



Forest sustainability in the province of Nova Scotia, Canada

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Project No.: 130373

November 2018

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1. Introduction

The combustion of wood for energy purpose is not considered to contribute to the augmentation of greenhouse gases concentration in the atmosphere, as long as the CO₂ emissions released during the combustion of wood are balanced by the growth of new trees. It is therefore essential to investigate if the forests in the region where the wood used for energy purpose are managed in a sustainable way, avoiding resources associated with overexploitation of forests, land use change, depletion of carbon stocks, etc...

In this framework, literature research was carried out to produce a summary of forest management in Nova Scotia, including general condition, management and sustainability assessment.

2. Nova Scotia forests overview

2.1. Location and distribution

Nova Scotia is the second-smallest province in Canada with an area of 55 500 km². The mainland of the province is a peninsula surrounded by the Atlantic Ocean. The Cape Breton Island, a large island north-east of the mainland, is also part of the province, as well as the small Sable Island. Nova Scotia has three regional municipalities (Halifax and Queens) and 18 counties.

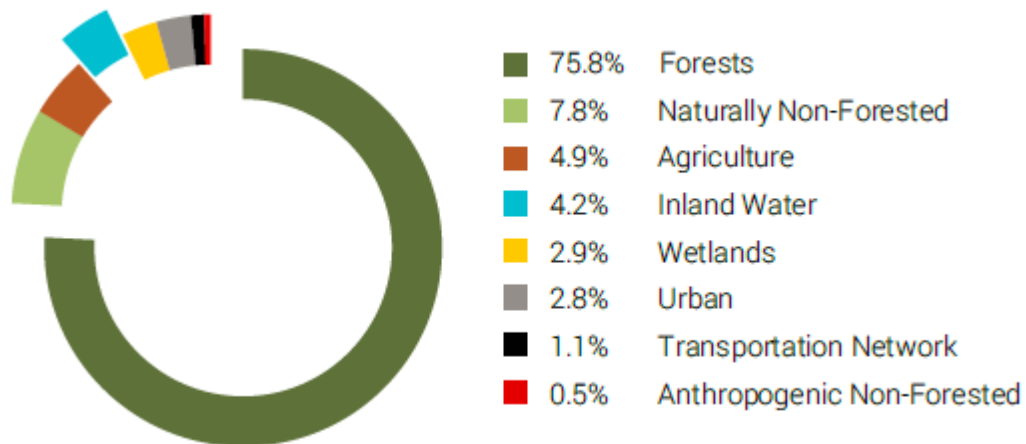
Figure 1 : General maps of Nova Scotia



Source: <http://geology.com>

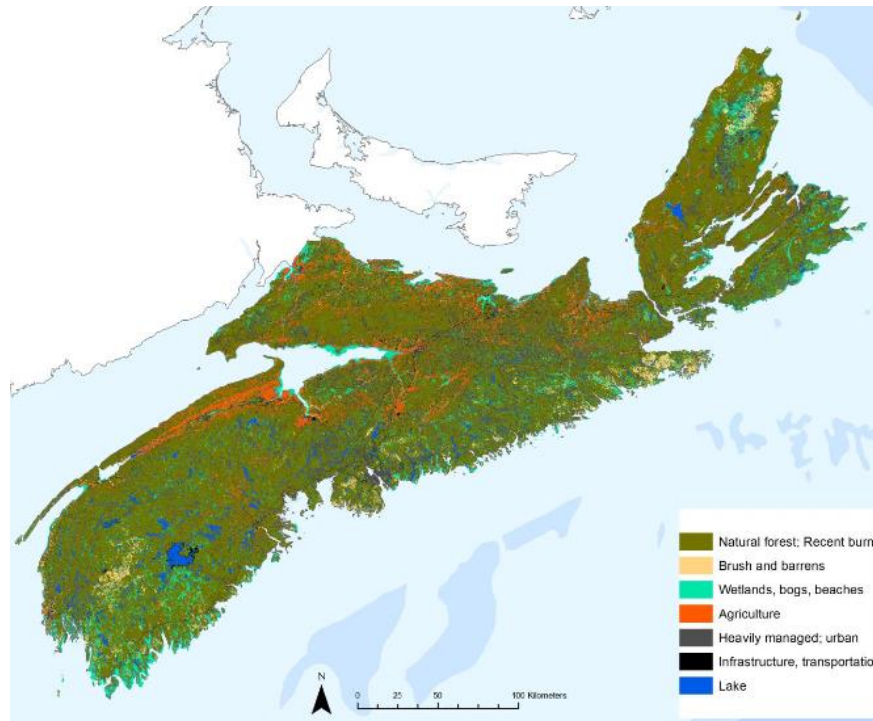
As we can see on Figure 2, the majority of Nova Scotia's mainland is forested. Most of the non-forested areas are water bodies, barrens, agricultural lands, urban areas and infrastructures.

Figure 2 : Land Cover types of Nova Scotia



Source : State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017).

Figure 3 presents the generalized land cover of Nova Scotia and the Figure 4 presents only the natural forest distribution in Nova Scotia.

Figure 3 : Generalized land cover in Nova Scotia

Source: The Inclusive Wealth of Nova Scotia's Protected Areas, A Preliminary Estimate of Nature's Benefits. Peter Lee, Ryan Cheng, Matt Hanneman. 2013

Figure 4 : Natural forest distribution in Nova Scotia

Source: The Inclusive Wealth of Nova Scotia's Protected Areas, A Preliminary Estimate of Nature's Benefits. Peter Lee, Ryan Cheng, Matt Hanneman. 2013

2.2. Ecological zones

This province has about 40.000 kilometers of coastline. The highest point in Nova Scotia is at White Hill Lake in Victoria County with 532 meters above sea level. Nova Scotia receives an average of more than 1400 mm of rain annually¹. Most of the province receives about 230 cm of snow, and considerable winter precipitation comes in the form of rain or ice storms. Many storms can occur and there are in average more storms in this place than in other parts of Canada. The average temperature in January, the coldest month, is generally about -4°C near the coast and somewhat colder toward the interior. The average temperature in July, the hottest month, is about 18°C in the interior and about 16°C near the shore².

Table 1 : Average variation of temperature during seasons

| <i>Season</i> | <i>Month</i> | <i>Temperature (°C)</i> |
|---------------|-------------------------------|-------------------------|
| Spring | Mid-March to late April | 0 - 10 |
| | Late April to mid-June | 10 - 20 |
| Summer | Mid June to mid-September | 20 - 25 |
| Autumn | Mid-September to mid-November | 10 - 20 |
| | Mid November to mid-December | 0 - 10 |
| Winter | Mid December to mid-March | -15 - 0 |

Source : <http://www.novascotia.com/about-nova-scotia/weather>

Nova Scotia has generally cool winters and hot summers and persistent falls. Several factors influence the climate. Three lakes surround the province: the Atlantic Ocean, the Gulf of St. Lawrence / Northumberland Strait and the Bay of Fundy. These three areas have their own properties (hot and cold water) and their reactions with the seasons (the amplitude variations of the water temperature). Due to the ocean's moderating effect, this is the warmest province in Canada. Nova Scotia is also the place where ocean currents converge i.e. the cold Labrador Current and the warm Gulf Stream. Furthermore, climate is also influenced by the movement of the air and topography. With distance from the sea, we have local weather conditions that create many micro-climates³. However, the weather conditions can be categorized into four physiographic regions (Figure 5).

From an ecological point of view, the province of Nova Scotia is in the Atlantic Maritime Ecozone. A high proportion of forests cover this ecozone (approximately 75%) which is divided into three distinct regions: Boreal, Great Lakes-St. Lawrence, and Acadian. All three regions are interlaced with

¹ <http://www.currentresults.com/Weather/Canada/Nova-Scotia>

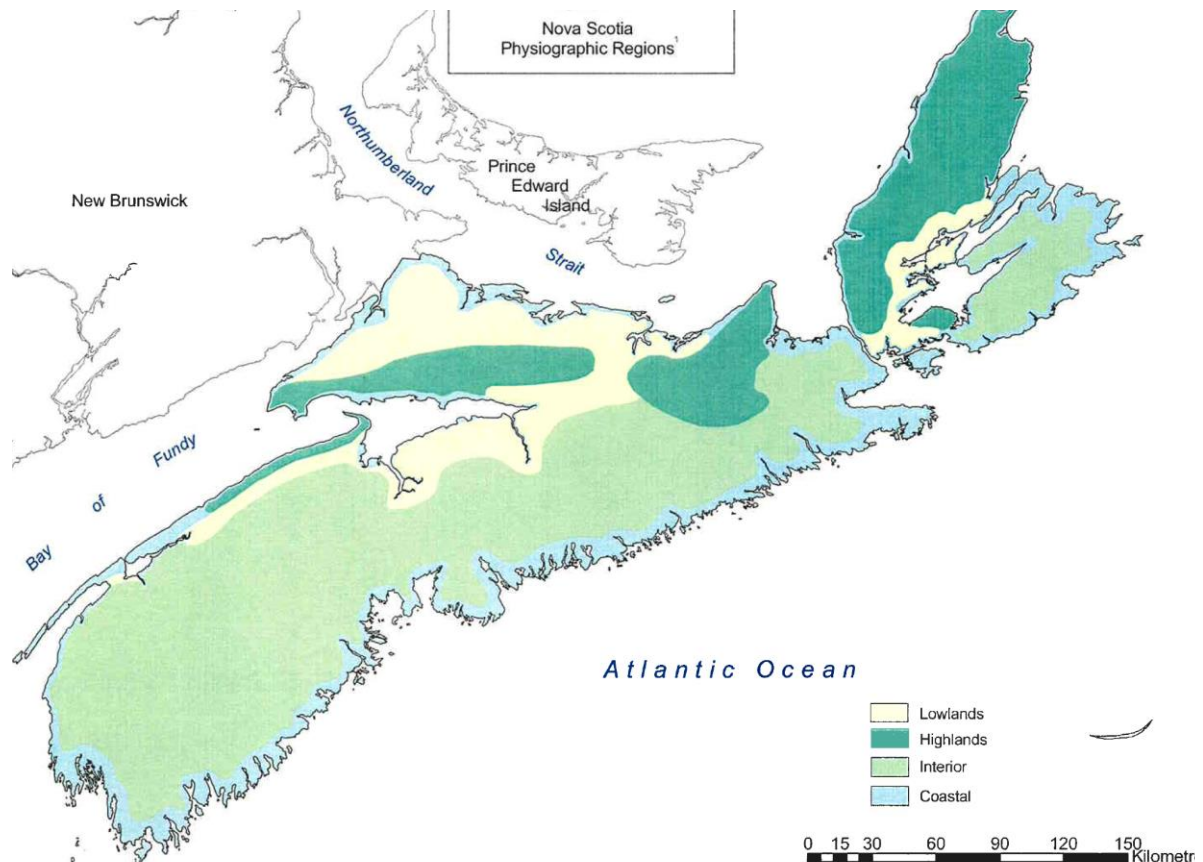
² *Natural History of Nova Scotia, Vol. 1: Topics and Habitats*. Nova Scotia's Climate, page 97 to 103

³ Gouvernement of Nova Scotia. 2005. Adapting to a changing climate in Nova Scotia: vulnerability assessment and adaptation options.

numerous lakes and wetlands⁴. All of Nova Scotia is within the Acadian Forest. This region is characterized by a mixture of coniferous and deciduous species.

Nova Scotia can be also divided into several ecoregions (Figure 6) which have their own characteristics⁵. These characteristics are summarized in the Table 2. The ecoregions are also subdivided into 39 ecodistricts along the province which are areas with similar physiographic pattern (upland, lowland, local climate etc.).

Figure 5 : Physiographic regions of Nova Scotia

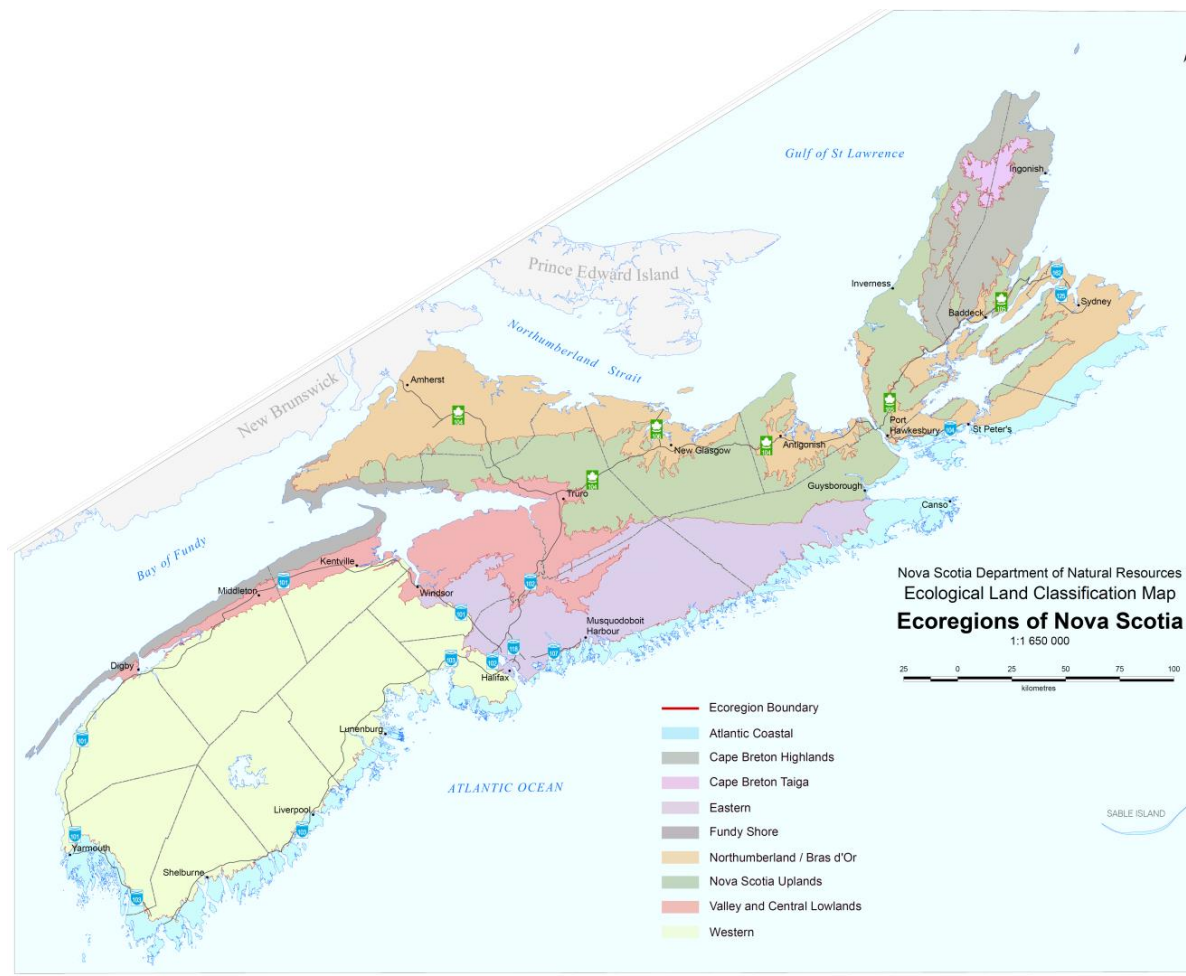


Source: Government of Nova Scotia. 2005. Adapting to a changing climate in Nova Scotia: vulnerability assessment and adaptation options

⁴ <http://ecozones.ca/english/zone/AtlanticMaritime/plants.html>

⁵ Source : Neily, Peter D., E. Quigley, L. Benjamin, B. Stewart, T. Duke. 2003. Ecological land classification for Nova Scotia: Volume 1 - Mapping Nova Scotia's terrestrial ecosystems. Nova Scotia Department of Natural Resources, Renewable Resources Branch, April 2003, Report

Figure 6 : Ecoregions of Nova Scotia



Source : http://www.novascotia.ca/natr/forestry/ecological/pdf/ELC_Map.pdf

Table 2 : Main characteristics of each ecoregion

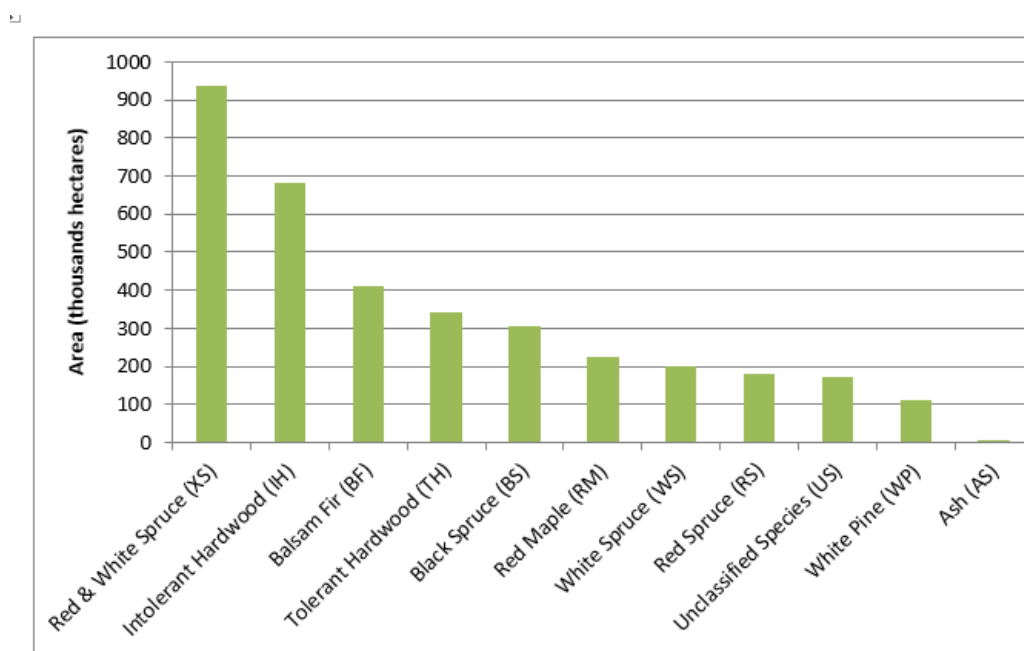
| Ecoregions | Topography | Land area | Climate | Vegetation | Land use |
|------------------------------|--|--|---|---|---|
| Cape Breton Taiga | - Highest elevation in NS, most of region exceeds 425 m (max. 532m) | - Bogs are moss bogs with low plants and sedges - High annual precipitation climate as well as natural disturbances (e.g., windstorms and insects) shape the forest ecosystem in the region | - One of the coldest and wettest areas in NS - Short growing season and constant wind | - Expanses of ombrotrophic (cloud - fed) bogs, stunted conifers and exposed bedrock - Wet areas are dominated by black spruce and larch, balsam fir dominates upper slopes - Krummholz stands difficult to pass through | - No history of logging (stunted trees are of little economic importance) |
| Cape Breton Highlands | - Average elevation 300 to 450m but extends to sea level -Mountain terrain | - Ecoregion includes varied topography of lowlands, steep slopes and plateaus | - Similar to the taiga region (cooler temperatures, fog and precipitation) but less "harsh" | - On the plateau, the forest is boreal, dominated by balsam fir followed by white spruce - Wetter areas dominated by birch and black spruce - Tolerant hardwoods as well as mixed woods on slopes | |
| Nova Scotia Uplands | - Elevations of 100-300m (with exception of Inverness Lowlands ecodistrict which is comprised of valley floors of rivers flowing from the uplands to the lowlands) | -Complex region with uplands and lowland with mixed conifer and deciduous forests | - Warm summers Hilly topography – creates microclimatic conditions (sheltered vs. exposed) | - Wind and ice damage are limiting factors affecting tree growth on the Cobequid and Cape Breton hills (stunted forests of beech and sugar maple) - Complex region with uplands and lowlands with mixed conifer and deciduous forests : <ul style="list-style-type: none"> • Sugar maple, beech, red maple and yellow birch dominate hardwood hills • White spruce, red spruce, and balsam fir form mixed woods with the above listed hardwoods on some valleys and slopes • Hemlock commonly in ravines • Red spruce, balsam fir, white pine and hemlock are common in areas with a hummocky terrain (Mulgrave Plateau, St. Mary's River and Central Uplands) • Black spruce and eastern larch occur on poorly drained soils • Also large areas of barrens caused by repeated burning | |
| Eastern | - Highest elevation is 220m | - South sloping upland interior in eastern NS - Consists of rolling till plains, drumlin fields, extensive rockland, wetlands and several freshwater lakes (eastern interior ecodistrict) | - Removed from the immediate climatic influence of the Atlantic and thus characterized by relatively warmer summers | - Predominantly coniferous forests with red and black spruce occupying most sites - Also scattered stands of hemlock, white pine and black spruce, and tolerant hardwood dominated by yellow birch and sugar maple are found in areas where conditions are appropriate | |

| | | | | | |
|--|---|--|---|--|--|
| Northumberland Bras d'Or Lowlands | <ul style="list-style-type: none"> - Most of ecoregion is low - lying; elevations 25 -50m | Sheltered lowland in northern NS | <ul style="list-style-type: none"> - Variable climate (warmer along Northumberland strait than Bras d'Or) - Climate moderated by proximity to warm bodies of salt water | <ul style="list-style-type: none"> - Coniferous, deciduous and mixed forests - Black spruce forests throughout the region (large areas of poorly drained soils) - Also tolerant hardwoods and mixed stands of red spruce, hemlock, sugar maple, yellow birch and beech (particularly on slopes vs. black spruce in the lowland areas) - Soil moisture deficits in some parts result in fire tolerant species like Jack Pine (e.g., Cumberland County) | |
| Valley and Central Lowlands | <ul style="list-style-type: none"> - Elevation seldom more than 50m - Gently rolling topography | <ul style="list-style-type: none"> - Includes Annapolis Valley and watersheds of the Minas Basin and Musquodoboit Valley - Extensive bogs (exceeding 400 ha) in Hants County - Wildfires = dominant natural disturbance (but reduced since European settlement) | Ecoregion Lowlands sheltered from coastal climatic influences with warmer summer temperatures and milder winters than elsewhere in the province | <ul style="list-style-type: none"> - Wide range of forest species associations occur throughout the region - Overall (mainly because of poorly drained soils) black spruce and red maple predominate - Tolerant hardwood on ridges and upper slopes (sugar maple, yellow birch and beech) but these stands also include trees typical of wetter sites creating mixed woods - Lowland fire sites red oak, red maple, red pine, jack pine, grey birch and black spruce | - Much is farmed and land reclamation along shores with the use of dykes |
| Western | <ul style="list-style-type: none"> - Elevations from 289 to 25 m (along Atlantic coast) | <ul style="list-style-type: none"> - Old growth "Maritime" forest prominent; also barrens, wetlands and extensive river system - Has some of the longest rivers in Nova Scotia - Significant portions in the southwest are covered by wetlands | Mild winters and warm summers are most typical but proximity to the coast makes climatic conditions variable | <ul style="list-style-type: none"> - Red spruce, hemlock and white pine (distinctive "Maritime forest") are more prominent here than anywhere else in NS; old growth forests - Stunted black spruce on bogs - Large tracts of red maple on wetlands associated with rivers - Conspicuous feature is extensive barrens with sparse forests of black spruce and white pine with a shrub and herb layer (fire suppression has led to more young forests in once barren areas) | - Much of the area has been extensively logged |
| Atlantic Coastal | | <ul style="list-style-type: none"> - Extends along the Atlantic Coast; seldom exceeds 5km in width except along the Cape Breton shoreline where the coastal influence can extend almost 20km inland - Eastern portion contains fens, bogs and salt marshes - Also large barren outcrops with scattered conifers and heath vegetation (east) | <ul style="list-style-type: none"> - Slow spring warm - up and the lowest number of growing days in NS - Subject to high winds, high humidity, salt spray and fog | <ul style="list-style-type: none"> - Absence of red spruce delineates the region from the Western and Eastern Ecoregions - White spruce is the most common on exposed sites (coastal islands and headlands) - Black spruce and balsam fir forests with red maple and white birch common components of the understory - Along eastern shore balsam fir forms dense stands with small diameters - Wet mineral soils (black spruce is the dominant tree) | |
| Fundy Shore | <ul style="list-style-type: none"> - Variable topography and up to 225m above sea level (North Mountain) | <ul style="list-style-type: none"> - Narrow strip that wraps around the Bay of Fundy | <ul style="list-style-type: none"> - Cold waters delay spring arrival and fog frequent along the shore | <ul style="list-style-type: none"> - Narrow band of forest, most notable on exposed cliffs, dominated by white spruce - Mixed wood forests of balsam fir, red spruce, red maple, white birch and yellow birch - Beech and maple at higher elevations. White pine and hemlock also present | |

Figure 7 shows the abundance of the different tree species in Nova Scotia. Northern temperate forests dominate a large portion of Nova Scotia province, and the most predominant forest types include spruce-fir conifer, northern hardwood, mixed deciduous-coniferous forests, regenerating forests and natural shrublands. Nova Scotia also encompasses considerable amounts of wetland habitats, including 5 934 km of mainland coastline, freshwater emergent marshes, freshwater forested wetlands, and a large number of open freshwater lakes, streams and rivers⁶.

In Figure 8 we can see the distribution of the different types of habitat.

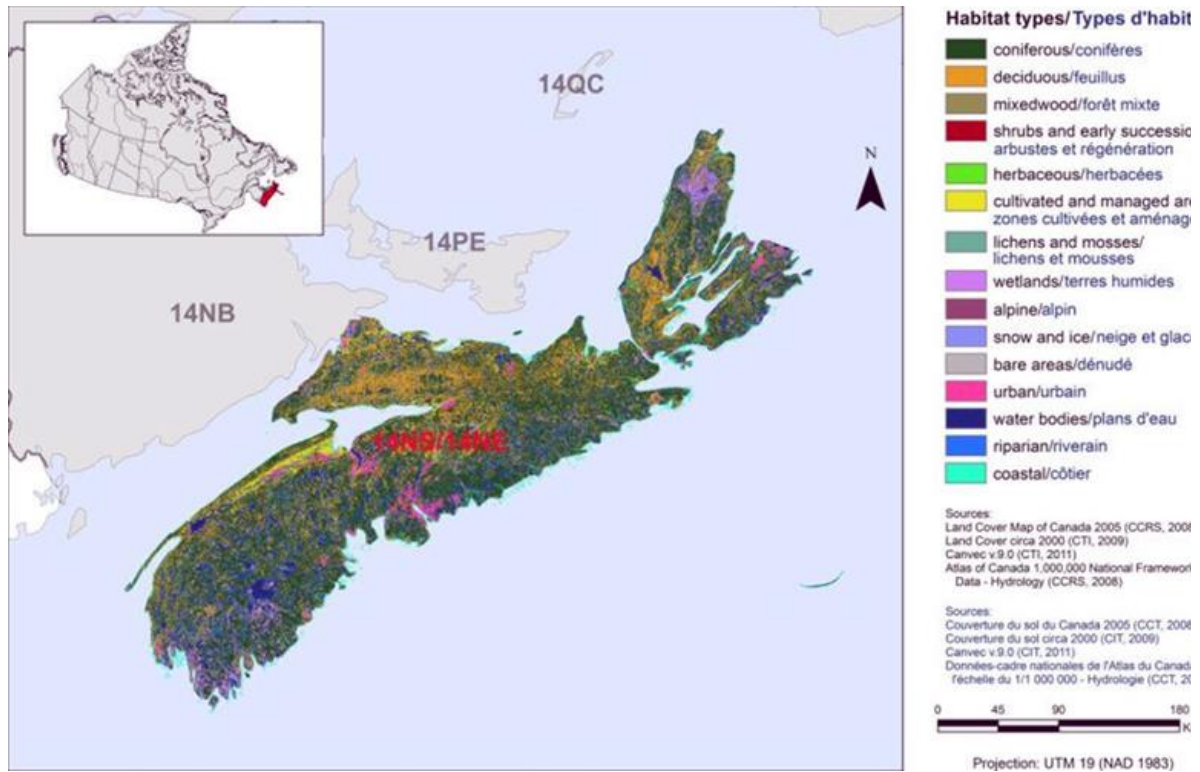
Figure 7 : Area of forest by predominant species (thousands of hectares)



Source: The Inclusive Wealth of Nova Scotia's Protected Areas, A Preliminary Estimate of Nature's Benefits. Peter Lee, Ryan Cheng, Matt Hanneman. 2013

⁶ <http://ec.gc.ca/>

Figure 8 : Repartition of habitats types in Nova Scotia

Source : <http://ec.gc.ca>

2.3. Forest ownership

Table 3 shows the area of forest land in function of the owner categories. The non-industrial private is the balance of private land remaining after the holdings of the major industrial owners (NorthernPulp, Irving, AbitibiBowater and Wagner) are taken away⁷. Generally, only the exploitations of more than 2000 hectares of forested land are under the industrial private category. This table indicates that the private areas represent 66% of the total forest landbase in the province and the public areas 34%. Public areas decrease by 16% when working forest landbase is used.

⁷ Non-industrial Private Non-participation Scenarios: Crown Lands Forest Model Online Reporting & Statistics for Potential Wood Supply (v2010.6). Nova Scotia. Department of Natural Resources, 2011.

Table 3 : Area of forest land by ownership groups

| Forest Ownership | Forested landbase area | | Working forest landbase⁸ | |
|-------------------------|-------------------------------|--------------------|--|--------------------|
| | Area (ha) | Percent (%) | Area (ha) | Percent (%) |
| Small private | 2 102 800 | 50,3 | 1 865 000 | 55,6 |
| Industrial private | 650 000 | 15,5 | 597 500 | 17,8 |
| Crown (provincial) | 1 317 100 | 31,5 | 881 900 | 26,3 |
| Federal | 112 000 | 2,7 | 12 300 | 0,4 |
| Total | 4 181 900 | 100,0 | 3 356 700 | 100,0 |

Source: Non-industrial Private Non-participation Scenarios: Crown Lands Forest Model Online Reporting & Statistics for Potential Wood Supply (v2010.6). Nova Scotia. Department of Natural Resources, 2011. Indeed, most federal spaces are national parks and a large part of the Crown land is included in the Interim Old Forest Policy that identifies and increases the representation and protection of old forests and to support the long-term restoration of old growth forest in the province.

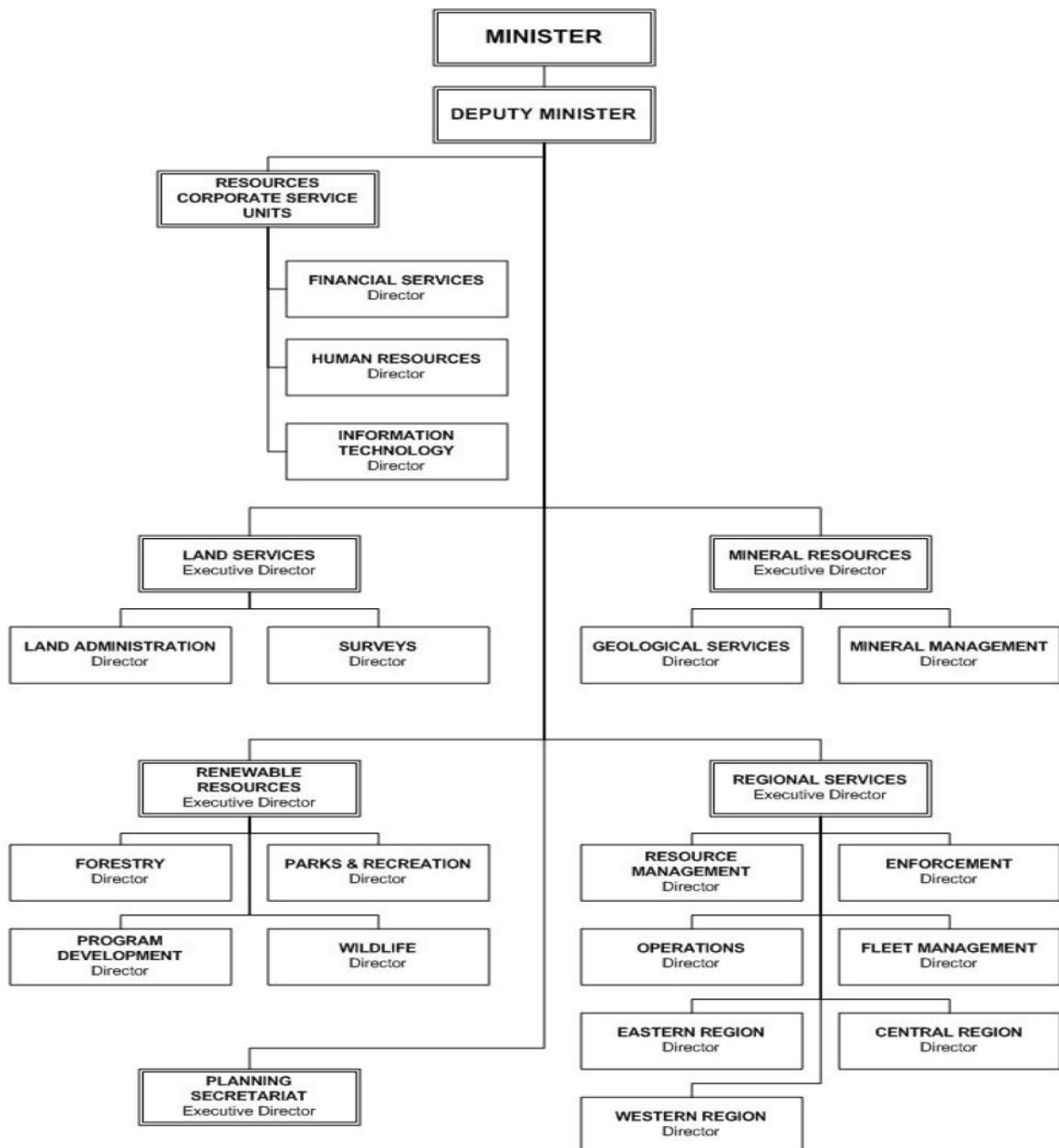
2.4. Competent authorities

Forest management in Canada is essentially at the level of the provinces. At the federal level, the authorities in charge in each province cooperate in the Canadian Council of Forest Ministers, which is more a discussion platform than a decision making entity. The decision power is at the level of the provinces.

In Nova Scotia, the Department of Natural Resources (DNR) has broad responsibilities relative to the development, management, conservation and protection of forest, mineral, parks and wildlife resources and the administration of the province's Crown land. The Minister of Natural Resources is the Honorable Margaret Miller. The Deputy Minister of the Department of Natural Resources is Julie Towers. The resources of the department are organized into five branches (Figure 9). The main forestry competences are shared between the two following branches: "Renewable resources branch" and "Regional services branch" (Table 4).

⁸ Working forest landbase is the proportion of the forested landbase considered available for conventional forest management planning after policy and operational restrictions are applied (i.e. protected areas, water coarse buffers, steep slopes, land protection program, oldgrowth, etc.).

Figure 9 : Organization chart of the Department of Natural Resources



Source : <https://novascotia.ca/treasuryboard/manuals/PDF/100/NatRes.pdf>

Table 4 : Main functions of the different branches in the DNR

| Branch | Main roles | Complementary responsibilities | Divisions |
|---|---|---|--|
| Renewable Resources | <ul style="list-style-type: none"> Integrated development management Conservation of the province's forests, parks, and wildlife resources | <ul style="list-style-type: none"> Coordination and leadership on policy planning Program development including industry development and resource promotion, marketing, resource inventories and research The preparation of strategies and plans | <ul style="list-style-type: none"> Forestry Parks and Recreation Program Development Wildlife Resource Management |
| Geoscience & Mines Branch | <ul style="list-style-type: none"> Implementing policies and programs dealing with the exploration, development, management, and efficient use of mineral resources | <ul style="list-style-type: none"> Promotes scientific understanding of the geology of Nova | <ul style="list-style-type: none"> Geological Services Mineral Development and Management |
| Regional Services | <ul style="list-style-type: none"> Delivers department programs and services through an extensive network of field offices Provides general field services for the Department of Environment and Labour's protected areas program | <ul style="list-style-type: none"> Forest management programs Crown land surveys Regional geological services extension and education, Hunter safety Forest fire Prevention, detection, and suppression, monitoring of forest insects and diseases, Operation and maintenance of Provincial Parks Resource conservation enforcement | <ul style="list-style-type: none"> Operations Fleet Management Forest Protection Regions (Western, Central, Eastern) Private lands Stewardship and Outreach |
| Land Services | <ul style="list-style-type: none"> Administers statutes Provides service, advice, and leadership on all land-related matters concerning the department | <ul style="list-style-type: none"> Providing advice and service to other departments | <ul style="list-style-type: none"> Land Administration Division Surveys Division |
| Policy, Planning and Support Services Branch | <ul style="list-style-type: none"> Planning and policy coordination support to the Deputy Minister and the department (coordination of policies and plans developed within and across the department) Support the integrated management of our natural resources and are compatible with and support the strategic direction of government. | <ul style="list-style-type: none"> Administrative, planning, research, information management, information distribution, graphics, cartographic and communication related services | <ul style="list-style-type: none"> Strategic Policy and Planning Information Management and Support Services |

Source : <http://novascotia.ca/natr/>

The Nova Scotia's forestry is guided by a several acts, regulations, and policies. The most important acts are the following⁹:

Crown Lands Act, amended in 1989, provides for the utilization of Crown lands, by governing forest management and harvesting, leasing and licensing, integration of wildlife and recreation in forest management planning, and administration and management of all Crown lands.

Forests Act, was amended in 1998 to allow for new regulations supporting the 1997 Forest. Strategy. A significant component of the Strategy was the provision of a Forest Code of Practice, which is to specify requirements for management of Crown lands. The Code consists of 3 parts:

Code Principles provide guidance for strategic planning in the areas of forest ecosystems, forest products, wildlife habitat, and integrated forest use. These principles were released in 2004.

Code Guidelines specify management requirements for ecosystems, forest products, wildlife, and integrated use. The code guidebooks are scheduled to be released in draft for public comment in 2008 through the Voluntary Planning strategy consultation process.

Technical References developed through research and practice provide tools and options for management applicable to Nova Scotia forest conditions. This includes a broad suite of existing and developing management and decision support tools.

Environmental Goals and Sustainable Prosperity Act 2007, recently established a number of specific initiatives and objectives affecting management of the provincial lands. The IRM process will need to reflect these objectives:

- commitment to legally protect 12 percent of the provincial land mass by year 2015
- develop a policy preventing loss of wetlands by 2009
- adopt a natural resources strategy for forests, mines, parks and biodiversity by 2010

Interim Old Forest Policy 1999, established an objective to identify and protect the best remaining old forests and old forest restoration opportunities on a minimum 8 percent of Crown land in each of the 39 Ecodistricts. Most of this objective has now been met.

Environmental Certification Programs, particularly Forest Stewardship Council (FSC), Canadian Standards Association (CSA), and Sustainable Forestry Initiative (SFI), have a growing influence on forest management direction on private land, which makes up over 70 percent of the provincial landbase. Many of the tools and planning processes developed for Crown IRM support these certification programs which is encouraging better landscape level coordination across tenures. Large areas of Nova Scotia Crown land have already been certified under one or more of these systems.

⁹ Implementing ecosystem-based management approaches in Canada's forests. A science-policy dialogue. 2008. McAfee, B.J.; Malouin, C. Natural Resources Canada, Canadian Forest Service, Headquarters, Science and Programs Branch, Ottawa. 111 p.

2.5. Overview of wood-related industry

In 2015, forestry contributes about \$800 million to Nova Scotia's gross domestic product (\$410 million direct GDP, \$390 million spinoff) and exports more than \$683 million worth of products internationally¹⁰.

The direct employment in forest industry employment in 2017 was estimated to be 4435 jobs. The direct employment includes wood products (1800 jobs), forestry and logging (910 jobs), pulp and paper (1130 jobs) and other support activities (595 jobs). Compared to 2003, the employment in forestry has been cut by half (9080 jobs).

The State of The Forest report (2016) describes the forest economy in Nova Scotia as follows:

Nova Scotia's total exports are predominantly driven by the pulp and paper sector. Between 2002 and 2014, pulp and paper experienced many difficult years. In 2005, the forest economy contributed over \$1 billion in export revenue to the provincial Gross Domestic Product.

Export revenue was first severely reduced in 2006 when the Point Tupper mill [... temporarily closed for nine months and reopened the following year under a new ownership. In 2006, total forest product exports to the United States were below 60 per cent, and export revenue fell below \$700 million for the first time since 1997. Wood-fabricated material exports decreased consistently after 2004. This was mainly a consequence of lower trade with the United States, which reached its low point during the US housing market collapse and global economic recession. Furthermore, a strong Canadian dollar likely reduced Canadian-sourced lumber demand in the United States.

Despite the dramatic drop in the Canadian dollar in 2015, housing starts and recovery in the United States has been slow. This same economic downturn, combined with high operating costs and lower demand for newsprint, explains the second pulp and paper export decline felt in 2009. For the third time since 1997, total export revenue fell below \$700 million. In 2012, with the permanent closure of the Resolute Forest Products mill and the temporary reclosure of the Point Tupper mill, revenue from forest product exports fell to a record low of \$384 million.

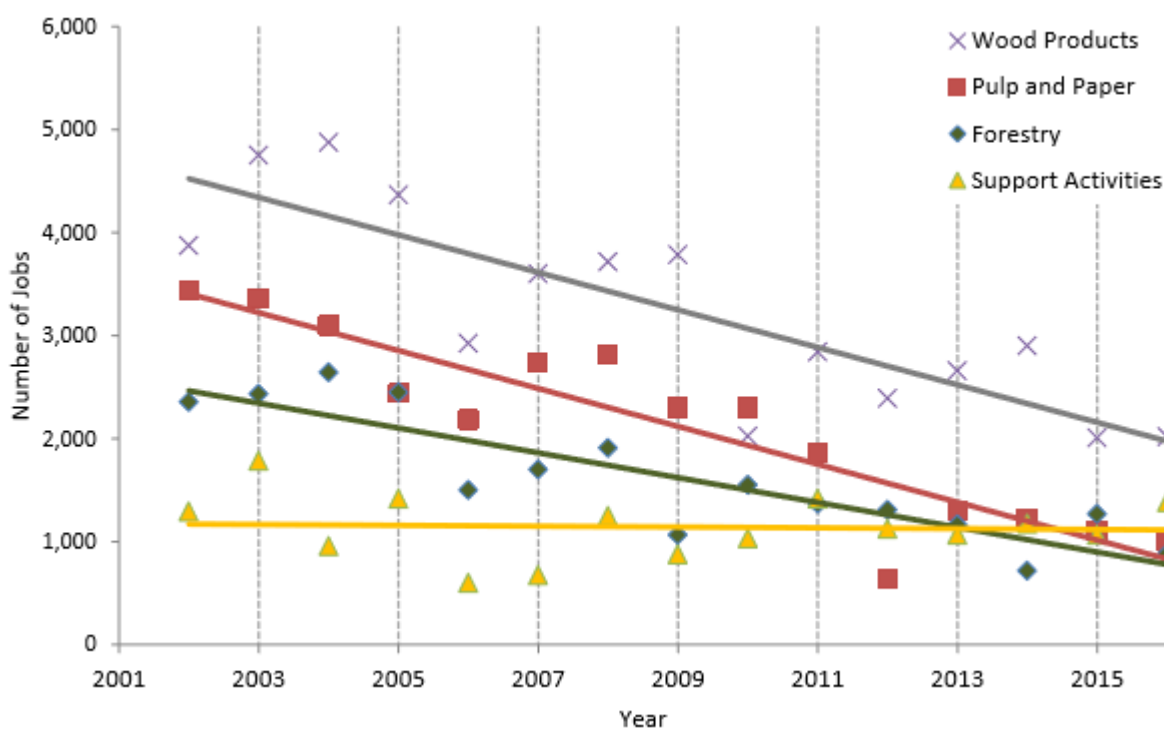
Recovery of pulp and paper exports of late can be attributed to the purchase and restart of the Point Tupper mill. These economic conditions have severely affected forest sector employment (see Table 6 and Figure 10). The most significant job losses in forest sector activity were seen in wood product manufacturing, pulp and paper manufacturing, and forestry and logging. Employment in industries involved in support activities for forestry has remained relatively stable¹¹.

¹⁰ Economic Impact Report. Gardner Pinfold Consultants Dec 2016. <http://forestns.ca/wp-content/uploads/2017/01/FNS-Economic-Impact-Report-Gardner-Pinfold-Dec-2016.pdf>

¹¹ State of The Forest 2016. Nova Scotia Department of Natural Resources Renewable Resources Branch. April 2017.

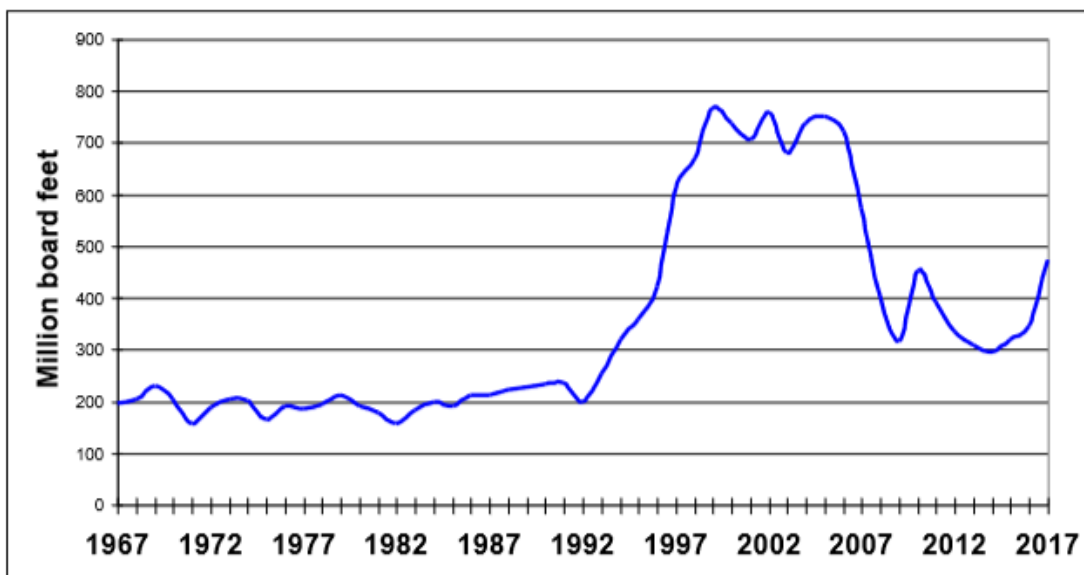
Table 5 : Employment evolution in forestry

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Forestry and logging industry | 1200 | 1500 | 1200 | 1200 | 1050 | 1050 | 995 | 956 | 910 |
| Pulp and paper product manufacturing industry | 2100 | 2300 | 1800 | 800 | 960 | 1200 | 1190 | 1090 | 1130 |
| Support activities for forestry industry | 1000 | 1100 | 1300 | 1100 | 490 | 470 | 475 | 500 | 595 |
| Wood product manufacturing industry | 3000 | 1400 | 2100 | 2100 | 1945 | 2035 | 2005 | 1840 | 1800 |
| Direct jobs (number) | 7300 | 6300 | 6400 | 5400 | 4445 | 4755 | 4665 | 4345 | 4435 |

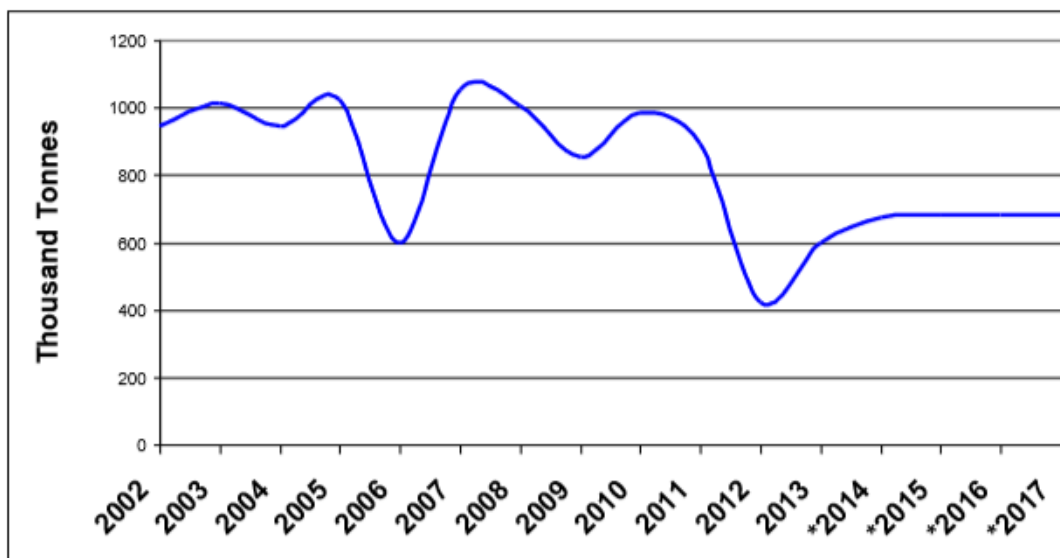
Source : <http://scf.rncan.gc.ca/profilstats>**Figure 10 : Direct jobs in the forest sector, 2002–2016**

Source: State of The Forest update 2017. Nova Scotia Department of Natural Resources Renewable Resources Branch

These trends are confirmed by the evolution of the production of two important sectors (Figure 11 and Figure 12).

Figure 11 : Sawmill production (1967-2017)

Source: <http://novascotia.ca/natr/forestry/registry/>

Figure 12 : Pulp and paper production (2002-2017)

Source: <http://novascotia.ca/natr/forestry/registry/>

The total exportation of forest resources in 2017 was approximately 615 million CAD (canadian dollars) compared with 50 million of importation. Nova Scotia has in 2017 a positive trade balance of 566 million CAD¹².

Table 6 : Importation and exportation of forest resources (CAD dollars)

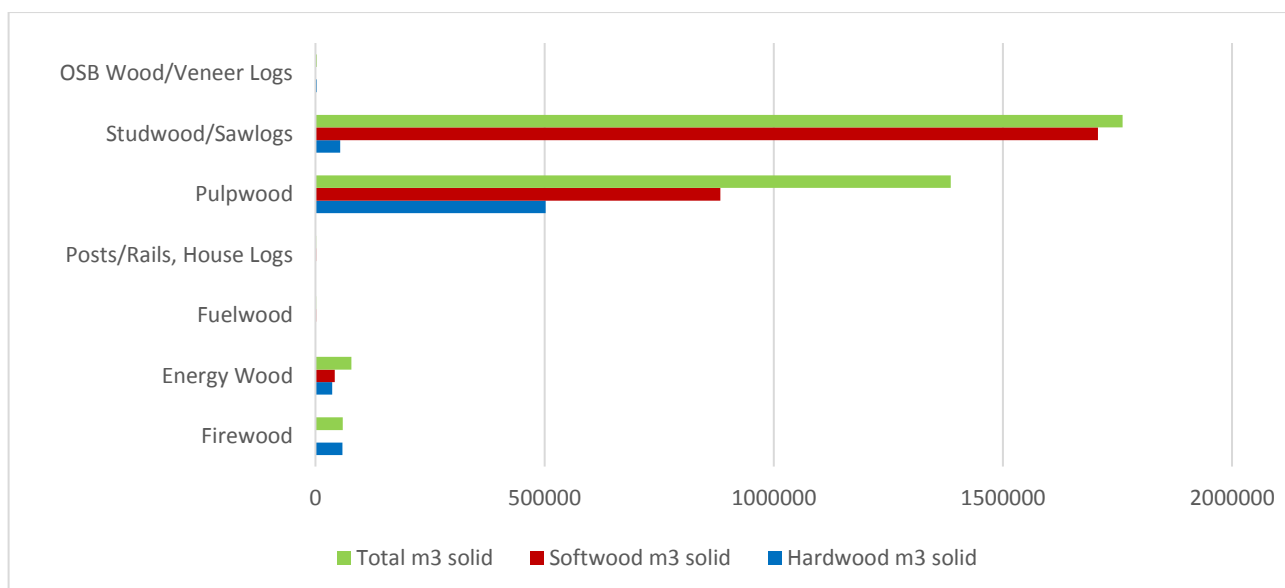
| | <i>Export</i> | <i>Import</i> |
|--|--------------------|-------------------|
| Primary wood products | 22 244 780 | 14 584 |
| Pulp and paper products | 447 919 936 | 22 280 084 |
| Wood-fabricated materials | 145 609 572 | 26 922 569 |
| Total (excludes maple products) | 615 774 288 | 49 217 237 |

Source : <http://scf.nrcan.gc.ca/profilstats>

In 2017 export destinations are mainly the United States (297 million CAD) but also China (154 million CAD), and Europe (41 million CAD)¹³. As can be seen in Table 6, forest products exportations are largely dominated by Pulp and paper products.

As can be seen on Figure 13, in terms of volume, forest products are largely dominated by sawlog and pulpwood.

Figure 13 : Primary forest products harvest by species (2017)



Source: Data calculated from <http://novascotia.ca/natr/forestry/registry/>

¹² <https://cfs.nrcan.gc.ca>

¹³ <https://cfs.nrcan.gc.ca>

3. Sustainability of Nova Scotia forest

3.1. Evolution of forest area and risk of conversion

The forest surfaces in Nova Scotia have remained fairly stable during the last couple of decades, even though a small decrease can be noted. The comparison of statistics from aerial surveys obtained in the period 1985-1993 vs 2001-2009 suggest a loss of 0.73% of the initial forest area in 16 years' time. On average, this is 0.05% loss yearly (Table 7). Softwood surfaces have been slightly decreasing while hardwood surfaces have been slightly increasing.

Table 7 : Evolution of forest cover in Nova Scotia (1985-1993 vs 2001-2009)

| Coverttype | Area (ha) | |
|---------------------------|------------------|------------------|
| | 1985-1993 | 2001-2009 |
| Softwood | 2 316 020 | 2 145 371 |
| Mixedwood | 1 106 585 | 1 098 199 |
| Hardwood | 499 217 | 502 098 |
| Unclassified regeneration | 306 890 | 452 163 |
| Total | 4 228 711 | 4 197 832 |

Source : State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017).

The anthropogenic changes experienced in Nova Scotia have been assessed in 2009 based on satellite pictures¹⁴. The definition of anthropogenic change is the following: *“All changes caused by humans. In Nova Scotia these changes include forest harvesting, road building, urban development, agricultural expansion and other natural resource exploration and development. It does not include natural disturbances such as fire, insect attack or wind damage. However, those areas that have been salvaged after a natural disturbance occurred there are included.”*

Several facts revealed by this study are interesting to evaluate these changes during the period 1990 - 2007:

- During the study period, roughly 12% of the area of the province has undergone anthropogenic change (665,395 ha of anthropogenic change, see Figure 14).
- The rate of anthropogenic change on Mainland Nova Scotia is almost three times the rate of that occurring on Cape Breton Island, at 0.89% per year compared with 0.33%. This level of anthropogenic change appears to be about twice the rate observed in other parts of Canada.

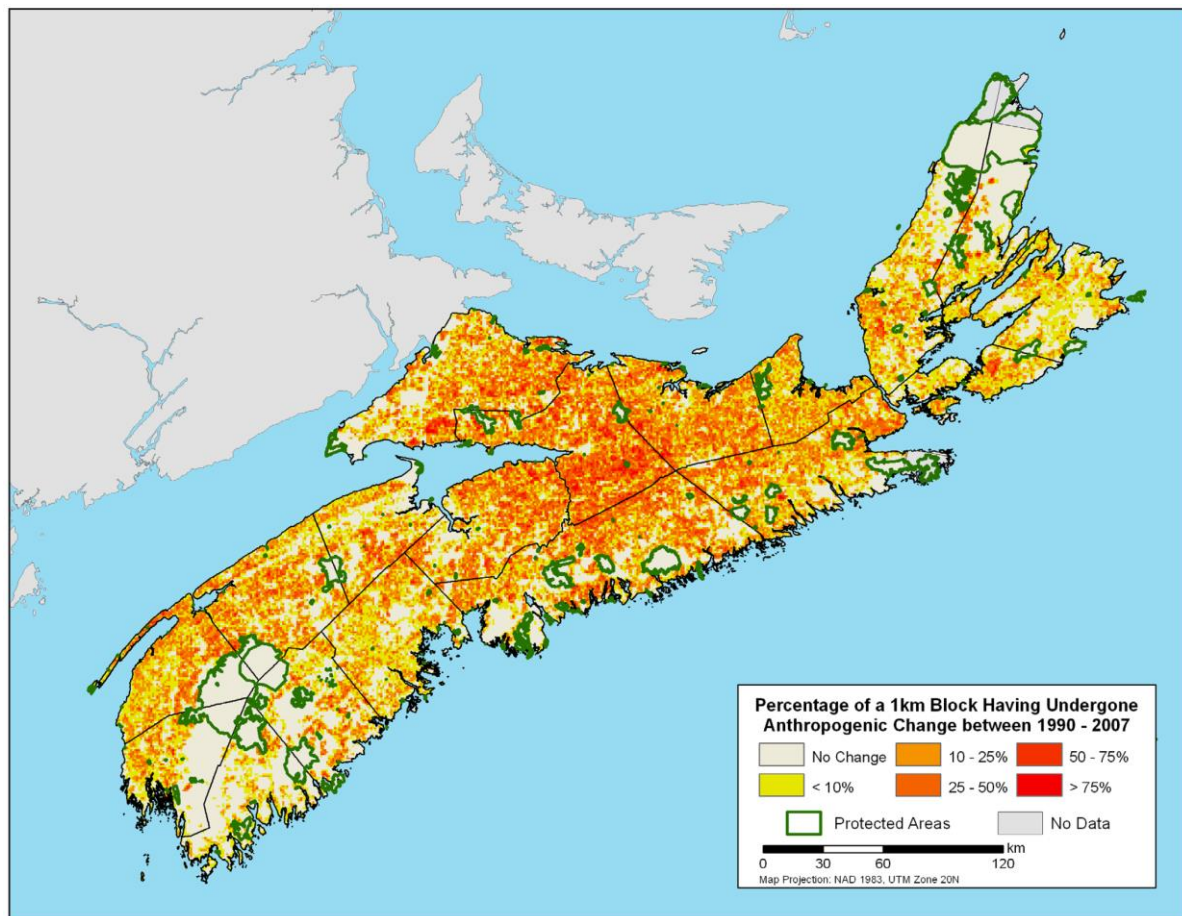
¹⁴ Cheng R and PG Lee. 2009. Recent (1990-2007) Anthropogenic Change within the Forest Landscapes of Nova Scotia. Edmonton, Alberta: Global Forest Watch Canada. 62 pp.

- Recent anthropogenic change is concentrated in the central portions of the province, with 60% located in the counties of Colchester, Halifax, Cumberland, Pictou, Hants and Guysborough.
- The ecoregions with the largest total area of anthropogenic change are the Uplands Ecoregion (26%) and the Western Ecoregion (24%).
- Significant amounts of anthropogenic change are occurring in landscapes that are not adequately represented in the Nova Scotia protected areas network.
- Recent (1990-2007) anthropogenic changes are widely distributed throughout Nova Scotia such that the suite of existing protected areas provide major areas of remaining intact forest.

This document also notes that the Nova Scotia department of Natural Resources states that there are 4275 million ha of forest lands, which means that roughly 15.5% of the forests of Nova Scotia have undergone anthropogenic change during this time period. Furthermore 20% of the province or 1100000 ha, had been cleared for agricultural purposes by the early 1900s and by 1912 only 5.6% of Nova Scotia's forests were still in a virgin state. A comparison with the current agricultural cover delineated by the Nova Scotia Natural Resources Forest Inventory dataset indicates that the present day extent is about 200000 ha. It would seem that significant portions of the landscape are reverting from agriculture to forest lands.

Recent anthropogenic change covers approximately 8% of the non-protected land area and the amount of change on private land (15.3%), is proportionately almost twice as much as on crown land.

Figure 14 : Percentage of a 1km block having undergone anthropogenic change during 1990 to 2007



Source: Cheng R and PG Lee. 2009. Recent (1990-2007) Anthropogenic Change within the Forest Landscapes of Nova Scotia. Edmonton, Alberta: Global Forest Watch Canada

Table 8 presents the forest cover lost to insects, fires and harvests, as well as the forest surface annually planted. It is important to note that this table does not present the forest area which are naturally regenerated after losses to insect/fire/harvest, which means that the balance between the gain and the losses presented on the table don't reflect the net loss of forest cover.

Table 8 : Evolution of the loss or gain of forest cover between 2010 and 2017

| <i>Area in hectare</i> | <i>2010</i> | <i>2011</i> | <i>2012</i> | <i>2013</i> | <i>2014</i> | <i>2015</i> | <i>2016</i> | <i>2017</i> |
|---------------------------|----------------|----------------|----------------|----------------|-------------|-------------|-------------|----------------|
| Area defoliated by insect | No information | No information | No information | No information | 533 | 533 | 4753 | No information |
| Fire area burned | 551 | 150 | 818 | 301 | 564 | 516 | 756 | 730 |
| Harvest | 40954 | 31851 | 30230 | 29112 | 32187 | 34777 | 34075 | No information |
| Area planted | 8883 | 7918 | 5973 | 5182 | 5038 | 4559 | 5024 | No information |

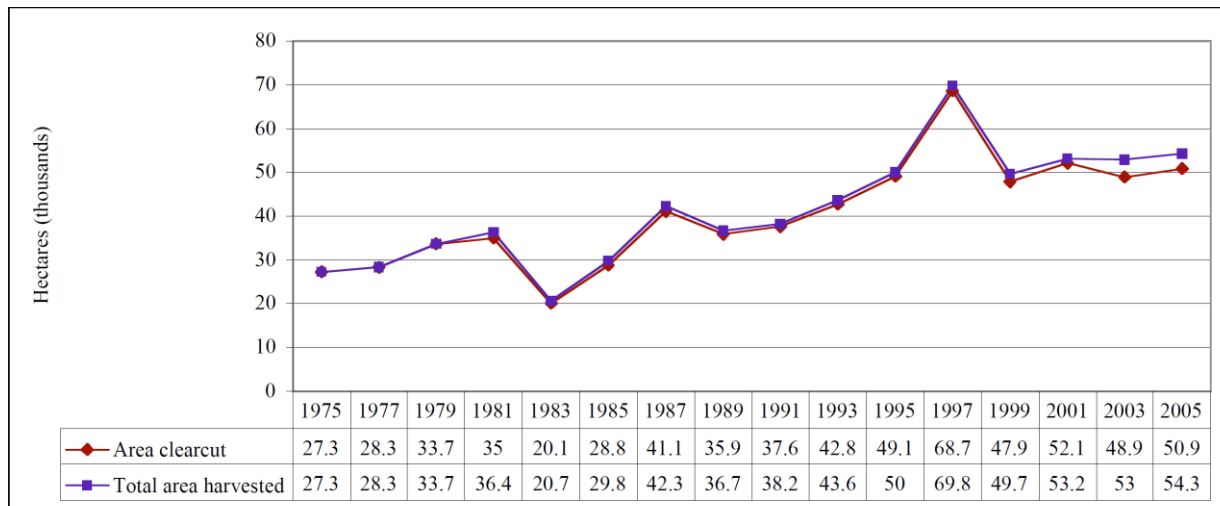
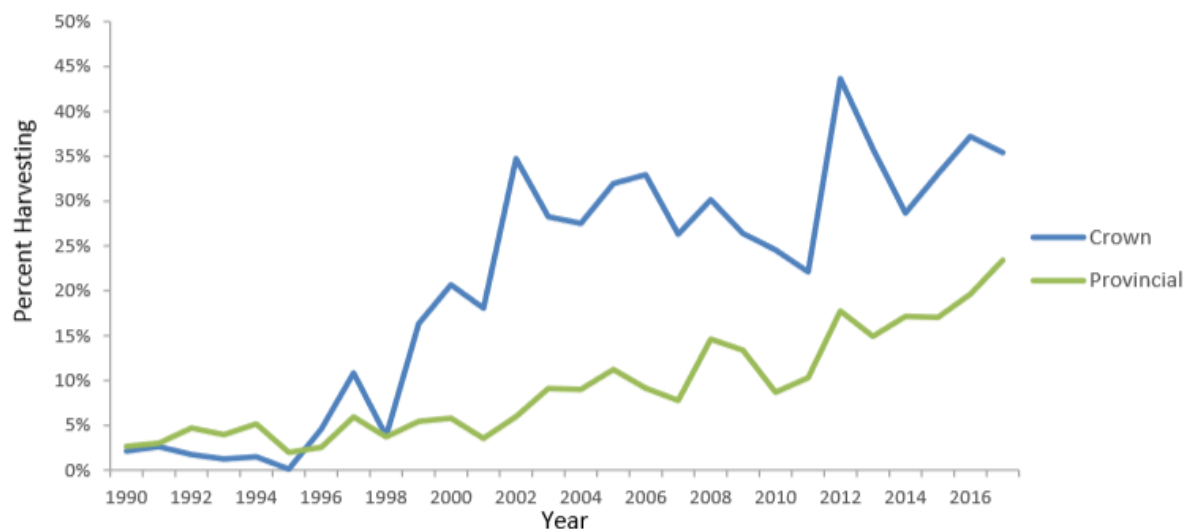
Source : <http://scf.rncan.gc.ca/profilstats>

Forests in Nova Scotia are also subject to important clearcutting (see Figure 15). Clearcutting occurred on 92% of the total area from which timber was harvested in 2007. This practice seems to be more important in the private area (98% for small private holding and 99% in industrial owned land) and less in Crown land (68% of clearcutting). Percentage for private and industrial ownerships is significantly overestimated in the National Forestry Database as there is no process in place to collect the actual information¹⁵.

On the other side efforts have been made by government actors because they commit to reduce clearcutting by 50% in 2015 and ban whole-tree harvesting¹⁶. These efforts are illustrated on Figure 16.

¹⁵ A Natural Balance: Working Toward Nova Scotia's Natural Resources Strategy : Report of the Steering Panel, Phase II, Natural Resources Strategy

¹⁶ <http://cpawsns.org/about/successes>

Figure 15 : Total area harvested and area clearcut, Nova Scotia, 1975-2005**Figure 16 : Provincial summary of the percentage of non-clearcut harvesting on Crown lands and across all land tenures from 1990-2017**

Source: Source: State Of The Forest update 2017. Nova Scotia Department of Natural Resources Renewable Resources Branch

The FSC risk assessment platform www.globalforestregistry.org considers that Canada (as a whole) is at low risk in terms of conversion of forest to other land uses. Standing trees volumes and removals

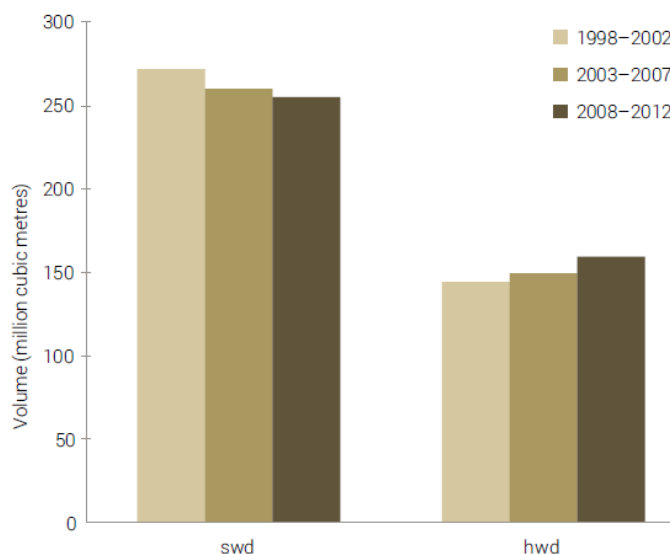
According to the latest survey¹⁷, the total standing volume of merchantable wood in Nova Scotia is estimated to be 413.9 million m³.

¹⁷ Source : State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017).

The evolution of the standing merchantable volumes of wood is presented on Figure 17. We can see that the merchantable volumes of softwood have been slightly decreasing between 1998-2002 and 2008-2012, while the merchantable volumes of hardwood have been slightly increasing. Cumulating both statistics, the total volumes of standing merchantable wood have been decreasing by 1.25 million m³ between the 1998-2002 survey and the 2008-2012 survey (Table 9). It represents a 0.3% reduction of wood volumes (on average, this a decrease of 0.03% yearly during a 10 years' interval).

Note that the slight reduction of forest surface for softwood and slight increase of forest surface for hardwood are consistent with the trends observed in terms of standing volumes of merchantable wood, with also a decrease in softwood and increase in hardwood, as well as a slight decrease in the total. Nevertheless the evolution of the volumes of standing wood does not only reflect the evolution of the respective surfaces, and can also be influenced by other factors (notably the maturity of the forests and the growth/fitness of the trees, among other factors)

Figure 17 : Evolution of the volumes of standing merchantable wood (1998-2012)



Source: State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017)

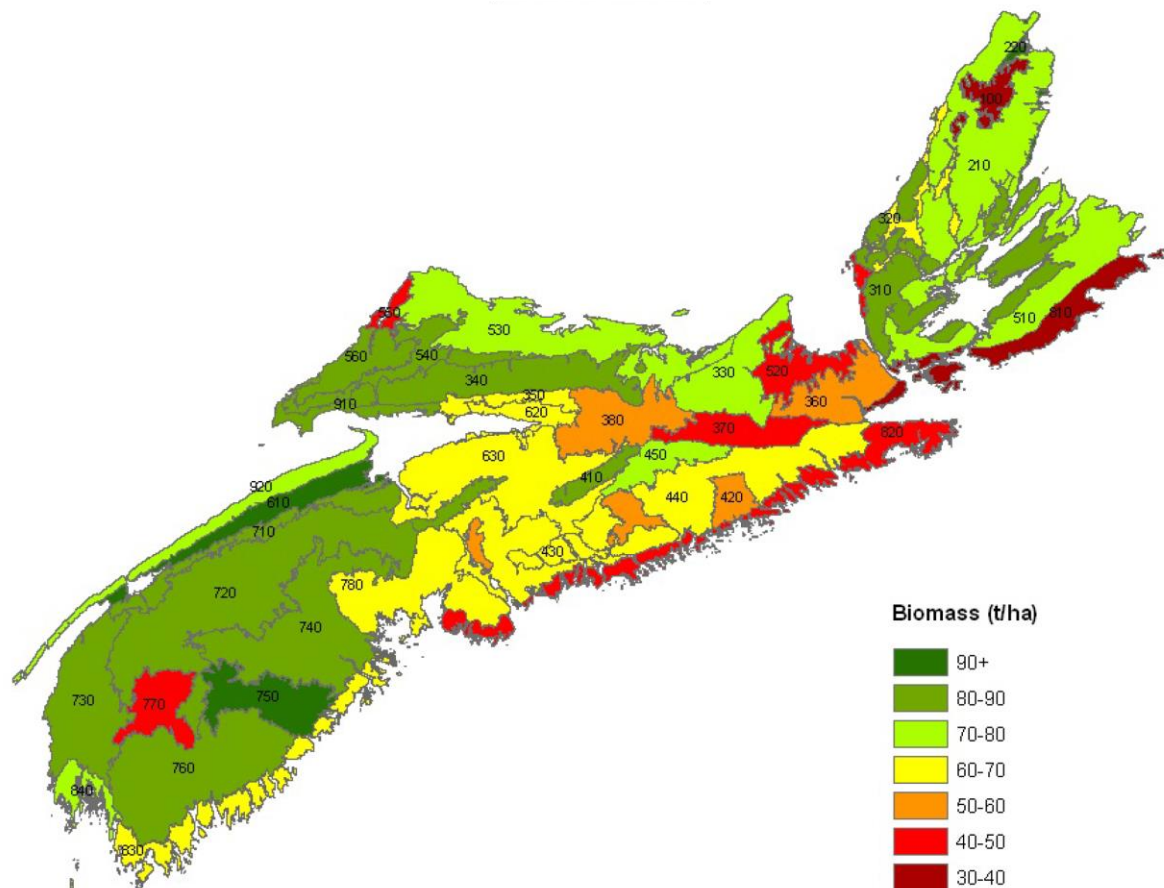
Table 9 : Evolution of the volumes of standing merchantable wood (1998-2012)

| Species group | Merchantable volume (cubic metres) by inventory cycle | | |
|---------------|---|--------------------|--------------------|
| | 1998-2002 | 2003-2007 | 2008-2012 |
| Softwood | 271 230 526 | 259 536 923 | 254 690 867 |
| Hardwood | 143 878 560 | 149 030 320 | 159 165 912 |
| Total | 415 109 086 | 408 567 243 | 413 856 779 |

Source: State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017)

Figure 18 shows the estimated amounts of biomass per ha in the different districts of Nova Scotia.

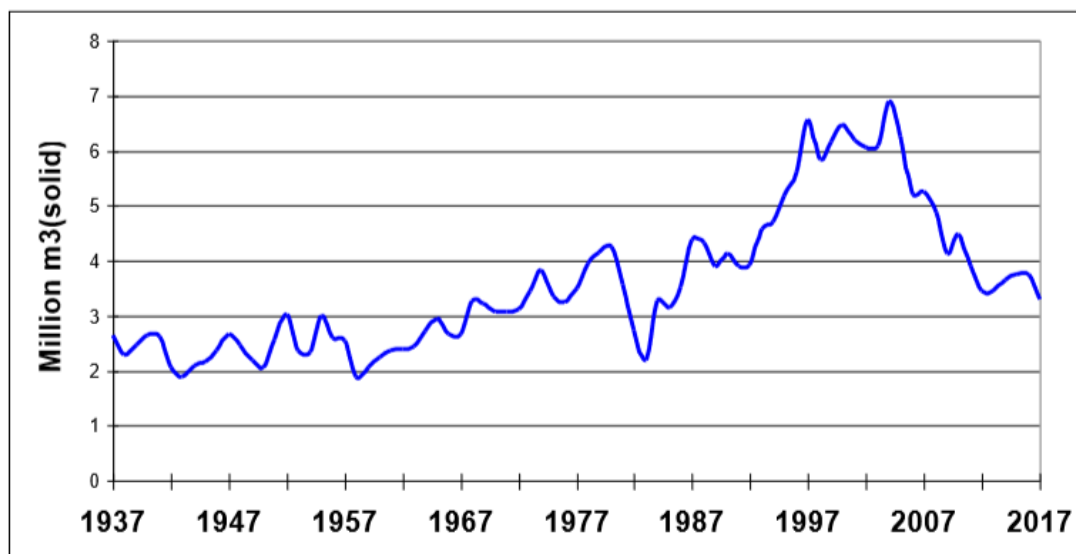
Figure 18 : Biomass of living, merchantable sized trees by Nova Scotia districts



Source: Townsend, P. 2008-07. Forest Biomass of Living, Merchantable Trees in Nova Scotia

Figure 19 shows the evolution of harvested volumes since 1933. The harvested volumes culminated in 2000-2005 then underwent a spectacular decrease, to reach 3.45 million m³ in 2013, twice less than 2005. The detail of volumes harvested in the last 15 years is presented in

Table 10. The most recent figure is 3.74 million m³ harvested in 2016

Figure 19 : Evolution of harvested volumes from 1937 to 2017

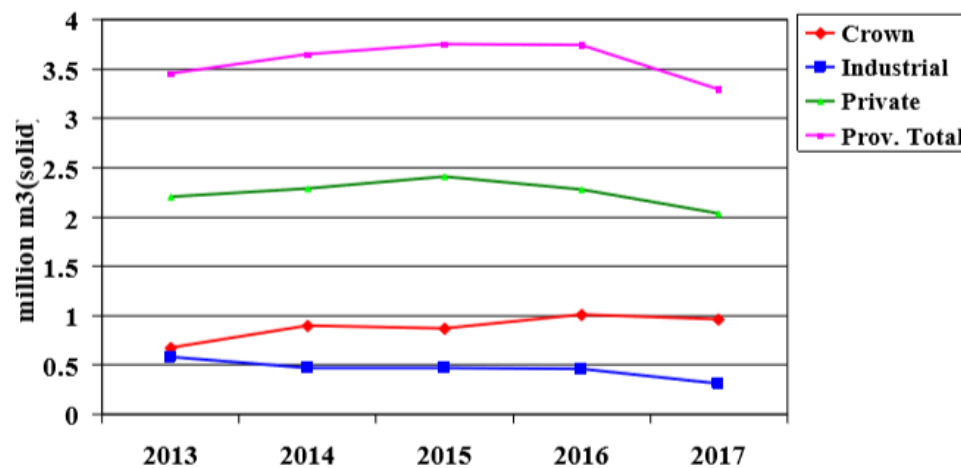
Source : <http://novascotia.ca/natr/forestry/registry/>

Table 10 : Harvested volume in the 2002-2016 period

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Harvest (volume) (1000 cubic meters) | 6 067 | 6 085 | 6 889 | 6 249 | 5 209 | 5 260 | 4 899 | 4 127 | 4 482 | 3 903 | 3 447 | 3 454 | 3 643 | 3 749 | 3 741 |

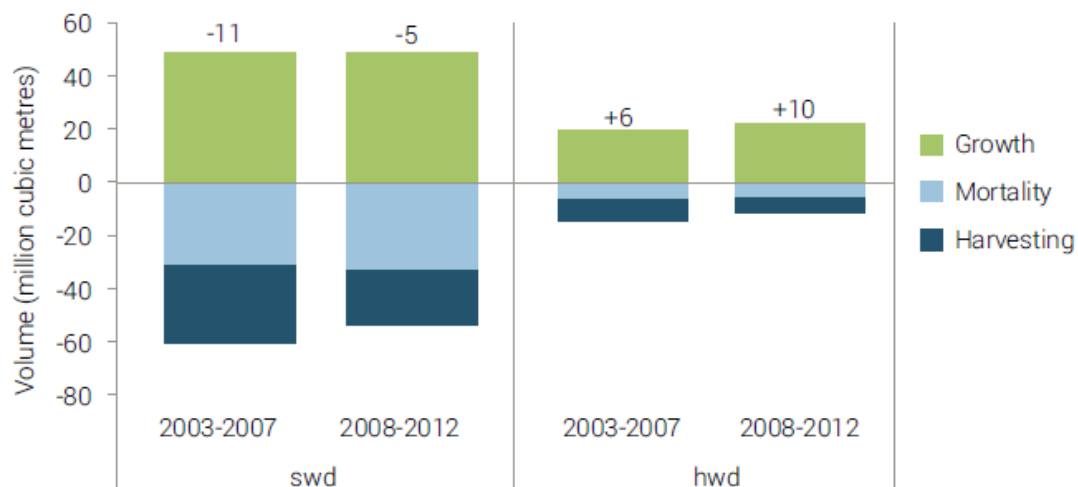
Source : <http://scf.mcan.gc.ca/profilstats>

Figure 20 shows the difference between the owners in terms of primary forest products. Small private production represents more than half of the total production.

Figure 20. Total primary forest products volume comparison by owners from 2013 to 2017

Source : <http://novascotia.ca/natr/forestry/registry/>

Finally, the balance of growth and losses in wood volume are presented on We can see that the growth has could compensate mortality and harvesting for hard wood in recent decades, but not for soft wood, resulting in a net loss of 1.25 million m³ merchantable wood between the 1998-2002 survey and the 2008-2012 survey (for the cumulative volumes of soft wood and hard wood). As explained above, it is a loss of 0.3% in 10 years time.

Figure 21 : Balance between growth and mortality / harvesting in Nova Scotia (2003-2012)

Source: State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017)

3.2. Protection of ecosystems and biodiversity

An estimated 12.26% of the land areas in Nova Scotia have a protection status. The future status of areas under protection is outlined by the Nova Scotia Environment Department in the *Environmental Goals and Sustainable Prosperity Act* (EGSPA). This plan aimed to reach a threshold of 12% of the total land mass of the Province of Nova Scotia under legal protection in 2015¹⁸.

Table 11: Land under protection status and parks in Nova Scotia

| Type of Land | Area (ha) | Portion of NS Land Base (%) |
|---|----------------|-----------------------------|
| Administered by Government of Nova Scotia | | |
| Wilderness Area | 354,540 | 6.41% |
| Nature Reserve | 5,000 | 0.09% |
| Provincial Park | 6,380 | 0.12% |
| Other contributing properties | | |
| National Park | 137,740 | 2.49% |
| National Wildlife Area | 2,400 | 0.04% |
| Land trust lands | 7,260 | 0.13% |
| Protected by conservation easements | 2,130 | 0.04% |
| Adjustment: nature reserves also in wilderness/land trust | -470 | -0.01% |
| TOTAL (2012) | 514,980 | 9.32% |
| Intended for designation by 2015 | 206,020 | 3.73% |
| TOTAL (existing and intended by 2015) | 721,000 | 13.04% |
| Intended for designation after 2015 | 10,610 | 0.19% |
| Potential for designation if certain conditions are met | 36,800 | 0.67% |
| Potential TOTAL | 768,410 | 13.90% |

Source: Our wild spaces: identifying new protected areas for Nova Scotia: 12 percent by 2015. Nova Scotia. Department of the Environment

The different types of conservation status are described here under¹⁹:

Private land conservation

Land Trust

¹⁸ <https://novascotia.ca/news/release/?id=20151229002>

¹⁹ Our wild spaces: identifying new protected areas for Nova Scotia: 12 percent by 2015. Nova Scotia. Department of the Environment.

Lands owned by charitable organizations. Usually small pieces of land, they are selected to protect plants, animals, or other important natural features. Light recreation, education, and research are usually allowed.

Conservation easement lands

The private land owners agree to leave the land in its natural state. The rules for conservation easement lands are set out in Nova Scotia's Conservation Easements Act.

Provincial government Protection**Wilderness areas**

Large areas selected to protect nature while supporting wilderness recreation, hunting, sport fishing, trapping, and other uses. Some off highway vehicle (OHV) use can be permitted on certain routes.

Wilderness areas usually do not have facilities or organized campgrounds. The rules for wilderness areas are set out in Nova Scotia's Wilderness Areas Protection Act.

Provincial parks and reserves

Areas selected for natural or cultural reasons. Many have developed areas for camping, hiking, picnicking, or other recreational activities. Some parks do not count towards the 12 per cent goal because of size or use. The rules for provincial parks and reserves are set out in Nova Scotia's Provincial Parks Act.

Nature reserves

Small areas selected to protect unique or rare species or features. They provide our highest level of protection and are used mainly for education and research. The rules for nature reserves are set out in Nova Scotia's Special Places Protection Act.

Federal government Protection**National parks**

Large areas of national importance.

National parks have three goals:

- *to protect a particular kind of natural environment*
- *to teach us about that environment*
- *to offer us places to enjoy nature*

They often have large areas of wild spaces as well as developed areas for camping, hiking, and other recreational uses. The rules for national parks are set out in Canada's National Parks Act.

National wildlife areas

Land selected for the protection of particular animals, often migratory birds.

The rules for national wildlife areas are set out in the Canada Wildlife Act.

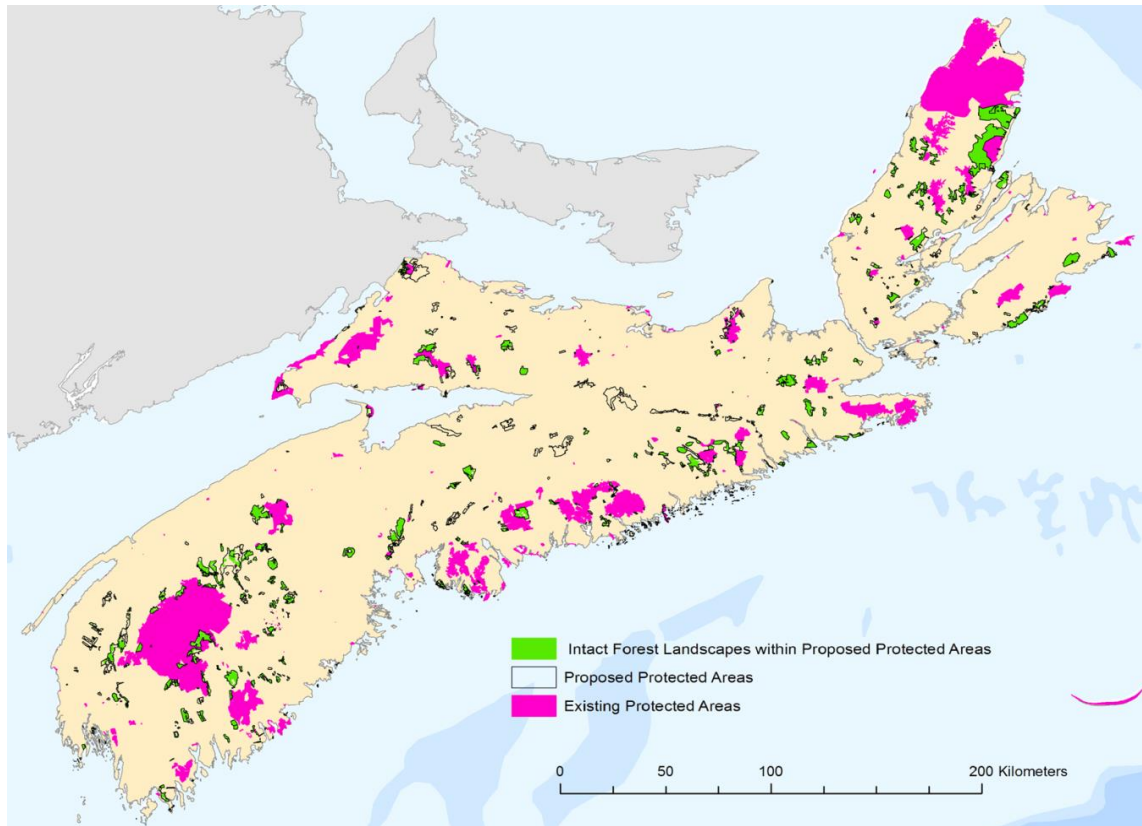
The location of the protected areas is available on the website

"<http://www.novascotia.ca/parksandprotectedareas/plan/interactive-map/>"

The EGSPA plan also recommends adopting strategies to ensure the sustainability of the Province's natural capital in the areas of forestry, mining, parks and biodiversity by the year 2010. In the document "The Path We Share, A Natural Resources Strategy for Nova Scotia 2011–2020", several strategies have been developed (23 goals and more than 90 actions). The companion document, "From Strategy to Action," lays out 32 specific time-bound actions to be implemented in the first 24 months.

If we focus on forest lands and if all of the area proposed by the plan move in protected area, a total of 45.9% of all intact forests²⁰ remaining would be legally protected²¹.

Figure 22 : Intact forest landscapes within proposed protected areas



Source: PG Lee. 2013. Nova Scotia's Proposed Protected Areas: How well do they capture large intact forest landscapes? Edmonton, Alberta: Global Forest Watch Canada. Global Forest Watch Canada

In terms of regulations in Nova Scotia, recommendations for protection and conservation of forests are included in the following acts and codes:

- *Forests Act*

²⁰ An intact forest landscape is a contiguous mosaic of naturally occurring ecosystems in a forest ecozone, essentially undisturbed by significant human influence visible on Landsat satellite images.

²¹ PG Lee. 2013. Nova Scotia's Proposed Protected Areas: How well do they capture large intact forest landscapes? Edmonton, Alberta: Global Forest Watch Canada. Global Forest Watch Canada. 11 pp. Available at: www.globaforestwatch.ca

- *Code of Forest Practice*
- *Wildlife Act*
- *Old Forest Policies*

Moreover, the last document gives more information about the policy objectives²²:

- *Identify and conserve old growth forests and the best old forest restoration opportunities on public land.*
- *Establish and sustain an ecologically representative network of old forest.*
- *Provide social, recreational, and educational opportunities for public use of representative old forests*
- *Provide direction and procedures for integrated resource management decisions involving old forest values.*
- *Establish a spatial database for storing and tracking old forest identified under the policy.*

3.3. Protection of water

In Nova Scotia, several legal provisions aim to ensure that the quality of surface water and groundwater is appropriately protected, the provincial *Environmental Goals and Sustainable Prosperity Act* and the *Water Resources Protection Act*. The main objectives of the first act are the following²³ :

Restoring, preserving, and managing our precious water resources:

- 1) Develop a comprehensive water-resource management strategy by 2010
- 2) Provide at least primary treatment to all wastewater treatment facility discharges by 2017
- 3) Meet operating guidelines for all septage treatment facilities by 2011
- 4) All municipal public drinking water supplies will meet the province's treatment standards by 2008
- 5) A policy of preventing net loss of wetlands will be established by the year 2009

These targets are reviewed regularly and are subject to an annual report (with the progress status of in function of the initial objectives)²⁴.

The second act specifies the special protection given to the Atlantic Drainage Basin, which includes the entire province, and covers all surface water or groundwater and such water in the form of ice.

In the forestry context, a section in the Code of Forest Practice is devoted to air, water and soil. See "Air, water and soil under the Code Principle 1.6: *Forest management practices will be designed and conducted in a manner that maintains and enhances the quality of air, water and soil in Nova Scotia.* This is a guidelines for the Crown land.

The *Wildlife Habitat and Watercourses Protection Regulations* is also designed to protect water quality and to maintain various elements of wildlife habitat on all forest harvest sites (private, industrial and

²² <http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf>

²³ <http://novascotia.ca/nse/pollutionprevention/docs/2020FactSheet.pdf>

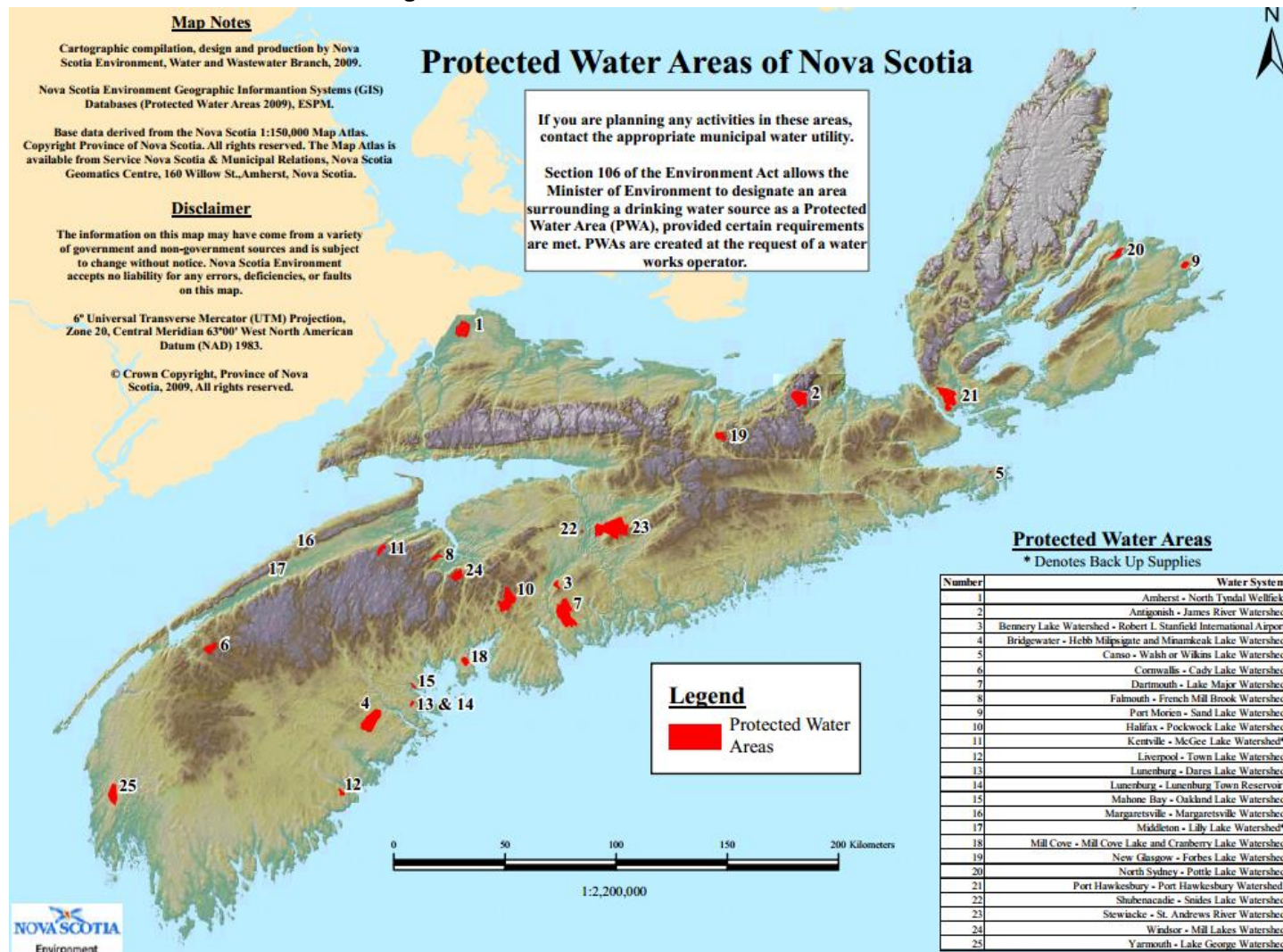
²⁴ <http://novascotia.ca/nse/egspa/>

Crown land)²⁵. This regulations enact the *Forests Act* and it consisting of 10 sections deals with the following aspects: definitions, application, legacy trees and habitat structure, determining average width of watercourse, special management zones, protection of watercourse less than 50 cm wide, provisions applying to all watercourses and offence.

As a large amount of forests in Nova Scotia is certified under a forestry standard (see section 3.9 hereunder), additional requirements for the protection of water are also applicable to most forest land, in accordance with the relevant forest standards.

²⁵ <http://www.novascotia.ca/just/regulations/regs/fowhwp.htm>

Figure 23 : Protected water areas of Nova Scotia

Source : <http://www.novascotia.ca/nse/water/docs/Protected.Water.Areas.Map.pdf>

3.4. Protection of soils

In a similar way as for the protection of water, the protection of soil in Nova Scotia relies on the *Code of Forest Practice*.

Soil conduction at a landscape level in forest can be manage in function of the ecosystem classification and the soil type²⁶. Furthermore a guide has been made by the Nova Scotia Department of Natural Resources. This guide describes all currently recognized Forest Ecosystem Classification Soil Types in the province along with related management interpretations²⁷.

A total of 19 soil types and 6 soil type phases have been identified. These soil types have been differentiated based on general features of ecological and/or management related significance, namely:

- thickness and type of surface organic horizons
- mineral soil depth
- presence of organically enriched Ah or Ap mineral horizons
- dominant particle size and soil texture classes within the soil profile
- soil drainage condition
- soil coarse fragment content
- surface stoniness

A soil type key and soil texture class key have been developed to aid soil type classification. When the soil is determined, some management interpretations related to soil compaction hazard, rutting hazard, erosion hazard, frost heave hazard, and sensitivity to forest floor loss have been made.

3.5. Protection of carbon stocks

In forest land the carbon stocks mainly includes:

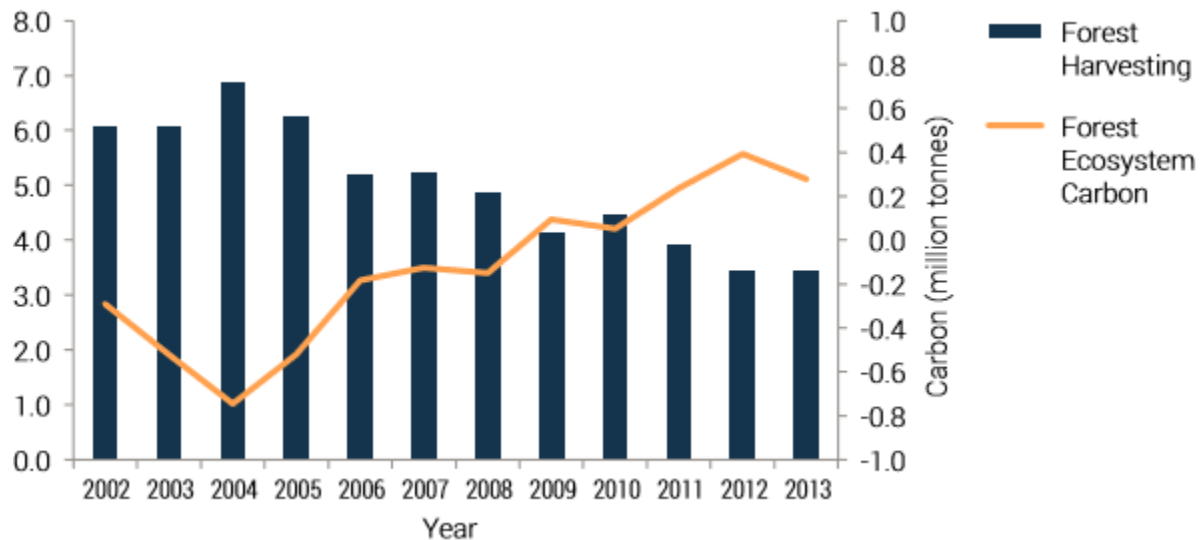
- living above ground and below ground woody biomass,
- soil organic carbon,
- carbon in litter.

Figure 24 shows the evolution of the forest harvesting levels (m³) and the annual net change in forest ecosystem carbon (tonnes of carbon) in Nova Scotia during the period 2002–2013.

²⁶ Soil Types are soils differentiated based on texture, drainage, fertility, and depth; all of which influence site productivity and other management interpretations.

²⁷ Forest Ecosystem Classification for Nova Scotia Part II: Soil Types (2010). Nova Scotia Department of Natural Resources.

Figure 24 : Harvested volumes and annual net change in forest ecosystem carbon in Nova Scotia, 2002–2013



Source: State of the Forest 2016, Nova Scotia Department of Natural Resources, Province of Nova Scotia (April 2017)

Figure 24 shows a reduction in provincial harvesting levels (left axis) during the last 10 years. Conversely, annual net change in million tonnes of carbon (right axis) has increased. Forest ecosystems in Nova Scotia lost carbon between 2002 and 2008, with a low of -0.7 million tonnes of carbon in 2004. More specifically, high decay rates of dead organic matter, in part associated to disturbances such as Hurricane Juan, and elevated harvest levels reduced net forest ecosystem carbon between 2004 and 2008. As of 2009, forests have been a net carbon sink. This is likely due to reductions in harvesting and high growth rates produced by a younger forest cover¹¹.

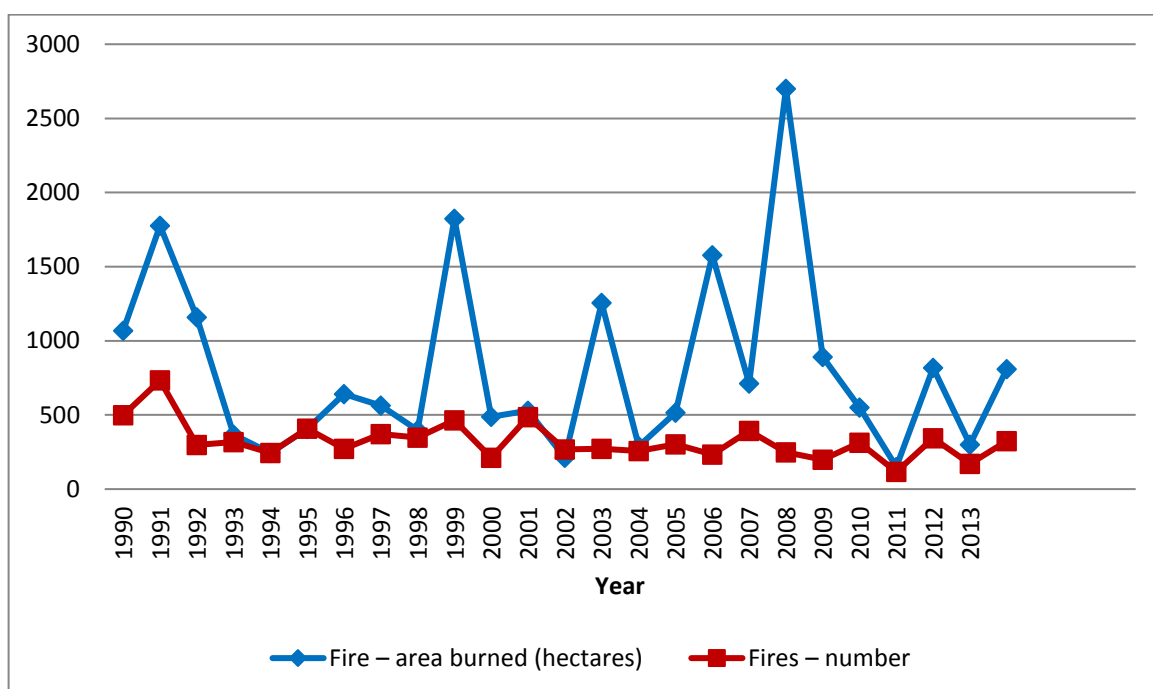
3.6. Protection of air quality

The main impact of forestry on air quality relates to fire. It includes wild fire (which are unintended) and prescribed fire (which is used as part of forest management under controlled conditions).

No information about prescribed fire is available for Nova Scotia forestry. Moreover Nova Scotia has a relatively wet climate, thus the number of fires that typically occurs in an average season is low compared to drier provinces²⁸.

The surfaces affected by wildfire and the number of fires are relatively constant during the 1990-2017 period with an annual average of 785ha burned and 308 fires.

Figure 25 : Number of wildfire and areas affected (1990-2017)



Source: <http://scf.mcan.gc.ca/profilstats>

We also note that a special act is consecrated to *Forest Fire Protection Regulations*²⁹.

3.7. Illegal logging

The FSC risk assessment platform www.globalforestregistry.org considers that Canada is at low risk in terms of illegal logging, because the following criteria are all verified:

²⁸ <http://novascotia.ca/natr/forestprotection/wildfire/>

²⁹ <http://www.novascotia.ca/just/regulations/regs/fofire.htm>

- 1.1 Evidence of enforcement of logging related laws in the district ³⁰
- 1.2 There is evidence in the district demonstrating the legality of harvests and wood purchases that includes robust and effective system for granting licenses and harvest permits ³¹
- 1.3 There is little or no evidence or reporting of illegal harvesting in the district of origin³²
- 1.4 There is a low perception of corruption related to the granting or issuing of harvesting permits and other areas of law enforcement related to harvesting and wood trade³³

3.8. Civil rights and traditional rights

The FSC risk assessment platform www.globalforestregistry.org considers that Canada is at low risk in terms of violation of civil and traditional rights, because the following criteria are all verified:

- There is no UN Security Council ban on timber exports from the country concerned
- The country or district is not designated a source of conflict timber (e.g. USAID Type 1 conflict)
- There is no evidence of child labor or violation of ILO Fundamental Principles and Rights at work taking place in forest areas in the district concerned
- There are recognized and equitable processes in place to resolve conflicts of substantial magnitude pertaining to traditional rights including use rights, cultural interests or traditional cultural identity in the district concerned
- There is no evidence of violation of the ILO Convention 169 on Indigenous and Tribal Peoples taking place in the forest areas in the district concerned

3.9. Forest certification

The main forest certification schemes used in Nova Scotia are:

- CSA (Canadian Standards Association - Group Sustainable Forest Management System³⁴) which is endorsed by PEFC (Programme for the Endorsement of Forest Certification)
- SFI (Sustainable Forestry Initiative³⁵), which is endorsed by PEFC (Programme for the Endorsement of Forest Certification)
- FSC (Forest Stewardship Council³⁶), which is specifically suitable for small private owners

The certified forest area under each of those schemes as for 2013 is presented in the table here under:

³⁰ www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

³¹ www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

³² www.illegal-logging.info ; www.eia-international.org ; <http://www.ahec-europe.org/>

³³ <http://www.transparency.org/cpi2012/results>

³⁴ <http://www.csasfmforests.ca/>

³⁵ <http://www.sfiprogram.org>

³⁶ www.fsc.org

Table 12: Certified forest land in Nova Scotia (2016)

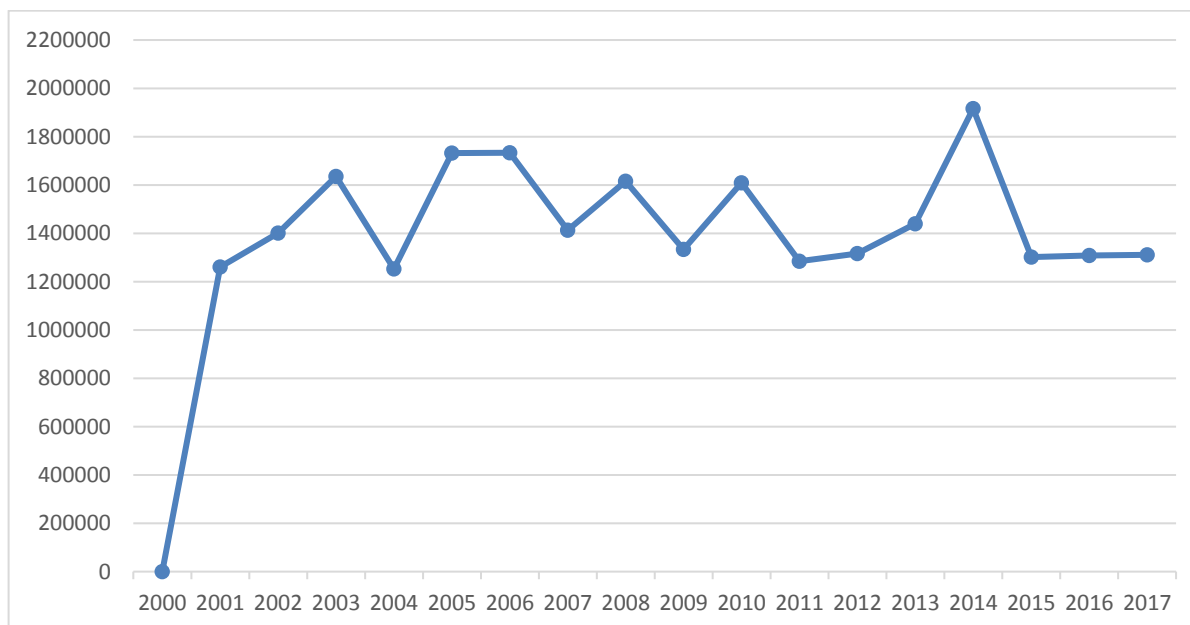
| | CSA | SFI | FSC | Total certified |
|-------------------------------------|--------|-----------|---------|-----------------|
| Area certified (thousand ha) | 10,927 | 1,237,366 | 594,260 | 1,308,691 |
| Percentage forests | 0,26% | 29,59% | 14,21% | 31,29% |

Source: calculated <http://www.certificationcanada.org>

The percentages have been calculated in comparison with the total forested reported above in

Table 3

The areas of certified forests have quickly increased since 2000 and remain stable after, as can be seen on Figure 26

Figure 26 : Evolution of forest area certified in hectaresSource: calculated from <http://scf.rncan.gc.ca/profilstats>

4. Conclusions

Nova Scotia has approximately 4.2 million ha of forests, which is about 75% of the province's land area. About 80% of the forest land is considered potentially available to timber harvesting. The province is very diverse in terms of ecological conditions, and the forest is present in most of the ecological regions (coast, hill and interior plains).

Approximately 34% of Nova Scotia's forest land area is publicly-owned (mostly Crown land). Private ownerships accounts for the remaining 66%. Public area decreases by 16% when working forest landbase is used.

Conifers predominate largely in Nova Scotia and account for the great majority of all forest species. Spruce, intolerant and tolerant hardwood, fir largely dominate the growing stock.

The comparison of statistics from aerial surveys obtained in the period 1985-1993 vs 2001-2009 suggest a loss of 0.73% of the initial forest area in 16 years' time. On average, this is 0.05% loss yearly. Softwood surfaces have been slightly decreasing while hardwood surfaces have been slightly increasing. The FSC risk assessment platform considers that Canada (as a whole) is at low risk in terms of conversion of forest to other land uses (www.globalforestregistry.org).

The volume of harvested wood used to fluctuate between 613 084 and 899 964 cubic meters per year in the period 2002 to 2015.

The most recent evaluation of the total merchantable volume of standing trees in the province stands at 413.9 million m³ (survey period 2008-2012). This volume decreasing by 1.25 million m³ between the 1998-2002 survey and the 2008-2012 survey. It represents a 0.3% reduction in 10 years.

Despite this trend, the annual volume of harvested wood has been decreasing sharply after 2010, presumably resulting in an annual increase in terms of volume of standing trees after 2010, but no published figures are available to illustrate this. In terms of carbon stocks, though, published figures show an annual positive balance since 2010. All compartments of the forest carbon included (living biomass, dead biomass, litter and soil organic matter) the forests of Nova Scotia have played the role of carbon sink since 2010, with an annual sequestration of up to 0.4 million tonnes estimated for year 2013.

Protected forest areas, mostly wilderness areas and national parks, cover about 12.26% of the province forests.

The *Environmental Goals and Sustainable Prosperity Act* has priorities like restoring, preserving, and managing water resources. The *Wildlife Habitat and Watercourses Protection Regulations* is also designed to protect water quality and to maintain various elements of wildlife habitat on all forest harvest sites

The protection of water, the protection of soil and air in Nova Scotia are also relied on the *Code of Forest Practice*. Determination of ecosystem soil type can help to advice management interpretations related to soil compaction hazard, rutting hazard, erosion hazard, frost heave hazard, and sensitivity to forest floor loss have been made. The main impact of forestry on air quality relates to fire. However Nova Scotia has a relatively wet climate, thus the number of fires that typically occurs in an average season is low compared to drier provinces.

The FSC risk assessment platform www.globalforestregistry.org considers Canada is at low risk in terms of violation of illegal logging and in terms of violation of traditional and civil rights.

The forest certification systems have strongly developed in Nova Scotia since 2000, with a cumulated 31 % of forest certified under 3 systems CSA, SFI and FSC.

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