Department of Lands and Forestry

2019 Update

ECOLOGICAL LANDSCAPE ANALYSIS ST. MARGARETS BAY ECODISTRICT 780

PART 1: Overview of Ecodistrict
PART 2: Linking the Landscape to the Woodlot

ELA 2019-780

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 780: St. Margarets Bay
2019 Update for Part 1 and 2

Prepared by the Nova Scotia Department of Lands and Forestry
Peter Bush and Courtney Baldo, Forestry Division

This report, one of 38 for the province, provides updated figures and tables to supplement the original Ecological Landscape Analysis documents.

Information sources and statistics (benchmark dates) include:

- Crown Lands Forest Model landbase classification (2017v.1)

Note this geodatabase includes the latest Forest Inventory Databases (FID), forest disturbance information, forest harvesting information, crown land purchases and new protected area designations. Forest harvesting, silviculture, and fire disturbance (including satellite updates) are current as of end of 2015.

As revision and peer-reviewing of Natural Disturbance Regimes mapping in Nova Scotia becomes available, any major changes will be incorporated in future updates.

Selected updated Tables and Figures

This document provides recalculated values for the following:

Table 1 (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 3 (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 5a (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 5b (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Development Class Targets by Elements – Only major forest elements are reported in the update. Wetlands and Valley Corridors are not reported in this update.

Table 2 was not updated as Integrated Resource Management Land Use Categories have not been updated.
Table 4 was not updated because the land capability for individual polygons has not changed since the original report. Land generally still has that same capability rating now as it did previously, regardless of any management activities at the site.

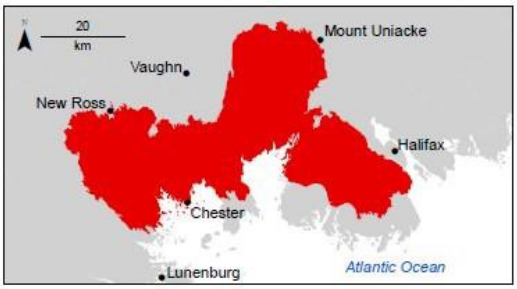
Table of Contents – Parts 1 and 2

Tables

A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 780: **St. Margarets Bay**



An objective of ecosystem-based management is to manage landscapes in as close to a natural state as possible. The intent of this approach is to promote biodiversity, sustain ecological processes and support the long-term production of goods and services. Each of the province's 38 ecodistricts is an ecological landscape with distinctive patterns of physical features. (Definitions of underlined terms are included in the print and electronic glossary.)

This Ecological Landscape Analysis (ELA) provides detailed information on the forest and timber resources of the various landscape components of St. Margarets Bay Ecodistrict 780. The ELA also provides brief summaries of other land values, such as minerals, energy and geology, water resources, parks and protected areas, wildlife and wildlife habitat.

The St. Margarets Bay Ecodistrict covers the eastern part of the South Mountain Batholith, a large, irregularly shaped slab of granite.

On a map, the ecodistrict looks like a billowing cumulus cloud, with the central part stretching north into Hants County. One side tilts to the east and covers most of the Chebucto Peninsula, including communities such as Timberlea, Seabright, Spryfield and Harrietsfield. The other side curls west into Lunenburg County, including Chester and extending nearly to Mahone Bay.

Looking northwesterly to Moose Cove on Pockwock Lake, a significant part of the Halifax water supply.

St. Margarets Bay is part of the South Mountain uplands and shares similar landscape features with neighbouring ecodistricts to the west and south. The effects of lower elevations adjacent to the coastal waters of St. Margarets Bay and Mahone Bay, however, create conditions of more rain and fog and higher moisture levels.

Hurricanes have played a significant role in shaping the forests of this ecodistrict, likely due to its geographic position near the Atlantic Coast and at the end of two major coastal bays.

For the most part, the soils are shallow and stony and the landscape is dotted with large granite boulders. Dispersed throughout the ecodistrict are small streams and rivers, bogs and swamps and several large lakes. The largest river, the Gold River, drains the western part of the ecodistrict. The Pockwock Lake watershed is a significant water supply source for the Halifax Regional Municipality (HRM) and is within the ecodistrict.

Four-toed salamanders have been found in a few of the wetlands common in the ecodistrict that are known to support a variety of native reptile and amphibian species.

Wetlands provide important habitat for the endangered mainland moose, generally found on the Chebucto Peninsula, about 10 kilometres from Halifax.

This ecodistrict is known for the extensive red spruce forest that covers most of the rugged topography.

The ecodistrict contains Lewis Lake, a popular 150 hectare day use park, specially designed to offer outdoor recreation opportunities for seniors and people with disabilities.

The main vegetation feature of this ecodistrict is the red spruce forest that is generally found on the slopes of hills and hummocks. Hemlock is usually found on the lower parts of slopes near watercourses. White pine and black spruce, over-topping a heavy cover of heath-like shrubs, are found on the shallow, coarse-textured and drier soils. Black spruce will occupy the poorly drained soils.

Private land ownership accounts for 44% of the ecodistrict area. Approximately 47% of the ecodistrict is under provincial Crown management. Less than 1% is considered aboriginal lands. The remaining lands are transportation corridors and inland waters.

Landscapes are large areas that function as ecological systems and respond to a variety of influences. Landscapes are composed of smaller ecosystems, known as elements. These elements are described by their physical features – such as soil and landform – and ecological features – such as climax forest type. These characteristics help determine vegetation development.

Element descriptions promote an understanding of historical vegetation patterns and the effects of current disturbances. This landscape analysis identified and mapped seven key landscape elements – one dominant matrix element and six smaller patch elements – in St. Margarets Bay.

Spruce Hemlock Pine Hummocks and Hills is the matrix element, representing about two-thirds of the ecodistrict. A little over half of the element is softwoods, such as red spruce, eastern hemlock and white pine. The remainder is mixedwood and hardwoods.

Spruce Pine Hummocks is the largest patch element, which is most prominent around Martins River, Spondo Lake, Seffernsville and Beech Hill. The area is dominated by a mature and multi-aged red and black spruce. The other patch elements, in order of size, are **Tolerant Mixedwood Drumlins**, **Spruce Pine Flats**, **Wetlands**, **Tolerant Hardwood Hills** and the tiny **Coastal Beach**.

Forest Ecosystem Management
For St. Margarets Bay Ecodistrict

The primary ecological goals of ecosystem-based management are to maintain and conserve ecosystem biodiversity, productivity and resilience. Integration of economic, ecological and social values within a single planning process provides opportunities for creative solutions to meet the challenges of sustainable resource management. By maintaining their integrity, ecosystems can better adapt to environmental stressors such as extended cycles of climate change, atmospheric pollution, changes in land use and vegetation cover.

This ELA provides detailed information on the resources and descriptions of various components of the landscape for St. Margarets Bay Ecodistrict 780. Resources and their components include the natural elements that make up the landscape and may affect functions like connectivity – how a landscape enables or impedes movement of resources, such as water and animals – as well as conditions of forest composition, road density and land use intensity.

Only brief summaries are presented for other land values, including minerals, energy and geology, water resources, parks and protected areas, wildlife and wildlife habitat. These summaries are included in the document to present the range of land values that must be balanced during the design stage of the land management process and are not intended to be exhaustive treatments of the respective land values. Where possible, the reader will be referred to additional sources for detailed information.

Application

The data in this ELA represent inventory based off the Forest Inventory Database (FID) current as of the end of 2015 and the Crown Land Forest Model (CLFM) current as of 2017. The update provides a reference to compare to the baseline conditions provided in the ELA 2015, which in the case of the St. Margarets Bay Ecodistrict was up to 2006. These baseline measurements can be used to assess trends through comparison with present and future inventories.

The ELA supports an approach to maintaining healthy ecosystems by mimicking natural conditions. The report describes the inherent natural structure and condition of landscapes based on enduring physical features, such as elements. It goes on to show how this structure may influence ecosystem functions, such as wildlife movement and connectivity. The ELA summarizes conditions of ecosystems such as forest composition, land use intensity and road density at the time the report was written.

Finally, the relationship between inherent structure and existing conditions is used to guide future direction. The ELA is part of an ecosystem approach that will expand to encompass other initiatives of Department of Lands and Forestry, such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011-2020 (http://novascotia.ca/natr/strategy/pdf/Strategy_Strategy.pdf).

The intention is to describe important ecological characteristics to consider during resource planning – the ELA is not a plan in itself.

Part 1: An Overview of St. Margarets Bay – *Learning About What Makes This Ecodistrict Distinctive*

This first part of the report provides an overview of the ecodistrict for a broad readership. By reviewing several key topics, the reader will have a better understanding of the features that help give the area its character and set it apart as a distinct and unique ecodistrict.

Ecodistrict Characteristics

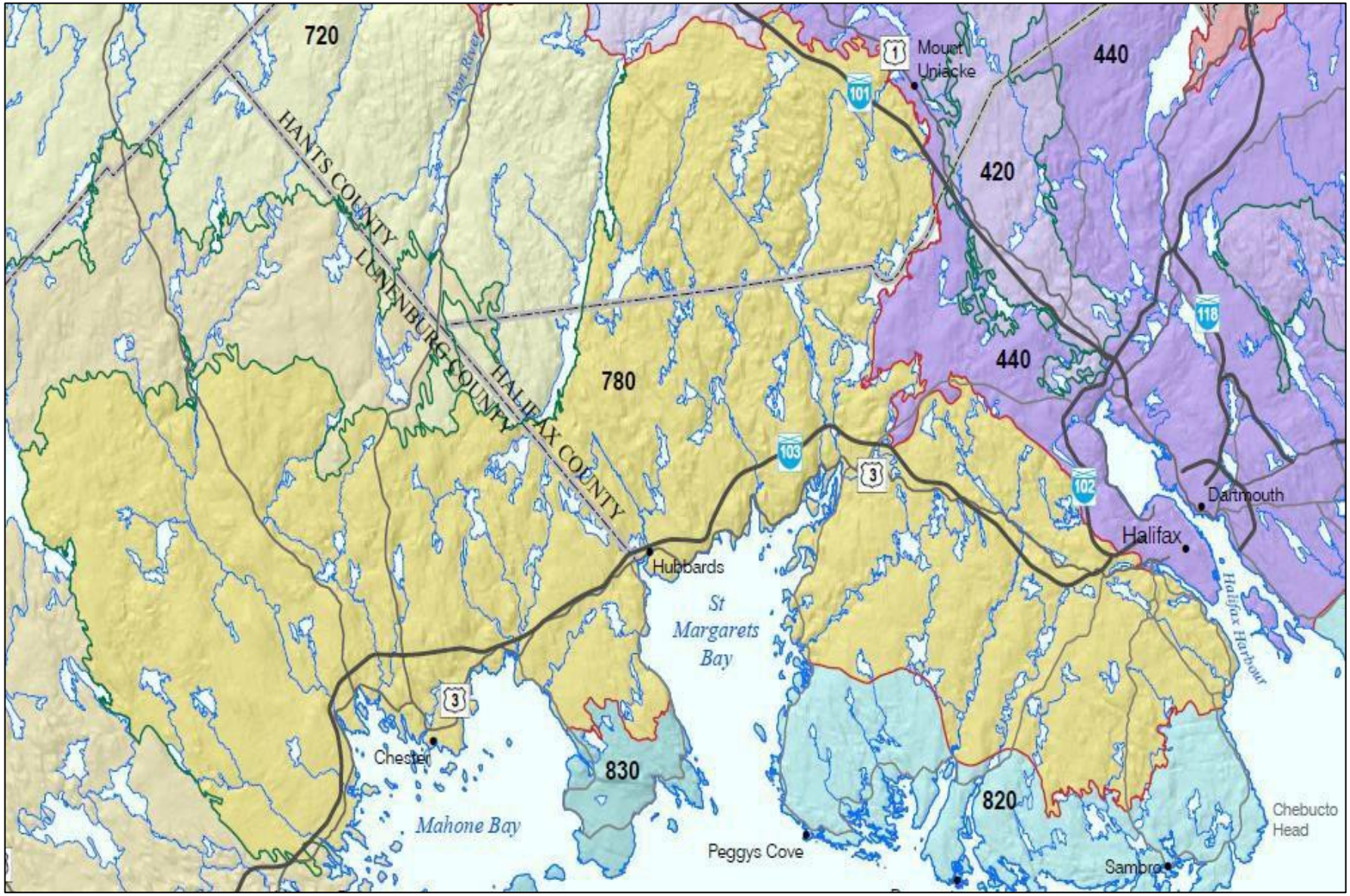
The St. Margarets Bay Ecodistrict is 184,673 hectares in size and forms part of the Western Ecoregion, stretching from Mahone Bay in the west to the Chebucto Peninsula in the east. The ecodistrict is a gently tilting upland ranging in height from 300 metres along its northern boundary to sea level along the Atlantic coast. The lower elevations adjacent to the coastal waters of St. Margarets Bay create conditions for more rain and fog.

The soils are generally shallow, stony, well-drained sandy loams. The landscape is also dotted with large granite boulders. The topography has an irregular arrangement of low rounded hills and hummocks with pronounced ridges, especially where the soil is thin and the bedrock is exposed. Small streams and rivers, bogs and swamps are dispersed throughout the ecodistrict.

Gold River is the largest river and drains the western portion of the ecodistrict. The Pockwock Lake watershed is a significant water supply source for the HRM. A little more than 7% of the ecodistrict consists of lakes and rivers.

The dominant vegetation is the red spruce forest. Hemlock is also found in lesser amounts, usually near watercourses. Large white pine and black spruce communities are found overtopping drier sites with heath-like vegetation. Black spruce will occupy the poorly drained soils associated with the lower level sites. The better drained, more fertile hills support tolerant hardwoods of sugar maple and yellow birch.

See map on following page for overview of the St. Margarets Bay Ecodistrict, including adjacent ecodistricts, locations of area towns and villages, county boundaries and major waterways.



St. Margarets Bay Ecodistrict 780 stretches across Lunenburg, Halifax and Hants counties.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

The St. Margarets Bay Ecodistrict is predominately rural, with more than 44% under private ownership and 47% under the administration of the provincial Crown.

See Table 1 for changes in ownership that occurred in 2013, increasing provincial Crown ownership to 47%.

Table 1 – Land Area by Ownership in the St. Margaret's Bay Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	86,864	47.0
Private	81,192	44.0
Federal	967	0.5
Aboriginal	372	0.2
Other (Includes inland water bodies and transportation corridors)	15,278	8.3
Total	**184,673**	**100**

*Note: Figures may vary slightly from table to table because of rounding, averaging, and overlapping of categories and other factors.

Other uses include railroad corridors and inland lakes, rivers and streams.

IRM Classification for Provincial Crown Lands

The Integrated Resource Management (IRM) classification for Crown lands was developed through a public consultation process during the strategic phase of IRM completed in 2002.

Table 2 provides a summary of Crown lands designated as either C1, General Resource Use; C2, Multiple and Adaptive Use (allows most uses, but special management may be required); or C3, Protected and Limited Use (such as beaches and sites of cultural and historic significance).

Table 2 – IRM Land Use Categories for Provincial Crown Lands in Ecodistrict

IRM land use category	Hectares	Percent of Crown Lands
C1 – General Resource Use	12,837	34.5
C2 – Multiple and Adaptive Use	19,728	53.1
C3 – Protected and Limited Use	4,463	12
Unclassified	150	0.4
Total	**37,178**	**100**

Table 2 provides an approximation of Crown lands designated as C1 (34.5%) – General Resource Use; C2 (53.1%) – Multiple and Adaptive Use; and C3 (12%) – Protected and Limited Use.

There are 23 camp leases in this ecodistrict, many concentrated on Island Lake (just north of Highway 103), and on Frederick Lake. *With the sale of the former Bowater Mersey Paper Company Limited lands to the Department of Lands and Forestry, the camp leases with Bowater are in the process of being transferred to Department of Lands and Forestry.* A hill to the west of Stillwater Lake, on the Hammonds Plains Road, supports several communication towers. One telecommunications company has a 2.2 hectare lease to build and maintain a communications tower and switching equipment, plus an easement. A second company has a 2.1 hectare lease here as well, plus an easement.

Most of the remainder of the leases are held by the HRM. A 1.4 hectare property at Lewis Lake is leased to the HRM for a fire station and hall (*now leased to Bay Road Community Hall Association for a social and recreation centre*). The HRM also leases 4 hectares of Crown land in Harrietsfield for a sports field, 3.5 hectares in Herring Cove for public recreation, 10.1 hectares in Fourth Lake for public recreation and 3 hectares in Glen Haven for public recreation. These are 10-year leases with a renewal option.

The Crown land below the high water mark is very heavily encumbered by permits. The edge of St. Margarets Bay has many wharves, skidways and moorings, as well as some mooring fields and marinas. All of these are relatively permanent structures, and privately owned, but the owners must apply to the Department of Natural Resources for approval to repair or modify them.

Forests

Within the St. Margarets Bay Ecodistrict, about 80% of the land is forested (Table 3). The remaining 20% comprises wetlands, urban development, barrens and corridors. Less than 1% of the landbase is used for agriculture.

Of the forested land, the majority is softwood stands. Red spruce is the dominant softwood species. Hemlock is also common. The abundance of red spruce can be attributed to the occurrence of fog and rains during the spring and summer seasons off the coast of St. Margarets Bay and Mahone Bay, which aids in the re-establishment of red spruce forests after a disturbance.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	146,956	79.6
Wetland	7,549	4.1
Agriculture	421	0.2
Barrens	4,616	2.5
Urban	8,590	4.7
Road, Trail, Utility	2,416	1.3
Other	14,124	7.6
Total	**184,673**	**100**

Hardwood stands only account for a little over 15% of the ecodistrict, with less than 3% classified as shade-tolerant hardwoods, such as sugar maple, yellow birch and beech.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.9 cubic metres per hectare per year (m^3/ha/yr), based on the ratings in Table 4. The average forest LC for the province is 4.9 m^3/ha/yr.

Some areas are not suitable for trees. These non-forested areas consist mainly of rock outcrops and barren lands.

The predominant soils of this region are well-drained, sandy loams. Although classed as shallow and stony this ecodistrict has an above-average LC rating for forested land in Nova Scotia.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3 /ha/yr)*	Hectares	Percent
2 or less	1,200	0.8
3	6,446	4.4
4	24,581	16.7
5	51,365	34.9
6	61,889	42.1
7 or more	1,489	1
Total	**146,970**	**100**

*Based on growth rating for softwood species.

Approximately 78% of the forested land has a LC rating greater than or equal to 5 m^3/ha/year.

Water Resources

Lakes and rivers represent 7.4% of the ecodistrict. Gold River, the largest river, drains the western part of the ecodistrict. Pockwock Lake, one of the largest lakes in the ecodistrict, is a major water supply for the HRM. Other lakes include Panuke, over 29 kilometres in length, Five Mile Lake and Big Indian Lake.

Lakes and rivers play an important part in the ecosystems of the St. Margarets Bay Ecodistrict.

Minerals, Energy and Geology

The St. Margarets Bay Ecodistrict lies on the eastern end of the 300 to 410 million-year-old South Mountain Batholith, a large slab of granite formed from molten rock deep in the earth's crust and exposed at the surface after millions of years of erosion.

The areas at the southwest end and along the eastern and northern edges of the ecodistrict comprise the Meguma Supergroup of sediments that have been altered by metamorphism. These rocks were formed from sediments deposited off the coast of Africa and changed by heat and pressure. This group of sediments is about half a billion years old.

At the northern tip and along the eastern edge of the ecodistrict, granodiorites – granite rocks with less quartz – can be found. The Meguma Supergroup covers approximately 5 to 10% of the ecodistrict. This supergroup comprises the Goldenville Formation and the overlying Halifax Formation that were metamorphosed and folded during the Acadian Orogeny, a mountain-building period, prior to the intrusion of the granites.

Granite outcrops, formed from molten rock deep in the earth's crust, are found in the ecodistrict.

The Halifax Formation consists mostly of black, grey and rust-brown slates with areas of abundant iron minerals containing iron and sulphur, such as pyrite, pyrrhotite and arsenopyrite, which can generate acid in water.

The Goldenville Formation comprises varying amounts of metasandstone and metasiltstones – sandstones and siltstones that have been changed by heat and pressure – and this is where many gold districts are found in Nova Scotia.

A few small patches of Windsor Group sedimentary rocks – formed in layers and deposited by water, wind or ice – occur along the coast. This group of rocks is about a third of a billion years old. Early carboniferous, Windsor Group sedimentary rocks can be found in small patches along the coast. These rocks are made up of marine sediments and are an important source rock for coal, salt, gypsum and, to a lesser extent, base metals.

There are numerous copper, arsenic and tungsten deposits throughout the ecodistrict with a few deposits of gold, fluorite, tin, diatomite, lithium, lead, molybdenum and uranium. There is an abandoned feldspar quarry in the Governor Lake Pegmatate – coarse grained granites – near Bayers Lake Business Park. The only past production of gold was at the Lacey Mine near Gold River. The fine to medium grained granites and the quartzites of the Goldenville Formation are a good source of aggregate, such as gravel and sand.

Overlying the bedrock in many parts of St. Margarets Bay Ecodistrict are sediments which were deposited over the last 2.6 million years. These contribute to the development of soils and have been used as aggregate.

Potential geohazards, such as abandoned mine openings, potential karst areas, flood risk areas, sulphide-bearing slates and underground coal workings, can be viewed at the following web sites:
http://gis4.natr.gov.ns.ca/website/nsgeomap/viewer.htm
http://gis4.natr.gov.ns.ca/website/mrlu83/viewer.htm
Please report any additional geohazards found on Crown lands to your nearest Natural Resources office.

Parks and Recreation / Protected Areas

For the parks and protected areas within your ecodistrict, please refer to the Park and Protected Areas website (http://novascotia.ca/parksandprotectedareas/plan/interactive-map/) and the Provincial Landscape Viewer, at the following url: https://nsgi.novascotia.ca/plv/.

Graves Island, a coastal campground, is part of the St. Margarets Bay Ecodistrict. The map also shows the location of area day parks.

Beach lovers flock to the white sand of Cleveland Beach in St. Margarets Bay Ecodistrict.

Wildlife and Wildlife Habitat

Wildlife in the St. Margarets Bay Ecodistrict includes relatively common species of plants, animals and other organisms, along with some species that are rare and/or at risk in Nova Scotia.

Wildlife information for St. Margarets Bay and other ecodistricts comes from a number of sources, including surveys, harvest statistics, hunter and trapper reports (abundance rankings), biological collections from harvested and road killed animals and observations and reports from the public and Department of Lands and Forestry staff. Information on important sites is documented by Department of Lands and Forestry in the Significant Habitats Database and by the Atlantic Canada Conservation Data Centre in Sackville, N.B.

Old forests are recognized as providing important wildlife habitat. The provincial goal is to have a minimum 8% for old forests on Provincial Crown land. Shade-tolerant hardwoods and softwoods may provide important wildlife structural components, such as cavity trees, and are encouraged across the landscape through appropriate silviculture systems.

The provincially significant Panuke Nature Reserve is one of the best examples of old growth hemlock and red spruce in the province.

Many cavity-nesting birds, such as woodpeckers and owls, and birds that feed on insects, including the threatened olive-sided flycatcher and vulnerable Eastern wood-pee, use the various types of forested areas in the ecodistrict for habitat.

Endangered mainland moose are found in the St. Margarets Bay Ecodistrict, mostly on the Chebucto Peninsula.

Approximately 2,000 of the 3,200 hectares of barrens within the ecodistrict occur on the Chebucto Peninsula in the vicinity of Hubley Big and Big Five Bridges lakes.

A large proportion of the ecodistrict is considered a concentration area for the endangered mainland moose and most occur on the Chebucto Peninsula, approximately 10 kilometres from metro Halifax. The area is separated from the remainder of the province by Highways 3 and 103, and associated linear urban development.

The fisher, sensitive to human activities or natural events, is believed to have been extirpated – no longer living in the wild in the province but still found in the wild elsewhere – from Nova Scotia by the 1930s. Re-introductions of this species to parts of the province were undertaken in the 1940s and the 1960s. As recently as the mid-1990s, Department of Lands and Forestry released fisher caught in northern Nova Scotia to the Holden Lake area of Lunenburg County to increase the extent of this species within its historical range.

Several rare species of lichens have been identified within the Blandford Game Sanctuary on the Aspotogan Peninsula. Lichen experts believe additional suitable habitat for rare lichens likely occurs within the coastal influenced moist forests.

Rare and/or at risk plant species have been found within the ecodistrict as well. Mountain sandwort, also sensitive to human activity, is known to occur on granite outcrops in the vicinity of Kidston Lake and Susies Lake and may occur elsewhere in this landscape. Buttonbush-dodder, American germander and Larger St. John`s wort have been found in the St. Margarets Bay coastal environment. Old records exist for a rock rose occurrence near Five Island Lake and hudsonia has been found at Purcells Cove.

Lakes are common across the landscape and include Panuke, Five Mile and Pockwock. The common loon is known to successfully nest along the lakeshores of many lakes in the ecodistrict. Several rivers of significance drain south towards the Atlantic. The Gold, Ingram and Nine Mile rivers are examples that maintain viable brook trout populations. Atlantic salmon, a species designated as endangered by the Committee on the Status of Endangered Species in Canada (COSEWIC), is still found in small numbers in several of these rivers.

Four-toed salamanders – so named because they have four toes on their back legs as well as their front legs – have been found in a few of the wetlands that are common in the ecodistrict, which also are known to support a variety of other native reptile and amphibian species.

During the winter months, the ice free portions of the bays provide important over-wintering habitat for such waterfowl species as golden eye, bufflehead, long tailed duck, black duck and Canada geese. In addition, many shorebird species use coastal beaches in the spring and summer for feeding areas along their migratory route.

Many islands, often privately owned (especially in Mahone Bay), occur within the inner bays and can provide ideal nesting habitat for colonial nesting sea birds, cormorants, osprey, bald eagle, great blue heron and common tern. Increased development and coastal recreation are reducing the amount and availability of suitable island wildlife habitat within this and other coastal ecodistricts. Bald eagles prefer to nest in coastal environments near rivers with healthy fish runs. Several nests are found near the head of St. Margarets Bay. Osprey, common within this ecodistrict, often nest on power transmission line poles close to the coast and freshwater lakes and rivers.

For more detailed and more current information on species at risk and species of conservation concern in this ecodistrict, refer to Appendix 3 and Map 6 in a separate Part 3 of this document. These species are important components of the landscape and are given priority attention in planning, management and stewardship activities.

With much of the ecodistrict privately owned, effective wildlife management will to a great extent rely on active, informed stewardship by the many landowners. The Department of Natural Resources can assist private land stewardship by providing knowledge and information on various management strategies. Legislation such as the Wildlife Habitat and Watercourse Protection Regulations, the Endangered Species Act and the Activities Designation Regulations address species and habitat concerns within the forest and wetland ecosystems.

Part 2: Linking the Landscape to the Woodlot – *How Woodland Owners Can Apply Landscape Concepts to Their Woodland*

This second part of the report provides information on how landscape concepts can be applied at the woodlot level. The starting point is an introduction to natural disturbances and succession to provide a foundation for better understanding forest ecosystems. The focus then shifts to elements that make up each ecodistrict and the forest groups and vegetation types at the stand level. This allows woodland owners to move between elements and stands to see how their woodland fits in with the larger landscape.

Forest Disturbances and Succession

Forest Disturbances

A disturbance can be described as an event, either natural or human-induced, that causes a change in the existing condition of an ecological system.

Disturbance pattern controls forest development classes (establishment, young, mature, multi-aged / old forest) and their distribution over area and time.

Due to the coastal location of Nova Scotia and its Maritime climate, the extent, intensity and frequency of natural disturbances is difficult, for the most part, to predict. Prior to European settlement, natural disturbances were only curtailed by natural barriers such as water, climate, topography and vegetation change. After about 400 years of activity by European settlers, the frequency, intensity and magnitude of these natural processes has been affected.

New disturbances have been introduced as a result of human activity and include:

- clearing of forests for agriculture
- timber harvesting
- urbanization and development
- introduction of exotic animals, plants, and insects
- disease-causing agents, such as viruses or bacteria
- fire suppression in the forest
- and changes in the chemical and physical characteristics of the atmosphere

Understanding how ecosystems respond to disturbances is critical to understanding how they function and how they can be managed. This will assist woodland owners and forest managers in:

i. assessing the potential for old forest stands and development class distributions
ii. determining appropriate patch sizes and species composition to emulate natural structures and processes

iii. prescribing the appropriate rotation age and development class structure across a forested landscape
iv. projecting future changes to the forest due to climate change and human disturbances
v. maintaining and conserving biodiversity

Natural disturbances are agents that abruptly change existing conditions and initiate secondary succession to create new ecological communities.

By adapting forest management practices to create the structures and processes that emulate natural disturbances, woodland owners and forest managers can help shape forest landscapes.

One approach that closely mimics nature is to allow ecosystems to naturally develop without active management. This approach is particularly effective on lands with long-lived tree species, such as red spruce, white pine, hemlock, sugar maple, yellow birch and beech. One of the roles of protected areas is to allow this to occur and also provide a model to compare with managed forests.

Many of the early successional vegetation types can be by-passed if harvesting or natural disturbance occurs when there is a well-stocked or established layer of advanced shade tolerant regeneration, such as red spruce, eastern hemlock or balsam fir.

The additional moisture from frequent rains and fog during the spring and summer seasons may also reduce the possibility of fires compared to the drier South Mountain Ecodistrict, where red and white pine, white birch and red oak, which are indicators of a fire history, are more prevalent. The added moisture during the growing season also assists in the re-establishment of red spruce forests after natural or human disturbances.

Hurricanes have played a significant role in shaping the forests of this ecodistrict, most likely due to its geographic position near the Atlantic Coast and at the end of two major coastal bays. Titus Smith is reported to have noticed extensive blowdown during a tour of the St. Margarets Bay area in 1802. Smith reported that at times there were miles where nearly all the trees had blown down, apparently from the Great Storm of September 25, 1798.

According to a local settler, as told to him by the Mi'kmaq, there had been an extensive blowdown 80 years earlier followed by a large fire ravaging part of Lunenburg County. This is an early verification that fire hazard following blowdown is worsened by the heavy fuel loads of downed material that dry quickly and become susceptible to ignition during extended periods of summer dryness.

Natural disturbances have shaped the development of forests in the St. Margarets Bay Ecodistrict

Natural Succession

Succession refers to the changes in vegetation types (communities) following disturbance which, over time, often leads to a climax stage. Most changes follow a course of vegetation community development (seral stages) for a particular disturbance regime.

Climax vegetation refers to vegetation communities that are relatively long-lasting and self-replacing. Three types of climax vegetation can be described as follows:

Climatic climax – Vegetation types that are mainly a function of regional climate conditions; these occur on sites with average (mesic) moisture and nutrient conditions.

Disturbance climax – Vegetation types which, due to frequency of disturbance, do not progress to the climatic climax.

Another Definition of Succession

Succession, as defined by Odum (1971), is an orderly process of community development that involves changes in species structure and community processes with time; it is reasonably directional and, therefore, predictable.

Successional development generally proceeds through a number of distinct seral stages (e.g. early, middle, late) that replace one another in a predictable sequence and which culminates in a relatively stable and self-perpetuating community condition called a climax.

– From *Part 1: Vegetation Types (2010) of Forest Ecosystem Classification for Nova Scotia* http://www.gov.ns.ca/natr/forestry/veg-types

Edaphic climax – Vegetation types that are mainly a function of soil and site conditions (i.e. low or excess moisture, low or high fertility) which do not progress to the climatic climax.

St. Margarets Bay – Elements Defined

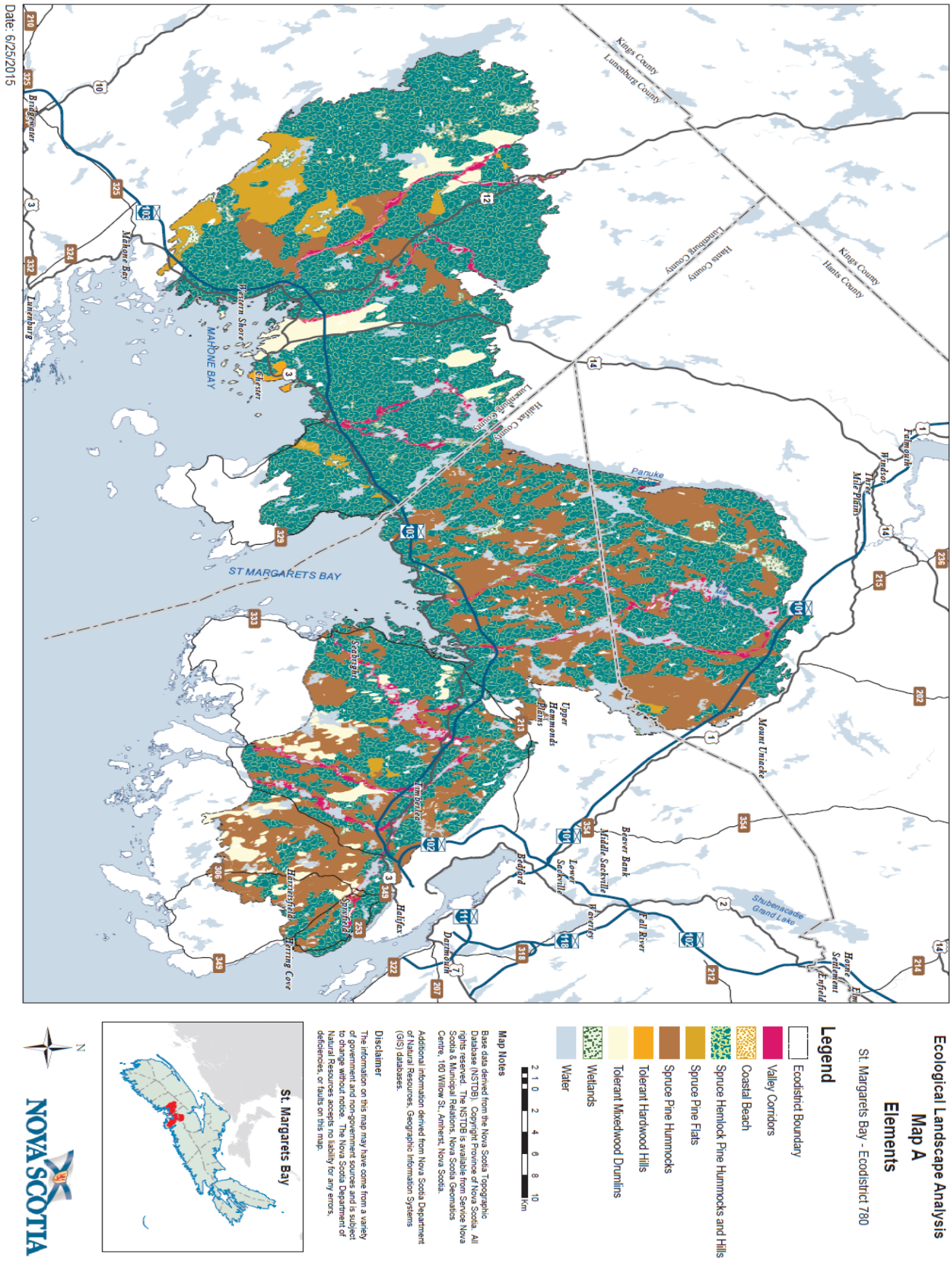
Landscapes are large areas that function as ecological systems and respond to a variety of influences. Landscapes are composed of smaller ecosystems, known as elements. These elements are described by their physical (e.g. soil, landform) and ecological features (e.g. climax forest type). These characteristics help determine vegetation development. Elements promote an understanding of historical vegetation patterns and present disturbances.

A landscape profile identified and mapped seven distinctive landscape elements in the St. Margarets Bay Ecodistrict – one matrix, and six patches. A matrix is the dominant community type. Patches are smaller yet still distinctive community types.

Spruce Hemlock Pine Hummocks and Hills is the matrix element, representing about two-thirds of the ecodistrict. The inherent softwood climax community of this element is red spruce, eastern hemlock and white pine.

The largest patch is **Spruce Pine Hummocks**, often found on poor quality soil, with a forest of black spruce, white and red pine. Smaller patches, in order of size, are **Tolerant Mixedwood Drumlins**, **Spruce Pine Flats**, **Wetlands**, **Tolerant Hardwood Hills** and the tiny **Coastal Beach**. See Table 5a for more detailed descriptions and Map A for element locations.

Map of Elements in Ecodistrict



Forest Stands Within Elements

Each element contains a number of forest stands that can be classified by vegetation, soil and ecosites. The Department of Lands and Forestry publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)***(http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp) is helpful in identifying forest plant communities.

Viewed online or available in print through Department of Lands and Forestry, woodland owners can learn about the characteristics of a particular forest community. Refer to Table 5a for descriptions of elements and Table 5b for forest vegetation types that are likely to be found within elements.

Table 5a – Elements Within St. Margarets Bay		
Landscape Element	**Size (Hectares)**	**Element Description**
Spruce Hemlock Pine Hummocks and Hills (Matrix)	115,063 67.3%	Spruce Hemlock Pine Hummocks and Hills is a matrix-level element occurring primarily on the hills and hummocky terrain where soils are well to rapidly drained and coarse-textured derived from granite till. A small portion of the element occurs on medium textured hummocks in the western part of the ecodistrict adjacent to the LaHave drumlins. The zonal condition supports a forest of red spruce and white pine with hemlock on the soils with higher moisture and nutrient content which are usually associated with lower slope positions. Yellow birch will also form a component on moister sites.
Spruce Pine Hummocks (Patch)	39,203 22.9%	Spruce Pine Hummocks is a patch-level element occurring on coarse-textured soils derived from granite till that are primarily imperfectly drained. Most of the element occurs on hummocky terrain but can also be found on low hills and ridged topography where soils are usually shallow to bedrock. A distinguishing feature is the low fertility of the soils which leads to a forest of black spruce and white pine with scattered red pine. Black spruce, white pine and red maple are predominant on all sites but white pine may occur as pure forests on the drier sites.
Tolerant Mixedwood Drumlins (Patch)	8,039 4.7%	Tolerant Mixedwood Drumlins is a small patch-level element scattered in the St. Margarets Bay Ecodistrict. Drumlin or drumlin-like landforms comprising unsorted glacial tills yield soils of variable textures that are typically well drained. Primary species include red spruce, hemlock, white pine, yellow birch, beech and sugar maple. Red oak and red maple may also be components. With progressively poorer drainage on the level terrain between drumlins, black spruce, tamarack and red maple dominate. Many islands within Mahone Bay are drumlins and are included in this element. The well-drained soils of these drumlin islands have often been converted to other land uses. Examples of late successional forest conditions are rare. Red spruce and white pine with scattered sugar maple, yellow birch and hemlock are found on the islands.

Table 5a – Elements Within St. Margarets Bay		
Landscape Element	**Size (Hectares)**	**Element Description**
Spruce Pine Flats (Patch)	5,540 3.2%	This element occurs primarily as small isolated areas within two large patches in the western portion of the ecodistrict. It occurs on imperfectly drained soils of coarse to medium textures on level terrain. Forests of black spruce, tamarack and white pine are typical but on the better drained soils red / black spruce, spruce / fir and balsam fir, all with white pine potential, are common. As soil drainage gets progressively poorer wet forests of red maple, alders, false holly, winterberry and other woody shrubs are common.
Wetlands (Patch)	2,808 1.6%	Small to medium sized wetland areas occur as bogs, fens, swamps, and poorly drained areas. The element may occur as a large wetland complex associated with rivers and lakes, or as narrow linear communities associated with flow accumulations and small streams. Wetlands are generally treeless or sparsely forested woodlands of slow growing black spruce with woody heath-like shrubs. For the most part, sites are underlain by poorly drained mineral soils or organic soils derived from peat (sphagnum mosses) or sedges. This element plays a critical role in water collection, filtering and ground water recharge and as habitat for the mainland moose.
Tolerant Hardwood Hills (Patch)	327 0.2%	This element occurs as a single occurrence near Chester on hilly, well-drained terrain. Much of the element has been converted to other uses and the forest is primarily red and black spruce, balsam fir and white pine. White spruce have established on abandoned farmlands. The soils have the potential to support a climax forest of tolerant hardwood, such as sugar maple, yellow birch and beech; however this is not currently reflected in the present composition of the existing forest. In addition, red maple and red oak should also be a component of this element. Stands can develop old forest characteristics.
Coastal Beach (Patch)	6 <0.1%	Very small fragmented, forested or partially forested areas in the Martins Point area. Area is now mud flats, salt marshes and gravel bars instead of the expected sand and cobble beaches.
Total	**171,005***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in St. Margaret's Bay						
Element	**Seral Stage**					
	Early	**% ***	**Middle**	**%**	**Late**	**%**
Spruce Pine Flats		10.1		36.8	**SP7**	32.6
Spruce Pine Hummocks	IH1, SP2, SP8	9.0	IH2, IH6, SP3, SP4, SP6, SP9	26.2	**SP5, SP7,** SP9	41.4
Spruce Hemlock Pine Hummocks and Hills[2]	IH3, IH4, IH5, IH6, MW4, MW5	16.2	SH5, SH6, MW2	32.0	**SH1, SH2, SH3, SH4,** MW1	31.3
Tolerant Hardwood Hills	IH3, IH5, IH6, OF1, OF3	20.2	IH7, TH8	4.6	**TH1, TH2,** TH3	9.4
Tolerant Mixedwood Drumlins[2]	OF1, OF2, OF3, OF4, IH4, IH5	23.0	IH6, IH7, MW2, MW4, SH5, SH6	34.3	**MW1, TH8,** SH1, SH2, SH3, SH4	18.8
Wetlands	FP3, WC1, WC2, WC5, WC6, WC7, WC8, WD1, WD2, WD3, WD6, WD7, WD8, SP7					

View forest groups and vegetation types at
http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by Department of Lands and Forestry are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (KA), Mixedwood (MW), Old Field (OF), Open Woodland (OW), Spruce Hemlock (SH), Spruce Pine (SP), Tolerant Hardwood (TH), Wet Coniferous (WC), Wet Deciduous (WD)
Bolded vegetation types indicate typical late successional community
[1] Forest Ecosystem Classification for Nova Scotia (2010)
[2] Hemlock is a minor component of this element in 780
*Percentage of element in each successional stage. Percentages may not total 100 due to unclassified lands (such as clearcuts and regenerating stands) not being included.

Photos Illustrating Vegetation Types in Elements

The following photos show some of the vegetation types expected to be found within their respective elements.

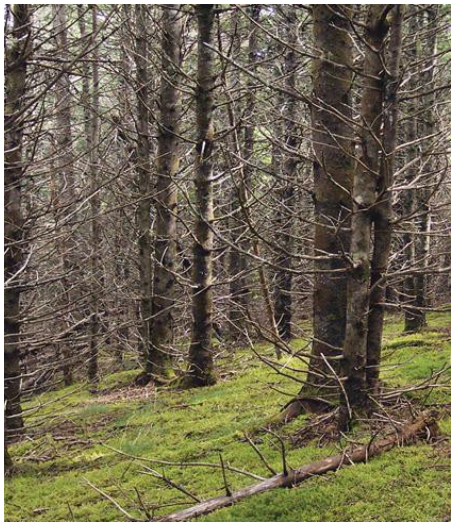
Hemlock / Pin cushion moss / Needle carpet (SH)1 is a late successional vegetation type found in the Spruce Hemlock Pine Hummocks and Hills matrix element.

Black spruce – Aspen / Bracken – Sarsaparilla (SP8) is an early successional vegetation type found in the Spruce Pine Hummocks patch element.

Red spruce – Red maple – White birch / Goldthread (MW2) is a mid-successional vegetation type found in the Tolerant Mixedwood Drumlins patch element.

Black spruce / False holly / Ladies' tresses sphagnum (SP7) is a late successional vegetation type found in the Spruce Pine Flats patch element.

The Red maple / Sensitive fern – Lady fern / Sphagnum (WD3) vegetation type is found in the Wetlands element.



White spruce / Aster – Goldenrod / Shaggy moss (OF1) is an early successional vegetation type found in the Tolerant Hardwood Hills patch element.

Landscape Composition and Objectives

Landscapes contribute to the maintenance and conservation of native biodiversity. Managing landscapes for biodiversity requires a variety of planning approaches and tools. Sustaining forest composition diversity by reflecting natural patterns of disturbance and succession is one approach that Department of Lands and Forestry is employing to try and realize this objective. Department of Lands and Forestry is developing a number of additional approaches and planning tools which will be integrated with objectives defined in the Ecological Landscape Analysis protocol.

Human activities, such as forest harvesting, can have a significant impact on the structure and composition of the forested landscape. Well-planned harvesting can provide a tool to achieve landscape composition goals.

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

Frequent Stand Initiating – Disturbances usually occur more frequently than the average life span of the dominant species and are of sufficient intensity to kill most of the existing mature trees, thereby promoting the establishment of a new forest within a relatively short period. Some unharmed trees often survive the disturbance in pockets and/or as scattered individuals.

Infrequent Stand Initiating – The time between stand initiating disturbances is usually longer than the average longevity of dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests.

Gap Replacement – An absence of stand initiating disturbances supports the development of a dominant overstory that is sustained through dynamic processes of canopy gap formation, understory development and overstory recruitment. Gap formation ranges from individual tree mortality to the replacement of a small group of trees.

Natural disturbances shape the diversity of the forest ecosystem. In the St. Margarets Bay Ecodistrict, infrequent stand initiating disturbance is the predominant natural disturbance regime. The time between these stand initiating disturbances is usually longer than the average longevity of the dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests. In these types of disturbance regimes it is favourable to have the forest predominately in the mature development class and the mid and late seral stages.

The most common disturbance agents associated with the St. Margarets Bay are hurricanes.

Forest Composition

Forest disturbances lead to forest renewal and the development of young forest habitats with characteristic successional patterns. Management of landscapes to conserve biodiversity requires sustaining ecologically adequate representation of natural habitat diversity, among a number of other measures and planning approaches.

At a landscape planning scale, the variety of habitats can be broadly described in terms of the composition of development classes, seral stages and covertypes.

Development Classes describe changes in structure and process as forests age and trees grow larger. For landscape management purposes, four development classes are recognized:

- forest establishment (0 to 6 m height)
- young competing forest (7 to 11 m height)
- mature forest (> 11 m height; including multi-aged and old forest)
- multi-aged / old forest (multiple layered)

Within this simplified description there is considerable variation in the processes and structures that evolve in particular stands. When the current forest inventory is used to classify development classes, the height criterion is used. When forecasting future conditions using the Forest Model, the age criterion is preferred.

Harvesting and silviculture activities, such as planting and thinning, have been ongoing on Crown land since the 1940s.

Seral Stages describe changes in species composition of forest communities as succession progresses from domination of early seral "pioneer" species following disturbance, toward late seral communities dominated by long-lived, shade-tolerant "climax" species. Seral stage is dependent on the composition of tree species of a forest, irrespective of age. For landscape management purposes, three seral stages are recognized:

- early
- mid
- late

Early successional species are those that do well in direct sunlight and include white and grey birch, aspen, poplar, white spruce, tamarack, pin cherry, jack pine and red pine. These species grow quickly, but are usually short lived.

They are replaced by mid-successional species that can tolerate moderate amounts of shade, such as white ash and red oak.

Late successional species generally have a high shade tolerance and include hemlock, red spruce, sugar maple and beech, as well as yellow birch and white pine. The species often develop slowly in shaded understories and can be long lived and form old growth.

Covertypes descriptions further refine landscape composition by distinguishing forests of different community conditions. Management generally recognizes three forest covertypes:

- softwood (overstory cover of softwood species is 75% or more)
- hardwood (overstory cover of hardwood species is 75% or more)
- mixedwood (overstory cover of either softwood or hardwood is between 25% and 75%)

Forest Composition Objectives

Within ecodistricts, the forest composition should contain a range of conditions that sustain the inherent forest communities and dominant natural disturbance regimes. Table 6 provides target ranges for development class and seral stage composition appropriate for different disturbance regimes. These ranges have been derived from the professional judgment of Department of Lands and Forestry forest ecologists to guide composition objectives for large landscape areas.

Woodland owners can use this guidance to assess how their holdings contribute to the overall ecodistrict structure by referring to the landscape element bar charts that illustrate where deficiencies exist. For example, landowners who have a large amount of mature forest in an element where this is in short supply can recognize the contribution of their holdings to the overall health of the landscape.

Four hundred years of European settlement in the Acadian region has left insufficient natural landscape structure to confirm these ranges. Facing similar challenges, a comprehensive modeling approach was used by the Ontario Ministry of Natural Resources to support "range of variation" targets for natural disturbance regimes in the Great Lakes St. Lawrence region (http://www.ontario.ca/document/forest-management-great-lakes-and-st-lawrence-landscapes).

A full description of definitions and mapping of Nova Scotia's disturbance regimes is contained in the report "Mapping Nova Scotia's Natural Disturbance Regimes" available from the Department of Lands and Forestry website (http://novascotia.ca/natr/library/forestry/reports/NDRreport3.pdf).

Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)

Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5 - 20%	>60% most in mid and late seral stages	>16%
Gap Replacement	0 - 15%	0 - 15%	>70% most in late seral stage	>24%

Table 6 indicates that for frequent stand initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively even balance of early, mid and late successional stands. At least 8% of the mature forest should be in the multi-aged and old forest class.

The targets for the other disturbance regimes are shown in Table 6. Forest planning should strive to maintain composition within these targets, and identify corrective and mitigating measures when outside these ranges.

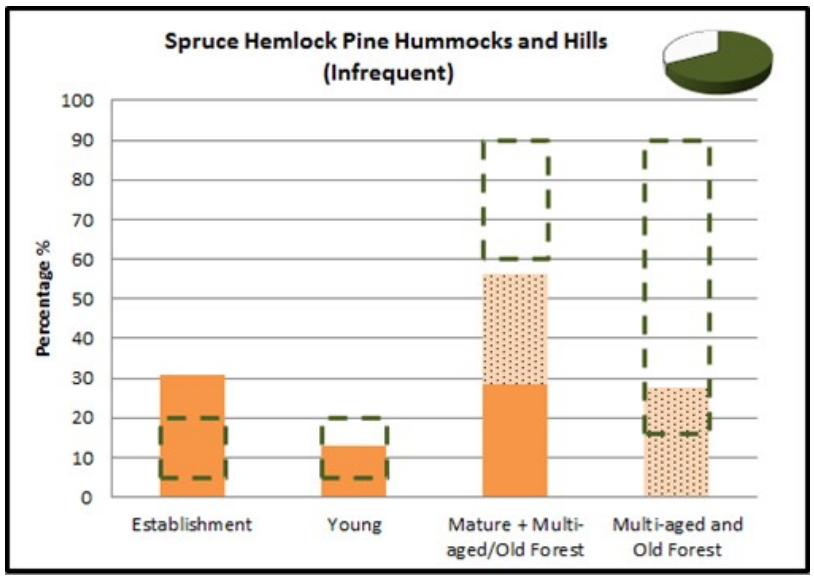
Healthy forests usually have a good variety of development classes.

Development Class Targets by Element

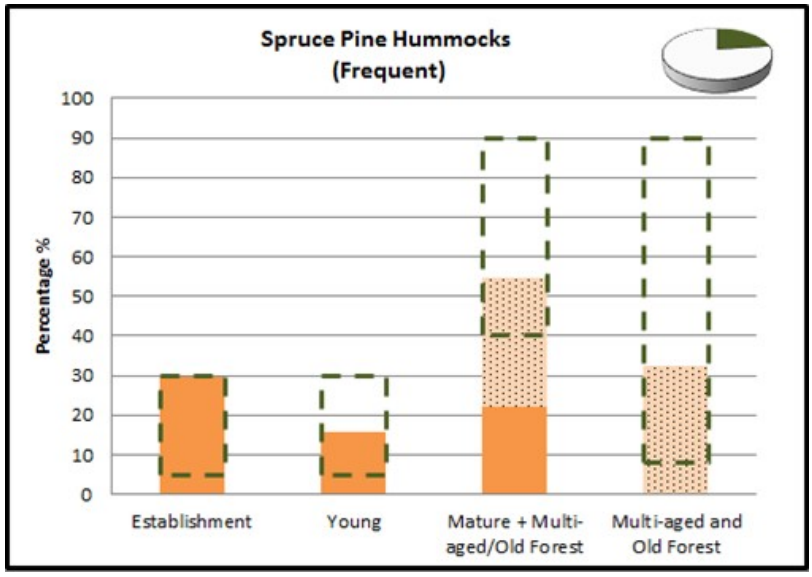
The series of charts that follow combine data on development classes for each element with desired or target percentages, based on the type of natural disturbance regime (NDR). The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage of each development class at the time the original data was gathered. The dotted area in the mature class shows the amount of multi-aged and old forest area included. The coloured portion of the small pie chart in the corner of the graphic shows the relative size of the element within the ecodistrict.

All non-forest elements, (e.g. Rockland, Wetland, Beach, Urban, Marshes/Grasslands, Salt marsh) and the Valley corridor element have not been measured or included in the 2019 update.

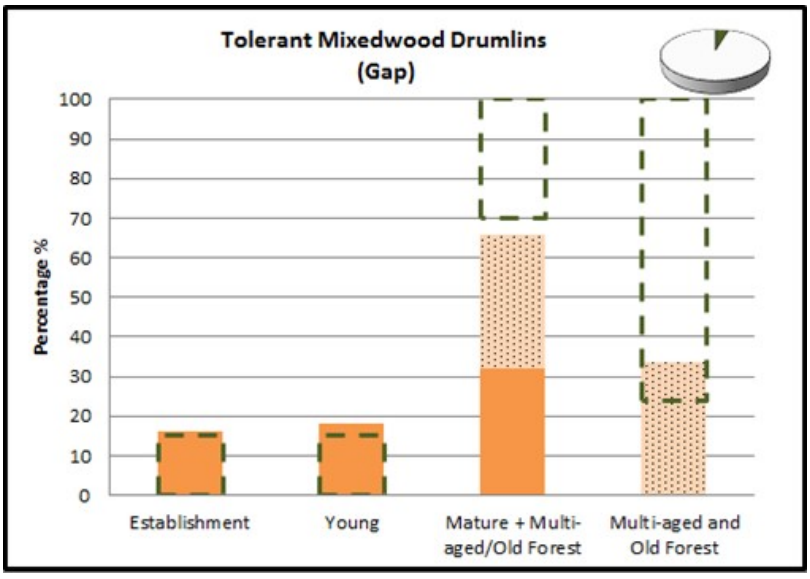
The **Spruce Hemlock Pine Hummocks and Hills** matrix meets the target range for young forest. The excess establishment may develop mature characteristics more quickly using silviculture to increase growth and climax species composition. Mature cover can be maintained with partial harvesting and extended rotations. Late seral species, large trees and natural regeneration are most appropriate.



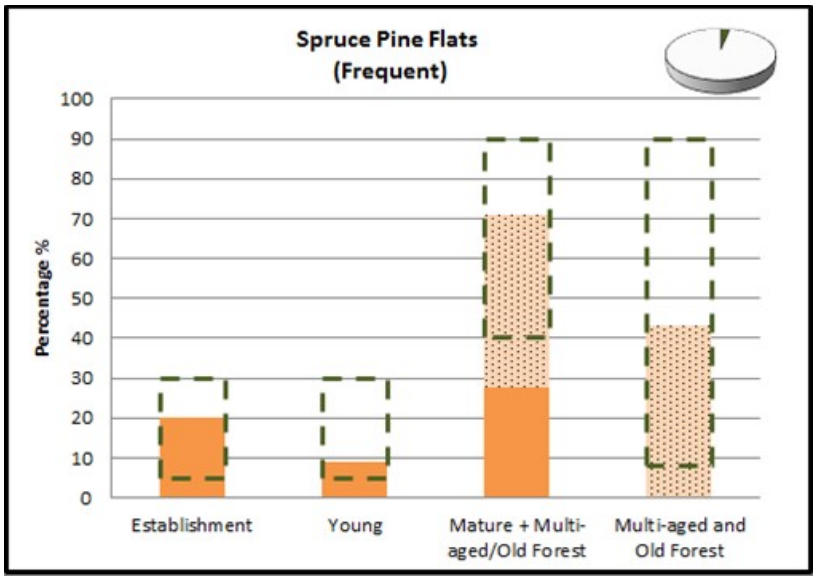
The **Spruce Pine Hummocks** patch element has a desirable range of development classes. These frequent NDR forests support periodic stand initiation events that favour establishment of an even-aged cohort, often with scattered surviving mature pine that provide large seed trees and super canopy structure.



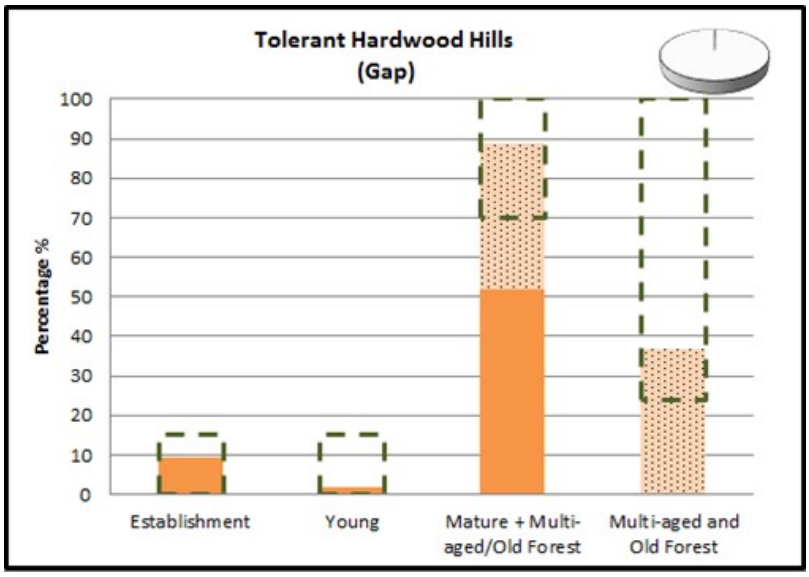
Tolerant Mixedwood Drumlins is a small patch element that currently has less mature and more young forest, thanis desired for gap NDR. Using silviculture in young stands to increase growth rates and climax species will hasten restoration of mature forest. Partial harvests, including retention of large old trees, will promote multi-aged forests of mixed climax species.



All the classes in the **Spruce Pine Flats** patch element are within the target ranges. Forest management options will favour clearcut and seed tree harvesting to encourage natural regeneration.



Tolerant Hardwood Hills is a small patch element with a single occurrence in the ecodistrict. Although the forest is predominately mature, the element has been heavily disturbed with over half converted to non-forest. This uncommon element warrants special attention to restore and maintain the unique tolerant hardwood habitat. A similar hardwood habitat may also occur on the upper slopes of the Tolerant Mixedwood Drumlins element.



Summary of Parts 1 and 2

This ends the first two parts of this report, which are available online to anyone who wants to view them. The intent was for the first part to provide a general overview of the ecodistrict for members of the public. The second part was designed for woodland owners to show how landscape ideas, such as elements, can be applied at the woodlot level.

The third part of the report, which includes more detailed information, maps, appendices, glossary, and literature citations, is designed for forest planners, managers, ecologists, analysts and interested woodland owners.

Glossary A: Terms in Parts 1 and 2

Biodiversity	The diversityof plants, animals and other living organisms, in all their forms and level of organization, including genes, species, ecosystems and the evolutionary and functional process that link them.
Canopy	The uppermost continuous layer of branches and foliage in a stand of trees.
Climax forest community	A relatively stable and self-perpetuating forest community condition that maintains itself (more or less) until stand-level disturbance causes a return to an earlier successional stage. The final stage of natural succession for its environment.
Climax vegetation	A forest or non-forest community that represents the final stage of natural succession for its environment.
Coarse filter approach	A habitat-based approach to conserving biodiversity by maintaining a natural diversity of structures within stands, and representation of ecosystems across landscapes. The intent is to meet the habitat requirements of most native species over time. Usually combined with a fine filter approach to conserve specific rare species and ecosystems.
Composition	The proportion of biological components within a specified unit such as a stand or landscape: **Stand or species Composition.** The proportion of each plant species in a community or stand. May be expressed as a percentage of the total number, basal area or volume of all species in that community. **Landscape Composition.** The proportion of each community type within a landscape. Community type may be defined by vegetation type, covertype, seral stage or development class (age).
Connectivity	The way a landscape enables or impedes movement of resources, such as water and animals.
Converted	Lands removed from a natural state (e.g. forest) and changed to other uses (e.g. agriculture, urban, settlement, road).
Corridor	Corridors are natural linear communities or elements, such as river valleys, that link parts of the ecodistrict. They are a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.

Crown land and Provincial Crown land	Used in these Ecological Landscape Analysis reports to include all land under the administration and control of the Minister of Natural Resources under the Forests Act, Section 3; as well as the lands under the administration and control of the Minister of Environment under the Wilderness Areas Protection Act. Also includes Federal Parks in the accounting of protected area representation.
Covertype	Refers to the relative percentage of softwood versus hardwood species in the overstory of a stand. In this guide, covertype classes are: **Softwood:** softwood species compose 75% or more of overstory **Hardwood:** hardwood species compose 75% or more of overstory **Mixedwood:** softwood species composition is between 25% and 75%
Development class	The description of the structure of forests as they age and grow (e.g. establishment forest, young forest, mature forest, multi-aged / old forest).
Disturbance	An event, either natural or human-induced, that causes a change in the existing condition of an ecological system.
Ecodistrict	The third of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecoregions. Characterized by distinctive assemblages of relief, geology, landform and vegetation. Used to define the landscape unit for these Ecological Landscape Analysis reports.
Ecological land classification	A classification of lands from an ecological perspective based on factors such as climate, physiography and site conditions. The Ecological Land Classification for Nova Scotia Volume 1 delineates ecosystems at five hierarchical scales: ecozone, ecoregion, ecodistrict, ecosection and ecosite.
Ecoregion	The second level of the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecozone. Used to characterize distinctive regional climate as expressed by vegetation. There are nine ecoregions identified in Nova Scotia.
Ecosection	The fourth of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecodistricts. An ecological land unit with a repeating pattern of landform, soils, and vegetation throughout an ecodistrict.
Ecosite	The fifth of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecosections. Characterized by conditions of soil moisture and nutrient regimes. Although not mapped, the Acadian and Maritime Boreal ecosites of the province are fully described in the Forest Ecosystem Classification for Nova Scotia (2010).

Ecosystem	A functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, pond, field, forest or the earth's biosphere – but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, such as a forest ecosystem, old-growth ecosystem or range ecosystem. Can also refer to units mapped in the Department of Lands and Forestry Ecological Land Classification system.
Element	A landscape ecosystem containing characteristic site conditions that support similar potential vegetation and successional processes. Elements were mapped by combining ecosections with similar climax vegetation and natural disturbance interpretations. Depending on their role in the ecosystem, elements may be described as matrix, patch or corridor.
Endangered species	A wildlife species facing imminent extirpation or extinction. A species listed as endangered under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal Species at Risk Act).
Even-aged	A forest, stand, or vegetation type in which relatively small age differences exist between individual trees. Typically results from stand initiating disturbance.
Extinct species	A species that no longer exists. A species declared extinct under federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Extirpated species	A species that no longer exists in the wild in Nova Scotia but exists in the wild outside the province. A species declared extirpated under federal or Nova Scotia endangered species legislation (Nova Scotia Species at Risk Act or federal SARA).
Forest management	The practical application of scientific, economic and social principles to the administration and working of a forest for specified objectives. Particularly, that branch of forestry concerned with the overall administrative, economic, legal and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection and forest regulation.
Frequent stand initiating	Disturbances usually occur more frequently than the average lifespan of the dominant species and are of sufficient intensity to destroy most of the existing trees, promoting a new forest within relatively short periods of time.

Gap replacement	An absence of stand initiating disturbances supports the development of a dominant overstory that is sustained through dynamic processes of canopy gap formation, understory development and overstory recruitment. Gap formation ranges from individual tree mortality to periodic gap formation events that are rarely of a stand initiating intensity.
Habitat	The place where an organism lives and/or the conditions of that environment including the soil, vegetation, water and food.
Impact assessment	A study of the potential future effects of resource development on other resources and on social, economic and/or environmental conditions.
Infrequent stand initiating	The time between stand initiating disturbances is usually longer than the average longevity of dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests.
Inherent conditions	Refers to the natural condition of ecosystems based on their enduring physical features. This is the potential condition expected in the absence of human influence.
Integrated Resource Management (IRM)	A decision-making process whereby all resources are identified, assessed and compared before land use or resource management decisions are made. The decisions themselves, whether to approve a plan or carry out an action on the ground, may be either multiple or single use in a given area. The application of integrated resource management results in a regional mosaic of land uses and resource priorities which reflect the optimal allocation and scheduling of resource uses.
Land capability (LC)	LC values represent the maximum potential stand productivity (m^3/ha/yr) under natural conditions.
Landform	A landscape unit that denotes origin and shape, such as a floodplain, river terrace or drumlin.
Landscape	An expanse of natural area, comprising landforms, land cover, habitats and natural and human-made features that, taken together, form a composite. May range in scale from a few hectares to large tracts of many square kilometres in extent.
Matrix	A widespread vegetation forest community which dominates the landscape and forms the background in which other smaller scale communities (patches) occur. The most connected or continuous vegetation type within the landscape, typically the dominant element. (Matrix is a fundamental feature of the “matrix, patch, corridor” concept of landscape structure.)

Mature forest	A development class within the sequence of 1) forest establishment; 2) young Forest; 3) mature forest; and 4) multi-aged and old forest. Mature forests include multi-aged and old forest. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old forest.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage or disease.
Natural disturbance regimes	The patterns (frequency, intensity and extent) of fire, insects, wind, landslides and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.
Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.

Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)
Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain or standing water body.
Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms that are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as "species of special concern." A species declared vulnerable under the federal or Nova Scotia endangered species legislation. (NS Endangered Species Act or federal SARA)
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).