Crown lands by Crown licensees with harvesting arrangements and by contracts awarded through the public tender process. Funding for the silviculture treatments are through appropriations from the legislature and the Crown Land Silviculture Fund. Silviculture expenditures on Crown land have increased approximately 75 per cent in the past five years (Figure 12).

FIGURE 12 Summary of Crown land silviculture expenditures, 2001–2005



The area of silviculture treatment peaked at 7500 hectares in 2003, and increased 52 per cent from 2001 to 2005 (Figure 13).

FIGURE 13 Summary of silviculture treatment area conducted on Crown lands, 2001–2005



Forest Strategy

In 1993, the Department of Natural Resources began developing the current forest strategy. The Coalition of Forest Interests was convened by then Minister of Natural Resources, Don Downe, with representation from a variety of organizations with a connection to forestry. This committee concluded in 1996, with a report and recommendations to government, titled *A New Forest Strategy for Nova Scotia: Discussion Paper*.

In 1997, the Department of Natural Resources released a discussion paper, *Towards Sustainable Forestry*. The elements of the current forest strategy were drawn from this discussion paper and input received through the public review process. There were five main accomplishments:

- **Forest Technical Advisory Committee**

The Forest Technical Advisory Committee is made up of various stakeholders to provide ongoing technical advice and recommendations on matters of concern to the Nova Scotia Department of Natural Resources. Topics are related to the implementation of the province's forest strategy, issues related to forest management and silviculture, and reporting related information to the public and clients.

- **Registry Of Buyers**

The Registry of Buyers was established in 1998 under the Registration and Statistical Returns Regulations. The Registry of Buyers is a registry of individuals and businesses that acquire primary forest products for processing into secondary products, export, sale as firewood, or production of energy. Registered Buyers are required to report all wood usage from within and into Nova Scotia on an annual basis.

- **Forest Sustainability Regulation**

The Forest Sustainability Regulations were enacted in 2000 and revised in 2001 and 2004. They require certain Registered Buyers, based on their annual volume of wood acquired, to undertake silviculture work on private land. Registered Buyers have three options to fulfil their silviculture requirements: conduct a silviculture program, contribute to the Sustainable Forestry Fund in lieu of a program, or a combination of both.

- **Wildlife Habitat and Watercourses Protection Regulation**

These regulations were enacted in 2002 and require all forestry operations to follow minimum mandatory standards to maintain special management zones adjacent to streams, rivers, and lakes and to retain wildlife habitat within harvested areas.

- **Code of Forest Practice**

A framework document for Nova Scotia's Code of Forest Practice has been completed. This document presents the principles that will set the course for a forest management

approach that will conserve natural forest biodiversity and enable the sustainable utilization of forest resources including timber.

Detailed guidebooks and technical manuals are currently being developed. These documents will provide direction and practical guidance for the sustainable management of a range of forest uses and values.

The Code of Forest Practice will be mandatory on Crown lands and will be applied within the framework of the Integrated Resource Management planning process at the strategic and local levels. All forest operations on Crown lands will be consistent with the Code of Forest Practice as policy of the Department of Natural Resources.

Voluntary application of the code by private landowners will be encouraged by government through outreach activities. By incorporating the code principles, guidelines, and technical details into their practices, private landowners can make significant contributions to sustainable forest management in Nova Scotia.



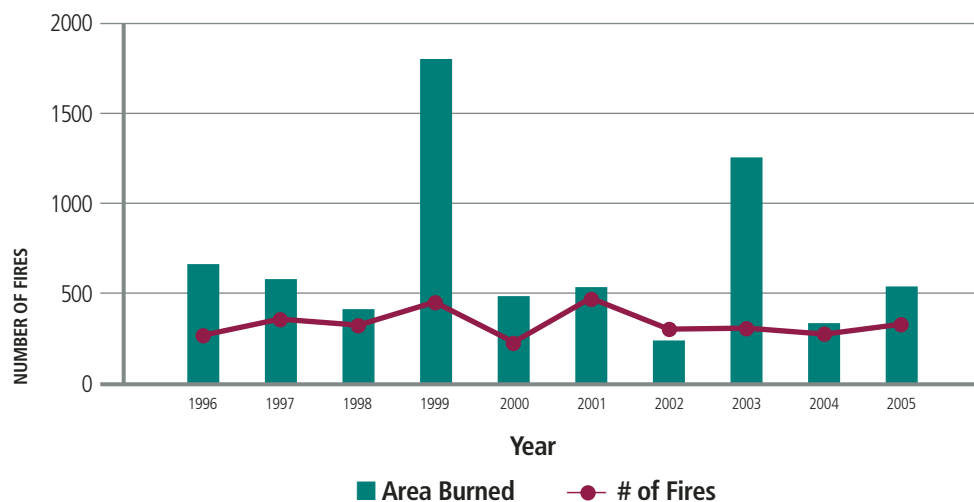
Fire and Pest Management, 1995–2005

Forest Fire Statistics

Forest fires in Nova Scotia during this 10-year period were remarkably consistent in the number of fires and area burned except for 1999 and 2003. Very dry periods in the spring of 1999 and 2003 resulted in larger fires: the Woods Harbour fire burned 810 hectares in 1999 and the Wallace Lake fire burned 759 hectares in 2003. The 10-year average from 1996 to 2005 indicates that there were 325 fires and 673 hectares burned annually with an average of 2 hectares burned per fire occurrence (Figure 14). The past fire season of 2005 had 302 fires with 516 hectares burned. This was the second consecutive year of lower-than-average fires and area burned.

The vast majority of fires in Nova Scotia are caused by humans. Lightning-caused fires are frequently less than 1 per cent of the total number of fires, compared to numbers reaching and sometimes exceeding 50 per cent in central and western Canada

FIGURE 14 Summary of forest fires in Nova Scotia, 1995–2005



Emergence of Fire Science

Although known for its experience, efficiency, and fire suppression success, DNR had little capacity in the fire science and understanding of fire behaviour. Starting in 1996, DNR staff have received extensive fire training to new national standards. In 2005, DNR had 32 staff trained in Advanced Fire Behaviour, 4 Wildfire Behaviour Specialists, and numerous other levels of training that are changing the way we will approach fire in the future. Understanding the way that fire behaves improves fire fighter safety and the allocation of fire resources, and generates new initiatives in mitigation and prevention.

In 1997, the province created its first fire science officer position dedicated to advancing

fire behaviour knowledge and application, including the coordination of provincial initiatives such as a forest fuel classification, and eventually a risk management system.

Forest Insect and Disease Issues

Over the last 10 years, insect issues have continued to emerge and with more complex challenges. Nova Scotia forests have been affected by various insect species that have emerged in recent years to cause significant damage, such as the whitemarked tussock moth, balsam fir sawfly, balsam woolly adelgid, black-headed budworm, and the jack pine budworm. Disease issues have been relatively minor over the same period in Nova Scotia.

Additional related issues have arisen with the occurrence of natural disasters caused by recent ice storms and Hurricane Juan in 2003. These type of events cause stress on forest trees and make them vulnerable to secondary pest infestations. Surveys have picked up the increased emergence of the native spruce beetle in the central part of the province since 2003. The impact of this beetle can also be seen throughout Nova Scotia in older spruce trees.

Invasive Alien Species

Since March 2000, significant provincial and federal resources have also been assigned to the brown spruce longhorned beetle (BSLB), the first find of this invasive alien species in North America. Initial surveys detected the occurrence of the beetle in the Halifax area and as a result the Canadian Food Inspection Agency established a BSLB Quarantine Zone in an attempt to eradicate this invasive pest. The brown spruce longhorned beetle caused significant mortality to healthy but older red spruce trees in Halifax's Point Pleasant Park. One of the major affects of the Quarantine Zone is the restrictions it places on the movement of round wood products out of the zone. This has significant impact for local landowners and sawmills to acquire and process softwood logs from the Halifax region.

Ecological Management Systems in Nova Scotia

During the last 10 years there have been significant developments for implementing ecosystem-based forest management in Nova Scotia. The province has been mapped according to a national ecological land classification framework. The process for classifying all Nova Scotia ecosystems is underway. To date more than 50 per cent of the province's forest types have been completed. Ecological planning tools such as the Ecological Landscape Analysis Procedures guide has been completed and is now being used in the Crown land integrated resource management planning process. The provincial Ecological Land Classification gives a scientific description of the variety of terrestrial ecosystems across the province. This framework enables resource managers and scientists to work with the diverse factors each ecosystem presents.

Mapping the Ecosystems of Nova Scotia

The Ecological Land Classification has five levels. The largest division is the ecozone. Nova Scotia is part of the Acadian Ecozone, as are New Brunswick, Prince Edward Island, parts of the Gaspè Peninsula, and several New England states. These areas share a similar continental climate. Ecozones further subdivide into ecoregions, ecodistricts, ecosections, and ecosites. Climate, topography, landform, soils, vegetation, nutrient and moisture regimes, as well as site (aspect, steepness, slope position) have been used to distinguish between the various units of the classification. Each level of the classification provides additional detail about the ecosystem.

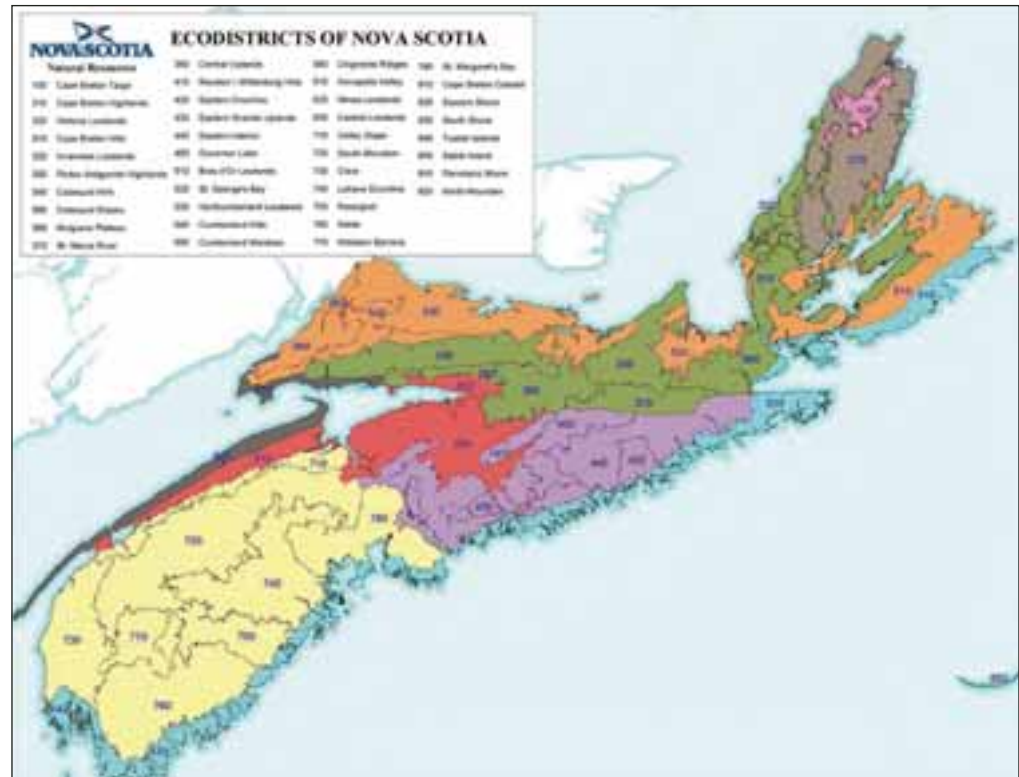
Ecoregions describe climate as it is influenced by topography and elevation or proximity to the Atlantic Ocean. Nova Scotia is classified into nine ecoregions (Figure 15).

FIGURE 15 Forest ecoregions of Nova Scotia



Ecodistricts describe areas within the ecoregion of similar physiography. Upland versus lowland, landform, and local climate are the key attributes to determine ecodistrict boundaries. Nova Scotia has 39 ecodistricts (Figure 16).

FIGURE 16 Forest ecodistricts of Nova Scotia



Ecosections and Ecosites

Ecosections and ecosites describe the enduring features of the ecosystem, such as topography, landform, soil drainage, and soil texture. These ecosystems are very repetitive across the landscape and create the mosaic of forests that are recognized as one travels throughout the province. The smallest ecosystem is the ecosite and refers to factors such as vegetation, the amount of moisture and nutrients in the soil, the position of the site on a slope, and the direction the slope faces. The ecosection component of the ELC has also been completed and are described for each ecodistrict. The ecosite layer is currently under development and will be mapped and fully described in the near future.

Classifying the Forest Ecosystems of Nova Scotia

The Forest Ecosystem Classification for Nova Scotia is currently under development. Four ecoregions in the central region occurring in the Nova Forest Alliance model forest area have been completed and are available in field guide format. It is a tool to manage the smallest forest ecosystem, the stand. The size of a stand depends upon the event that creates it, such as fire, infestation, hurricane, or harvesting. The Forest Ecosystem Classification gives the resource manager information about the site, soil moisture, soil

nutrients, and tree and understory plant species. The site-specific classification of these smaller units will guide the management decisions at the stand level. The forest manager and woodlot owner then has an opportunity to develop site-specific forest and wildlife management measures using the ecosystem guide.

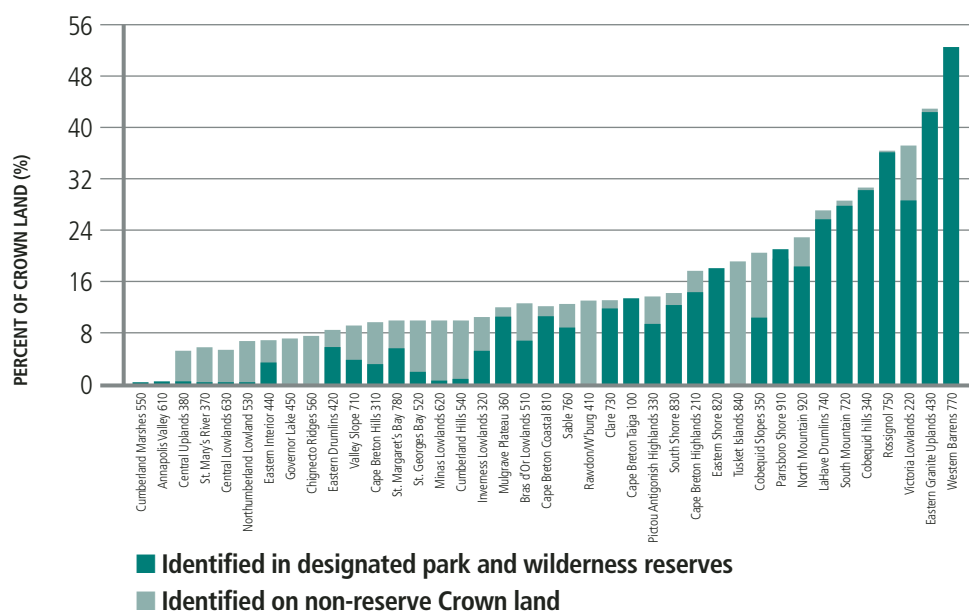
For further information on the Ecological Land Classification, see the Department of Natural Resources website at www.gov.ns.ca/natr/forestry/.



Old Forest Policy on Crown Lands

Old forests play a critical role in sustaining bio-diversity. Nova Scotia introduced an Interim Old Forest Policy in 1999 to protect and restore old growth forest on a minimum of 8 per cent of the publicly owned productive forest land in each of the province's 39 ecodistricts (NSDNR, 1999). Since that time, NSDNR's Regional Services personnel have identified significant Crown land areas as the best remaining old growth forests and old forest restoration opportunities. They include high quality old stands that represent the variety of climax forest types found on Crown land, and consist of larger tracts of old forest that have interior conditions and are better able to withstand occasional disturbances.

FIGURE 17 Percentage of Crown land identified in each ecodistrict under the Interim Old Forest Policy



Progress to Date

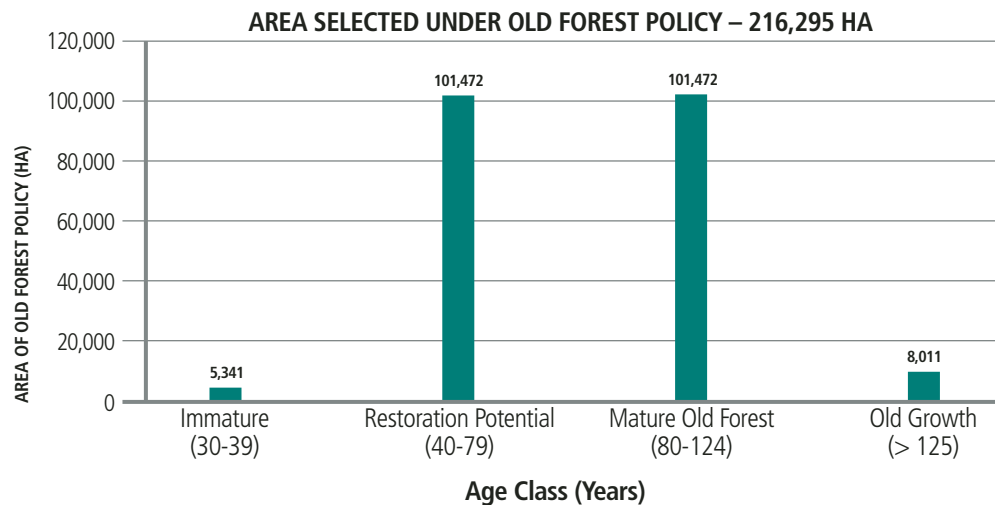
The policy gives priority to identifying old growth and restoration opportunities within existing protected lands. Analysis has identified that Nova Scotia's existing parks and protected areas currently hold approximately 177 000 hectares of suitable old forest, allowing 19 of the 39 ecodistricts to meet the policy target of 8 per cent of productive Crown forest. Selections on non-reserve Crown land are targeted to capture existing old growth, and fill gaps in meeting the 8 per cent target by adding additional forests with good restoration potential. To date 39 665 hectares of forest have been identified on non-reserve Crown land, bringing the number of ecodistricts meeting the 8 per cent target to 32 of 39 (Figure 17). Provincially, 16 per cent of productive Crown forests (216 295 hectares) have now been identified under the policy. Seven ecodistricts are still short, and collectively require the identification of an additional 4250 hectares to meet the 8 per cent target. Seven of these have had significant areas of old forest identified

and are close to the target levels (5 to 7 per cent). However, the Annapolis Valley and Cumberland Marshes present the biggest challenges, as both are dominated by non-forest landscapes with very limited old forest restoration opportunities on Crown land.

Age of Selected Forests

An assessment of the quality of the selected old forest is ongoing, and includes use of the GIS and PSP inventory systems, as well as field assessment and old forest scoring. The inventory indicates that approximately 8000 hectares of the area selected is “old growth” (>125 years old), with an average age of 146 years (Figure 18). Approximately half of the area selected (101 472 hectares) is at a “mature old forest” stage of development (≥80 years old), with an average age of 97 years. Most of this should be in the “transition stage” of succession that precedes old growth, and thus should be developing important structural characteristics associated with old growth, such as large trees, snags, coarse woody debris, and understory growth. The remaining forest selected under the policy is primarily between 40 and 79 years old, with an average age of 64. This forest will provide old forest restoration opportunities in the future, but most would not yet be in a “transition stage” of succession. In many cases this less mature forest is intermixed with older stands, which were selected as a group in order to create larger patches of old forest. Despite its younger age, much of this “restoration” age forest will be starting to develop mature forest features that can help contribute connectivity and support interior habitat conditions within patches of old forest stands.

FIGURE 18 Age class distribution of forests selected under DNR Interim Old Forest Policy



Conservation Areas

There were significant achievements towards expanding various types of conservation area initiatives in Nova Scotia throughout the past decade. The Wilderness Protection Act passed in 1998 established 31 wilderness areas on provincial Crown lands. Designation of sites at Gully Lake and Eigg Mountain in 2005 increased the number of wilderness areas on provincial Crown lands to 33 totaling 295 000 hectares (Figure 19).

Other key initiatives included the designation of the Southwest Nova Biosphere Reserve, and Heritage River status for the Shelburne and Margaree Rivers. The department completed a review of existing and proposed provincial wildlife management areas and sanctuaries in 2005, with a commitment to maintain existing as well as establishing eight new areas and enlarging an existing site. Federal and provincial sanctuaries and wildlife management areas (excluding marine waters and overlapping wilderness areas) established with terrestrial and wetland wildlife habitat as a key focus currently cover approximately 32 000 hectares.

Initiatives to establish various types of conservation areas are undertaken by a variety of organizations and partnerships including Ducks Unlimited, Nova Scotia Nature Trust, Nature Conservancy of Canada, Eastern Habitat Joint Venture, and major industrial landowners. Collectively these groups have acquired more than 9300 hectares or hold long-term agreements and easements on more than 5200 hectares of land.

FIGURE 19 Conservation lands in Nova Scotia



Species at Risk

Species at Risk conservation and recovery is an important component of the Biodiversity Program of the Wildlife Division of the Department of Natural Resources. Species at Risk include plants, animals, and other organisms that are at risk of extinction in Nova Scotia. Species listed through the provincial process are protected under the Nova Scotia Endangered Species Act. Species can also be listed through the national process and protected under the federal Species at Risk Act. Once a species has been assessed and legally listed, a recovery team is established to initiate a recovery and conservation plan.

The species that are currently listed as endangered, threatened, and vulnerable in Nova Scotia are listed in Table 9. The latest release of species protected under the Endangered Species Act occurred in 2006 and included the yellow lamp mussel, eastern white cedar, eastern lilaopsis, and prototype quillwort (Table 9).

TABLE 9 Wildlife species protected under the NS Endangered Species Act

	Endangered	Threatened	Vulnerable
Species living in the forest	Marten	Eastern Ribbon Snake	Bicknell's Thrush
	Lynx		White Cedar
	Moose (Mainland)		
	Boreal Felt Lichen		
Species living in stream or lakeside (riparian) areas	Blanding's Turtle	Golden-crest	Sweet Pepperbush
	Pink Coreopsis	Redroot	New Jersey Rush
	Thread-leaved Sundew	Tubercled Spikerush	Long's Bulrush
	Eastern Mountain Avens		Eastern Lilaopsis
	Plymouth Gentian		Prototype Quillwort
	Water Pennywort		Wood Turtle
Species not associated with the forest	Roseate Tern	Peregrine Falcon	
	Piping Plover	Yellow Lamp Mussel	
	Harlequin Duck		
	Atlantic Whitefish		

Non-Timber Forest Values

Nova Scotia forests have many values beyond the harvesting and marketing of timber. Since forests cover approximately 80 per cent of the Nova Scotia landbase, the local population and visitors to the province rely on forests for a diversity of values.

The wide array of non-timber values can be described under the following major categories:

- tourism and recreation services
- environmental and ecosystem services
- education and cultural services
- hunting, fishing, and trapping activities
- non-timber forest products

Tourism and Recreation

The national and provincial parks systems are key to providing a variety of forest-based recreational activities across Nova Scotia. Camping, canoeing, hiking, nature, and eco-tourism activities are enjoyed by park users of all ages.

Over the past 10 years, there has been a tremendous expansion of trails and trail networks across the province. Trails encompass a broad scope of activities and include hiking, walking, biking, and various motorized opportunities. The Department of Natural Resources has acquired 1500 km of abandoned rail corridor to be developed as operational multi-use trail corridors. Many local communities and organizations have created partnerships to create new recreational trails in the last few years. Additional trail development has occurred outside the government rail corridors on both private and Crown lands. All of these initiatives have greatly increased the potential for recreational activities in forested areas.

Environmental and Ecosystem Services

Since 2001, Nova Scotia has required that forested riparian zones be maintained along all watercourses. This has contributed to improving the water quality in all types of watercourses. These forested ecosystems also provide for greater potential to maintain wildlife habitat in riparian areas that are so important for most wildlife species.

Nova Scotia has placed increased emphasis on establishing a more representative network of protected areas, ecological reserves, and other types of nature reserves in this period. This has created a higher potential to maintain and improve complex natural biodiversity. Improving biodiversity is an important environmental necessity for the continued existence of Nova Scotia's natural forested ecosystems.

Our first measurement and analysis to determine whether forests sequester carbon dioxide, CO₂, from the atmosphere and thus contribute to the mitigation of greenhouse gases occurred in this period. The analysis concluded that Nova Scotia forests sequestered an average of 1.6 million tonnes of carbon from the atmosphere per year.

Education and Cultural Services

Nova Scotia has a number of educational sites that provide opportunities for school children and the general public to learn about forests, forest-based activities, and Nova Scotia's forest history.

The institutions are operated by government, local communities, industry, non-profit organizations and interested citizens. Some examples of sites are shown in Table 10.

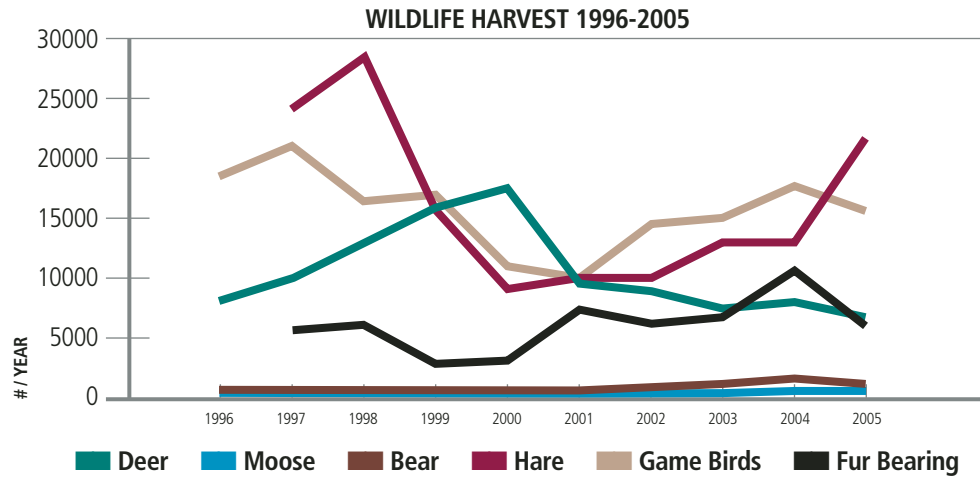
TABLE 10 Educational and cultural sites in Nova Scotia that contribute to forest-related educational opportunities

Site Name	Location	Organization	Specialty	Participants/year
Natural Resources Education Centre	Middle Musquodoboit	NSDNR	Forest resource education programs	5,000+
Shubenacadie Wildlife Park	Shubenacadie	NSDNR	Wildlife programs & park	100,000+
Greenwing Legacy Centre	Shubenacadie	Ducks Unlimited & NSDNR	Wetland programs & exhibits	same as above
Two Rivers Wildlife Park	Mira River, Cape Breton Co.	Two Rivers Development Authority	Wildlife exhibits	32,000+/-
Parks for People Program	Various park locations	NSDNR	Multiple topics	25,000+/-
Upper Clements Wildlife Park	Upper Clements, Annapolis Co.	Hanse Society	Wildlife exhibits	No data

Hunting and Trapping

The rural forested landscape has historically and to the present day been used for recreational, commercial, and cultural harvesting of wildlife by many Nova Scotians and visitors alike. Wildlife harvesting statistics for the last 10 years show some interesting trends correlated to animal population abundance. Deer harvest peaked in 2000 at 17,179 and has declined since to less than half by 2005 (Figure 20). Statistics indicate that bear harvests have been increasing in the last 10 years with a peak of 842 in 2004 (Figure 20). A significant trend in trapping results during the last 10 years has been the doubling of coyote harvest in 2003 to 2005, which combined with consistent trends for other species, has resulted in an upward trend towards the end of the decade (Figure 20).

FIGURE 20 Hunting and trapping results in Nova Scotia for the major wildlife species, 1996–2005



Non-Timber Forest Products

Forests produce a variety of products that do not support the primary forest products industry. The most valuable of non-timber products are generated by the Christmas tree industry and include trees, wreaths, and other products for the export and domestic markets with an annual retail and wholesale value of \$10,000,000+/year.

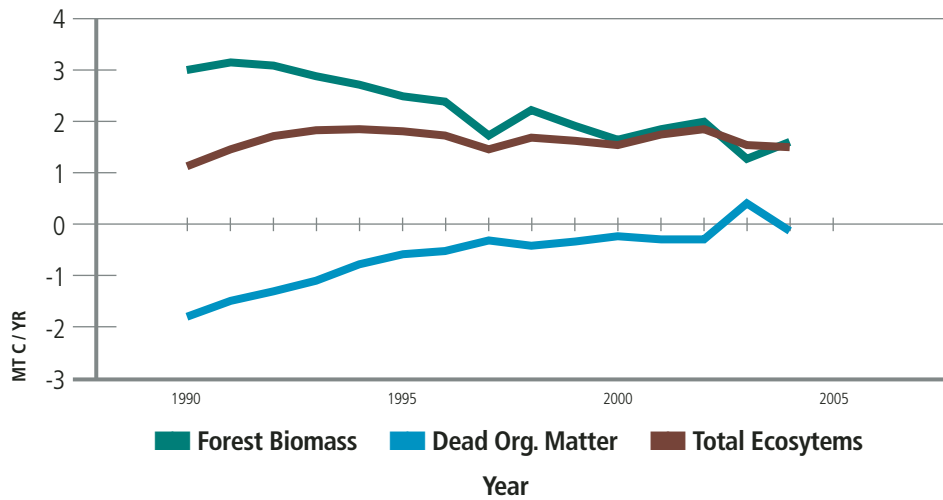
The production of maple sugar products is also of significant importance with an approximate annual production of 140 000 litres with a wholesale value of \$700,000 from Nova Scotia.

Other products that have experienced some harvest potential from the forest in the past 10 years are ground hemlock for bio-medical purposes, materials for crafting industry, medicinal plants, wild fruits and mushrooms, and others. The monetary value of this segment of forest harvesting is difficult to quantify, but trends indicate that interest in diversification of niche products is increasing.

Carbon Balance of Nova Scotia Forests

A recently completed analysis by the Canadian Forest Service has indicated that for the period 1990 to 2004, the carbon balance in Nova Scotia forests is showing a positive mean annual change of 1.6 million tonnes of carbon being removed from the atmosphere and captured in the forest environment. The current balance indicates that Nova Scotia forests are a sink of carbon rather than a source (Figure 21). The slight negative trend in ecosystem carbon is caused primarily by the current level of harvest and natural disturbances such as fire and the damage from Hurricane Juan.

FIGURE 21 Net annual change in forest ecosystem carbon in Nova Scotia, 1990–2004



Appendix I

Tree Species by Abbreviation

Softwoods

XS	Red & Black Spruce combined
BF	Balsam Fir
WP	White Pine
EH	Eastern Hemlock
TL	Eastern Larch - Tamarack
RP	Red Pine
OS	Other softwood, various species

Hardwoods

RM	Red Maple
YB	Yellow Birch
SM	Sugar Maple
WB	White Birch
AS	Trembling & Large Tooth Aspen
BE	American Beech
RO	Red Oak
WA	White Ash
GB	Grey Birch
OH	Other hardwood, various species

