Department of Lands and Forestry

2019 Update

ECOLOGICAL LANDSCAPE ANALYSIS TUSKET ISLANDS ECODISTRICT 840

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

ELA 2019-840

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 840: Tusket Islands
2019 Update for Part 1 and 2

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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.

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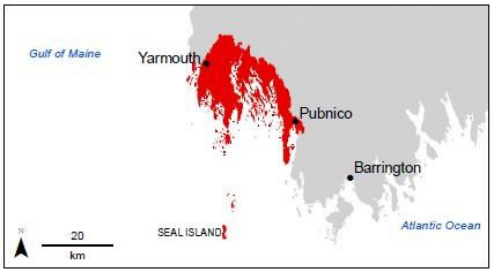


An objective of ecosystem-based management is to manage landscapes in as close to a natural state as possible. The intent of this approach is to promote biodiversity, sustain ecological processes, and support the long-term production of goods and services. Each of the province's 38 ecodistricts is an 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 Tusket Islands Ecodistrict 840. 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 Tusket Islands Ecodistrict extends along the coast of southwestern Nova Scotia from Pubnico to Yarmouth. This ecodistrict has similar topography and geology to the adjacent Clare (730) and Sable (760) ecodistricts but can be separated from them due to the climatic influence of the Gulf of Maine.

The moderating effect of the gulf gives this area the mildest winters in the province and a frost-free period of over half the year, longer than any other place in Atlantic Canada.

The Tusket Islands Ecodistrict is made up of a submerged coastline with tidal rivers and inlets, numerous islands, long linear peninsulas, and salt marshes. At any point, the ecodistrict seldom exceeds 10 kilometres in width.

Forests in this ecodistrict have been heavily impacted by human activity. Black spruce is the dominant species along the shore. White spruce and balsam fir are also common. In areas where shelter is provided by topography, conditions are suitable for other species such as red spruce, white pine and red oak and shade-tolerant hardwoods, such as sugar maple and yellow birch.

The Tusket Islands Ecodistrict includes islands and seascapes from southwestern Nova Scotia.

Offshore islands provide critical habitat for colonial nesting birds that require isolation from humans and predators to reproduce. Communally nesting species include great blue herons, double-crested cormorants, common eiders, common terns, Arctic terns, and Leach's storm petrels.

Extensive salt marshes such as this one at Abrams River provide significant habitat for migratory waterfowl.

Private land ownership accounts for 84% of the ecodistrict, with 10% held by the Crown and the remainder under other ownership.

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 six key landscape elements – one dominant matrix element and seven smaller patch elements – in Tusket Islands.

In the matrix **Coastal Spruce** element, representing 41% of the ecodistrict area, forests of black spruce and white spruce are typical. Red spruce may be found on better-drained soils, while on wetter soils red maple, tamarack, and alder are common.

Coastal Red Spruce Hills and Drumlins is the largest patch element and is located inland and on the interior islands of Lobster Bay. This element is sheltered from the coastal exposure and possesses conditions suitable for species such as red spruce, white pine, red oak, and shade-tolerant hardwoods. Where exposure is more prominent, a climax of black and white spruce can be expected. The other patch elements, in order of size, are **Coastal Spruce Flats**, **Salt Marsh**, **Wetlands**, **Coastal Spruce Islands**, **Coastal Spruce Ridges**, and **Coastal Beach**.

Forest Ecosystem Management
For Tusket Islands 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 Tusket Islands Ecodistrict 840. 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 Tusket Islands 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 Tusket Islands – *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

Tusket Islands is a coastal ecodistrict along Nova Scotia's southwest shore. Stretching from Yarmouth to Pubnico, the ecodistrict represents 9% of the Atlantic Coastal Ecoregion. The ecodistrict includes numerous islands in Lobster Bay.

The interaction of geological structures and glacial action has produced many, long, parallel ridges oriented in a north-south direction. Drumlins are present both inland and as offshore islands. Bedrock of the Tusket Islands is mostly quartzite and slate with an intrusion of granite near Wedgeport. Salt marshes are prominent features.

The moderating effect of the Gulf of Maine gives the area the mildest winters in the province. Summers are cool and fog is common.

Forests in the ecodistrict have been heavily impacted by human activity.

Black spruce is the dominant species along the shore with white spruce and balsam fir. Where shelter is provided by topography, conditions are suitable for other species such as red spruce, white pine, red oak, and tolerant hardwoods.

Red spruce is the dominant species over well-drained sites with moderately coarse soil. The climax forest on hills and drumlins with well-drained, sandy soils is red oak and white pine.

Natural disturbance agents in the ecodistrict are primarily associated with hurricanes and exposure from storms due to the proximity to the Atlantic Ocean.

Much of the forest is on imperfectly drained soils and is prone to blowdown which, once started, can quickly expand small patches into larger areas.

Insect defoliation has not been a significant factor, although the balsam wooly adelgid is damaging and causing mortality in balsam fir forests throughout the ecodistrict.

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

The Tusket Islands Ecodistrict includes Yarmouth, Wedgeport, Tusket, Argyle, and Pubnico as part of Lobster Bay Islands and the Tusket Islands, located mainly in Yarmouth County.

(From Ecodistricts of Nova Scotia map 2007)

Land Area

The majority of the land is owned privately (Table 1). A few scattered Crown blocks are present – the larger ones being Spinneys Heath and land at Comeaus Hill, Little River Harbour, and Brooklyn.

Table 1 – Land Area by Ownership in the Tusket Islands Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	4,056	9.7
Private	34,955	83.8
Federal	0	0
Aboriginal	26	0.1
Other (Includes inland water bodies and transportation corridors)	2,686	6.4
Total	**41,722**	**100**

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

The ecodistrict is rural in nature with many small communities interspersed among isolated dwellings, fields, abandoned fields, salt marsh, and forest. Yarmouth is the largest community with other centres located at Tusket, Wedgeport, and Pubnico. The fishing industry is the economic driver in the ecodistrict.

IRM Resource 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 (14%), General Resource Use; C2 (54%), Multiple and Adaptive Use (allows most uses, but special management may be required); or C3 (33%), Protected and Limited Use (such as beaches and sites of cultural and historic significance).

The former CN Rail line runs through this ecodistrict. The rail line is generally 30 metres wide but is wider at old station and siding sites. The long-term plan for this land is trail development, which is well underway. There are a large number of existing private crossings and new crossings are being applied for.

There is at least one campsite lease and two special leases in this ecodistrict. There are no new campsite leases being issued.

Almost all land below the mean high water mark is provincial Crown land. Permits are required from Department of Lands and Forestry for activities that take place on this land. These activities include wharf construction, bank stabilization, and installation of salt water intake and outflow pipes. Because of the extensive coastline in this ecodistrict, there are a large number of permits issued for these types of activities.

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	492	13.6
C2 – Multiple and Adaptive Use	1,943	53.5
C3 – Protected and Limited Use	1,179	32.5
Unclassified	16	0.4
Total	**3,630**	**100**

Forests

Tusket Islands has 41,722 hectares of area, of which 61% is forested (Table 3). The remaining area is occupied by wetland (18%), barrens (3%), urban (10%), roads, trails and utility (2%), agriculture (2%), and other (4%) which refers to areas such as water bodies, brush and alders.

Table 3 – Area Distribution by Land Category for All Owners		
Category	**Hectares**	**Percent**
Forested	25,543	61.2
Wetland	7,314	17.5
Agriculture	967	2.3
Barrens	1,390	3.3
Urban	4,059	9.7
Road, Trail, Utility	843	2.0
Other	1,607	3.9
Total	**41,722**	**100**

The current forest cover consists of 50% softwood, 39% mixedwood, 9% hardwood, and 2% unclassified.

Forests in this ecodistrict have been heavily impacted by human activity. Softwood species are the climax forest over much of the ecodistrict.

Boreal-like forests of black spruce with white spruce and balsam fir are prominent on the most exposed headlands and outer islands. Further inland and on the interior islands of Lobster Bay sheltered from the coastal exposure, conditions are suitable for other species such as red spruce, white pine, red oak, and shade-tolerant hardwoods.

The presence of these Acadian Forest species and their continuance up the Bay of Fundy coast in Maine and New Brunswick and into Chignecto Bay suggests that the coastal influence of the Gulf of Maine is moderate compared to that of the Atlantic Ocean.

Forests have been heavily impacted by human activity usually associated with settlement and the fishing industry.

Softwoods, such as spruce and balsam fir, dominate the forests in the ecodistrict.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.7 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.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	63	0.3
3	1,158	5.5
4	5,173	24.7
5	13,090	62.5
6	1,326	6.4
7 or more	142	0.7
Total	**20,952**	**100**

*Based on growth potential for softwood species.

Water Resources

The estuaries of the Tusket and Chebogue rivers are included in the ecodistrict.

Glacial action has resulted in an abundance of long narrow lakes – the longest being Eel Lake which stretches for seven kilometres.

Surface waters are often acidic and associated with bogs which are high in humus and impart a characteristic brown colour to the water. Wetlands are often associated with waterways. The ecodistrict has a large area of salt marsh along the estuaries of the Chebogue and Tusket rivers.

Salt marshes are common in the ecodistrict.

Water is an important provincial resource that must be considered in the context of IRM in general, and specifically within individual ecosystems.

The Environmental Goals and Economic Prosperity Act, which was enacted in early 2007, has committed the province to prepare a comprehensive water strategy. This strategy will include a high-level evaluation of water resources. *Nova Scotia's water strategy can be found at* *http://www.novascotia.ca/nse/water.strategy/docs/WaterStrategy_Water.Resources.Management.Strategy.pdf*

Minerals, Energy and Geology

The Tusket Islands Ecodistrict is located at the western end of the Atlantic coast and extends from the Yarmouth area in the west to the Pubnicos in the east. The ecodistrict is dominated by the metasedimentary rocks of the Meguma Supergroup, from 480 to 540 million years old.

The structural geology and degree of regional metamorphism is fairly complex in this ecodistrict. The Meguma Group and White Rock Formation were deformed during the Acadian mountain-building period about 400 million years ago, which resulted in a northeast-trending folding of the bedrock.

There are four major shear zones contained within the Meguma Group: Cranberry Point, Cape Forchu, Chebogue, and Kemptville. The shear zones are host to the Southwest Nova Scotia Tin Domain that extends from the northeast of the East Kemptville tin mine deposit to the Atlantic coast near Yarmouth.

Numerous polymetallic (tin-zinc-copper-gold), base, and precious metal deposits are found both within the granites of the batholith as well as the metasediments adjacent to the batholith. One of the few geological environments where the rare metal element indium is enriched is in tin-zinc-copper-gold deposits at East Kemptville, the only large-scale greisen hosted tin deposit in North America.

In the area near Arcadia and Plymouth, there has been extensive exploration on a tin-zinc-copper-indium mineral prospect. This area has mineral potential for tin and indium. The Pinkneys Point pluton is host to a copper-molybdenum-tungsten-tin occurrence. Associated with the granites in this ecodistrict is a mine site that produced mica. There is one known abandoned mine opening associated with the mica production and caution should be exercised if accessing this area.

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.

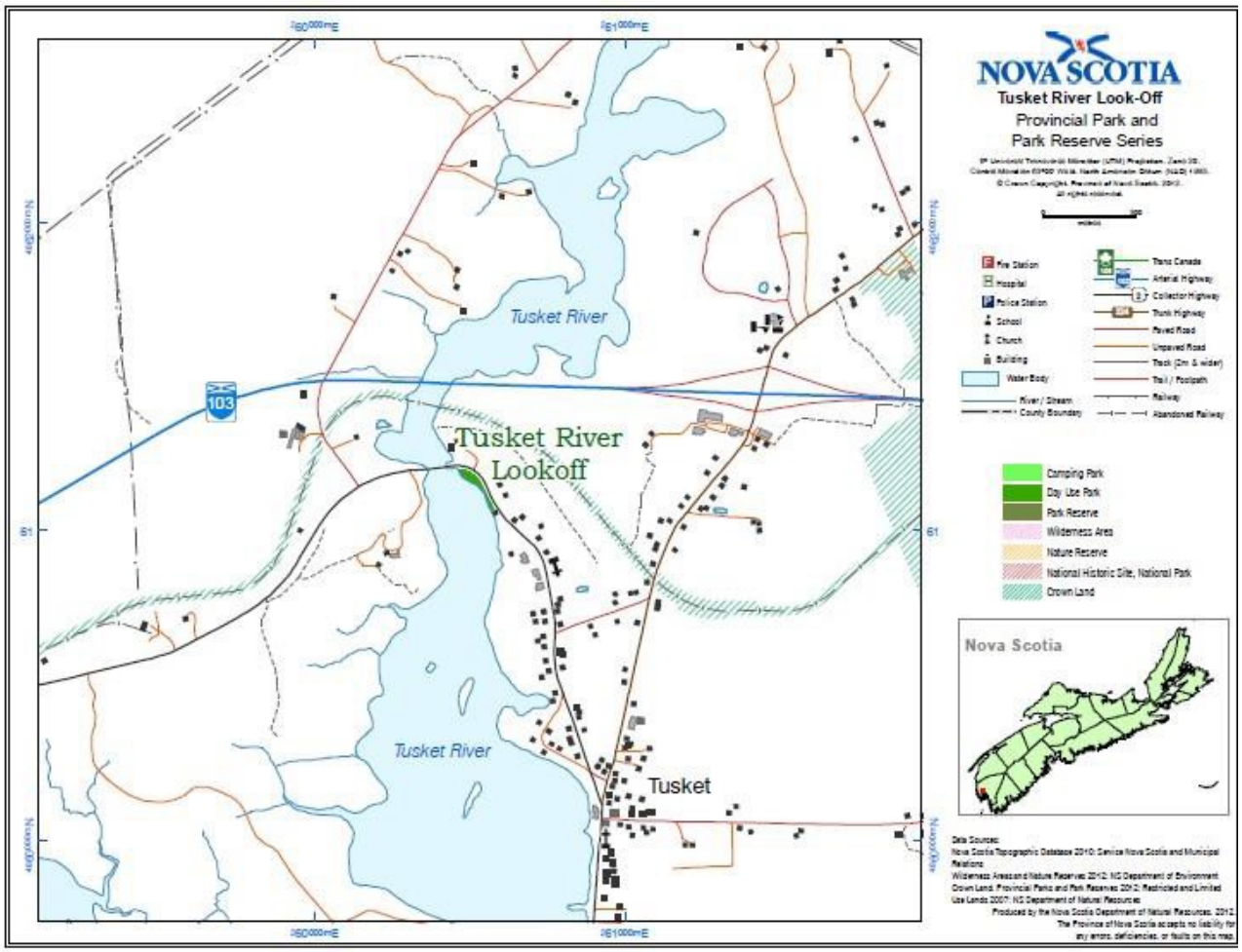
From an industrial minerals perspective, areas of the ecodistrict hold great potential. Some parts of the granitic plutons have been quarried for aggregate as well as dimension stone. Slate units in the ecodistrict are also being used as a source of aggregate. Large boulders from till deposits and glacial erratics are used for shoreline protection and enhancement along waterways and coastlines.

Glaciofluvial deposits (kames, eskers, and glacial outwash fans) occur in the Dominque and Upper Woods Harbour areas, which are excellent sources of sand and gravel. There are a number of stony till drumlins in the ecodistrict that are also good sources for sand, gravel, and glacial boulders.

This ecodistrict has a small number of large peat deposits that may be suitable for peat as well as fuel-grade peat production. The density of peat resources increases in the western end of the ecodistrict.

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/.



The Tusket River Look-Off is one of the recreational assets of the Tusket Islands Ecodistrict.

Wildlife and Wildlife Habitat

Wildlife in the Tusket Islands 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 Tusket Islands 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 management of fish resources in Nova Scotia is shared among the federal Department of Fisheries and Oceans and the Nova Scotia Department of Fisheries and Aquaculture. While the

Nova Scotia Department of Lands and Forestry does not have direct responsibilities related to fish, there is some overlap with regard to the aquatic habitat of fish and other wildlife.

Wetlands and Aquatic Habitat

In addition to providing important wildlife habitat, wetlands perform vital environmental functions, such as flood and erosion control, groundwater recharge, and water filtration. Given their importance to wildlife in southwest Nova Scotia and their potential for containing rare species, all wetlands in this ecodistrict are considered to be a significant component of the landscape.

Wetlands data are contained in Department of Lands and Forestry's GIS wetland layer, collected primarily through aerial photograph interpretation. Wetlands of 0.2 hectares or more in size which are visible on aerial photos are included.

The most common freshwater wetlands in the Tusket Islands ecodistrict are bogs, which account for 65% of freshwater wetlands. Fens along watercourses are the next most abundant at 15%. Bogs and fens together make up 80% of total wetland area.

Unlike fens and shrub swamps, bogs receive their water primarily from rainfall, so they are not closely associated with watercourses in the ecodistrict, except where streams carry draining water away. Lakeshore wetlands account for 8% and other wetland types make up the remainder.

Wooded swamps are a common wetland type in Nova Scotia, but they are not documented in the Tusket Islands Ecodistrict. Wooded swamps can be under-represented in data because tree canopies make it difficult to detect them on aerial photographs. Water table data and experience on the ground suggest that these wetlands may be more common than indicated in manyecodistricts.

In addition to wetlands, watercourses and their tributaries provide important aquatic and riparian habitat. In these areas, aquatic plants and invertebrates support semi-aquatic mammal species, such as beaver and muskrat; several species of waterfowl, particularly ring-necked ducks, common mergansers, and black ducks; as well as amphibians and reptiles, including a number of frogs, salamanders, snakes, and turtle species.

The riparian zone, the area where terrestrial vegetation meets a watercourse or wetland, is one of the most productive habitat zones on the planet and it promotes a rich diversity of wildlife species.

Some of the most significant areas of salt marsh in Nova Scotia are found along the coast of the Tusket Islands Ecodistrict. Salt water wetlands are extremely important ecologically, providing nutrients to marine ecosystems, habitat for marine and terrestrial organisms, and protection of coastline.

Salt marshes are present at many sites along the coastline, but the most extensive marsh complexes are associated with the estuaries of the Chebogue and Tusket rivers.

Some of the most significant areas of salt marsh in the province are found in the Tusket Island Ecodistrict.

Terrestrial Habitat

Forested wildlife habitat in the Tusket Islands Ecodistrict is predominantly softwood and mixedwood, but wildlife habitat varies depending on location. Softwood forests with black spruce, white spruce, and balsam fir predominate along the coast, and stands of mixedwood are more common inland. A range of predictable wildlife species are associated with the various forest stand species and age compositions.

In attempting to broadly assess the nature of forested wildlife habitat within an ecodistrict, it can be useful to focus on the availability of preferred habitat for common species, such as white-tailed deer and snowshoe hare.

Deer prefer a mix of habitat types, as needs change seasonally. Ideal habitat for white-tailed deer would provide a combination of mature softwood cover, regenerating hardwood browse, open sites with herbaceous plants and fruits, and access to water.

The predominance of softwood in this ecodistrict does not provide the best habitat for deer, except where mature stands occur near sources of hardwood browse and other foods. Distribution and abundance of deer is variable and dependent on the arrangement of required habitat features.

Ideal habitat for snowshoe hare has low dense ground cover, shrubs and regenerating hardwoods, and is near open areas that provide access to green plants in summer. The best habitat that could potentially support large populations of snowshoe hare would be early successional hardwood and mixedwood forests.

The number of snowshoe hare and deer in the Tusket Islands Ecodistrict could also be limited somewhat by the apparent absence of wooded swamps, with their rich soils and understory of shrubs and other food plants. But this habitat may be more common than the data indicate.

Like deer, snowshoe hare will occur throughout the ecodistrict, but abundance will depend on the arrangement of suitable habitat features. Their distribution and abundance will in turn influence that of their predators, mainly bobcats and coyotes.

Birds of prey (raptors) are high trophic level feeders that occupy large territories and are far less abundant than their prey species. Because raptors are relatively few in number, raptor species are of concern from a conservation standpoint. Identifying existing or suspected nest site locations is an important aspect of raptor conservation. Information on nest locations is accumulated opportunistically and because of their transitory nature, this data requires regular updating.

The red-tailed hawk is one of the raptors found in the Tusket Islands Ecodistrict.

Raptor habitat requirements vary, but most need large mature trees for nesting. The red-tailed hawk is a species that hunts a variety of prey in areas of mixed open and wooded habitat, so the Tusket Islands should provide ample nesting opportunities. Ospreys are a high profile bird of prey in the ecodistrict, specializing in hunting fish along the coastline or on inland lakes. Nests occur near water either in trees or on man-made structures such as power poles.

The Tusket Islands Ecodistrict includes a number of offshore islands that provide critical habitat for colonial nesting birds that require isolation from humans and predators to reproduce.

Within the ecodistrict are islands that annually support communal nesting of great blue herons, double-crested cormorants, common eiders, common terns, Arctic terns, Leach's storm petrels, great black-backed gulls, and herring gulls.

In addition to salt marsh, which provides important habitat for marine and terrestrial organisms, extensive mud flats exposed at low tide are feeding sites for a number of species of migrating shorebirds. A unique coastal feature in the ecodistrict is Melbourne Lake, a tidal lake used by flocks of waterfowl.

An important wildlife feature of the Tusket Islands Ecodistrict is the occurrence of rare plant species belonging to a group known as Atlantic Coastal Plain Flora (ACPF). These plants became established in southwestern Nova Scotia between 10,000 to 14,000 years ago as a result of a land bridge that existed between Nova Scotia and Massachusetts. As glaciers melted and the sea level gradually rose, the land connection disappeared under the water, isolating the plants.

River watersheds and the coastal salt marshes are important habitats for coastal plain plants in the Tusket Islands Ecodistrict.

For more detailed and 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 Lands and Forestry 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 Environment Act's 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
- 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.

Since European settlement, the use of the land for agriculture and forestry, and the introduction of exotic plants, insects, pathogens, and fire suppression, has impacted the natural disturbance regime. The influence of a coastal climate and occasional hurricanes adds further complexity to the natural disturbance regimes.

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.

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.

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

The dominant climax forest is coastal spruce and fir with red spruce on sheltered sites. The eastern limit of the ecodistrict occurs at Pubnico Harbour. Coastal influence southwest of that point is

considered to be from the Gulf of Maine instead of the Atlantic Ocean. A working group studying the Gulf of Maine uses the Clyde River watershed as the southerly limit of the Gulf of Maine watershed.

There appears to be a climatic influence associated with the Gulf of Maine that allows the growth of red spruce and other tolerant species such as white pine, sugar maple, and yellow birch in the coastal zone. The continuance of these species along the shore to Cape Chignecto, around the Bay of Fundy and down the coast of Maine indicates that the coastal influence of the Gulf of Maine is moderate compared to that of the Atlantic Ocean.

Tusket Islands – 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.

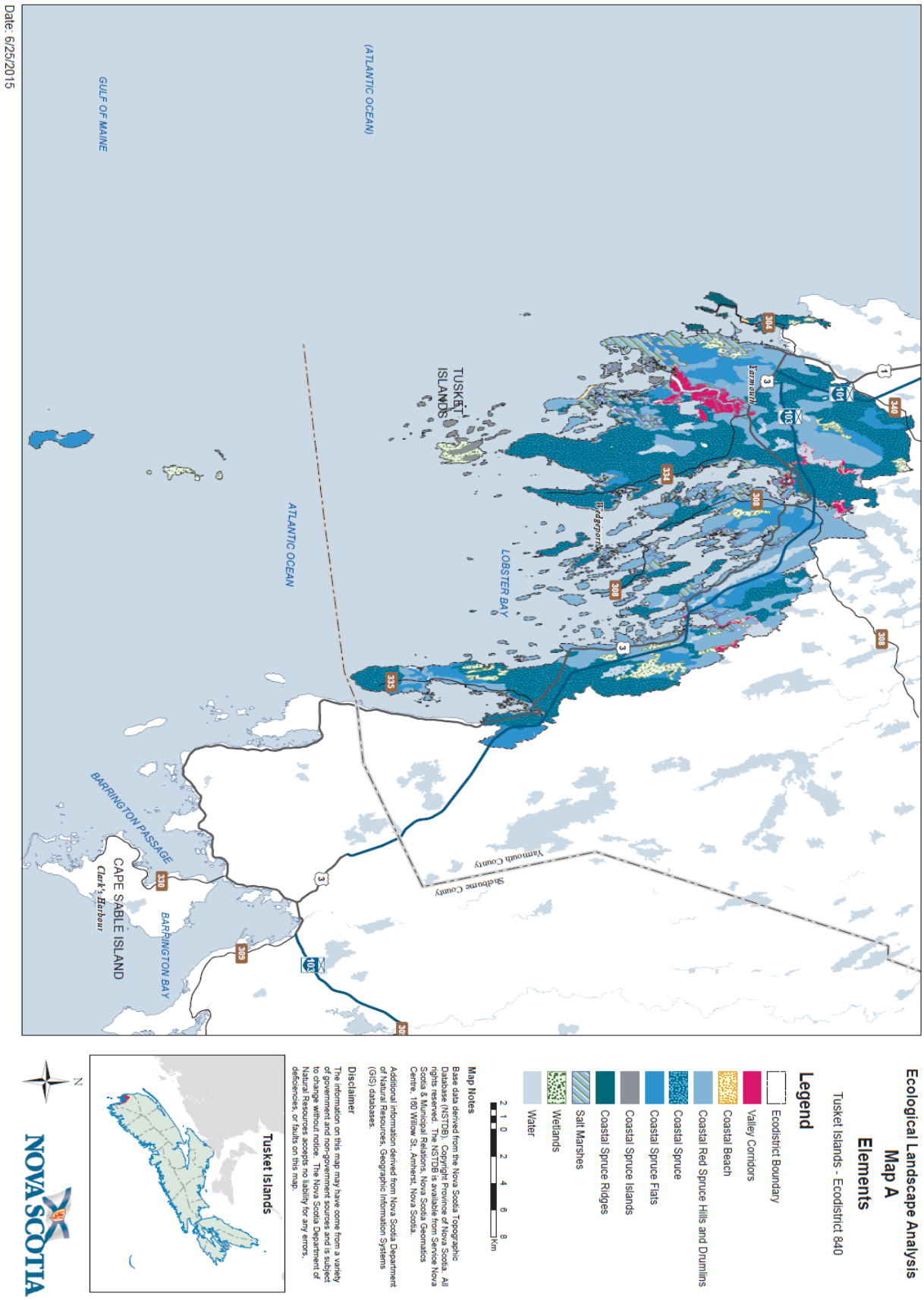
A landscape profile identified and mapped eight distinctive elements in the Tusket Islands Ecodistrict – one matrix and seven patches (Table 5a). A matrix is the dominant community type. Patches are smaller yet still distinctive community types.

In the matrix **Coastal Spruce** element, representing 41% of the ecodistrict area, forests of black spruce and white spruce are typical. Red spruce may be found on better-drained soils, while on wetter soils red maple, tamarack, and alder are common.

Coastal Red Spruce Hills and Drumlins is the largest patch element and is located inland and on the interior islands of Lobster Bay. This element is sheltered from the coastal exposure and possesses conditions suitable for species such as red spruce, white pine, red oak, and shade-tolerant hardwoods. Where exposure is more prominent, a climax of black and white spruce can be expected. The other patch elements, in order of size, are **Coastal Spruce Flats**, **Salt Marsh**, **Wetlands**, **Coastal Spruce Islands**, **Coastal Spruce Ridges**, and **Coastal Beach**.

Inkberry is one of the woody shrubs commonly found in the Coastal Red Spruce Hills and Drumlins patch element.

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 Tusket Islands		
Element	**Size (Hectares)**	**Element Description**
Coastal Spruce (Matrix)	16,403 41.2%	This matrix element occurs on moderately well-drained to imperfectly drained, coarse to medium-textured soils on hummocky terrain. Forests of black spruce and white spruce are typical but on the better-drained soils, red spruce may be possible in this ecodistrict. As soil drainage gets progressively poorer, wet forests of red maple, black spruce, tamarack, alders, false holly, winterberry, and ericaceous woody shrubs are common. Embedded within this element are wet open woodlands, bogs, swamps, fens, and seasonally flooded flats. This element is frequently disturbed by windthrow, insects and/or natural old age which limit the potential for old growth forest development. Earlier successional forests will have red maple and white birch but these species are quickly over-topped by the spruce. Further inland, the hardwood species will form part of the canopy and on better sites coastal hardwood forests and red oak are possible. Where forests have been cleared for settlement and later abandoned, forests of white spruce are common.
Coastal Red Spruce Hills and Drumlins (Patch)	11,601 29.1%	This is a significant large patch element in the Tusket Island Ecodistrict. This element occurs equally on well-drained, medium-textured drumlins or hummocks, often as islands, or long linear peninsulas in Lobster Bay. Where the sites are sheltered, red spruce is the climax forest with the occasional white pine. Where exposure is more prominent, a climax of black and white spruce can be expected. As soil drainage gets progressively poorer, wet forests of red maple, black spruce and tamarack with alders, false holly, winterberry, and ericaceous woody shrubs, such as huckleberry and inkberry, are common. Although this element is frequently disturbed by windthrow, insects and/or natural senescence old growth forest development is possible given the longevity of red spruce.
Coastal Spruce Flats (Patch)	4,462 11.2%	This patch element occurs primarily on imperfectly drained soils of medium texture (sandy loams) on flat terrain most often associated with lakes and watercourses. Wetlands are embedded within this element. Forests of slow growing black spruce are typical. As soil drainage gets progressively poorer, wet forests of red maple, black spruce, and tamarack with alders, false holly, winterberry, and ericaceous woody shrubs, such as huckleberry and inkberry, are common. Red maple fens along the major streams and rivers are noteworthy.
Salt Marsh (Patch)	4,935 12.4%	Extensive salt marshes are found along the Chebogue and Tusket rivers. Other significant marshes are near Melbourne (Little River) and around Morris Island. The salt marshes are formed from marine sediments deposited from repeated saltwater flooding of low-lying coastal areas. At high tide, deep deposits of sediment have been built up over time in sheltered, intertidal areas or behind spits, bars, or islands and protected bays. The deposits are typically silt loams with semi-decomposed grasses and sedges trapped in the accumulating layers. The dominant natural vegetation is various grasses. Saltwater cordgrass dominates the lower marsh while salt-meadow cordgrass (salt hay grass) is found on the drier and higher marsh. The lands have not been used for agriculture other than for pasture or the harvesting of salt marsh grass for hay or bedding for livestock.

Table 5a – Elements Within Tusket Islands		
Element	**Size (Hectares)**	**Element Description**
Wetlands (Patch)	1,550 3.9%	Wetlands is a patch element comprising freshwater bogs, fens, swamps and poorly drained areas (salt marshes are excluded). The element may occur as a large wetland complex associated with rivers and lakes, as narrow linear communities associated with flow accumulations and small streams, as a community of hydrophytic vegetation associated with level terrain where drainage is impeded, or as a depression in the landscape where water remains in excess year round. Smaller disjoint wetlands are often embedded within other elements, especially Coastal Spruce Flats.
Coastal Spruce Islands (Patch)	603 1.5%	This element comprises imperfectly drained-medium textured drumlins occurring as offshore islands or islands embedded in salt marshes. These islands include Big Tusket and the many smaller islands surrounding it as well as several islands located at the mouth of the Chebogue River. Black spruce and white spruce dominate the forest with some balsam fir. These forests are frequently renewed by windthrow and seldom attain a multi-aged condition. Tree height is severely restricted on the islands and krummholz-like conditions – indicative of windswept areas along the coast where severely exposed conditions restrict height growth – may occur.
Coastal Spruce Ridges (Patch)	215 0.5%	This small patch element occurs on bedrock-ridged terrain at Cape Forchu and nearby Kelleys Cove. Soils are well-drained of medium texture (sandy loams). The climax forest is dominated by black spruce and white spruce and is fully exposed to the coastal climate with very few red maple or white birch in the canopy. Krummholz white spruce occurs on the most exposed headlands. There are very few wetlands embedded within this element but there are adjacent salt marshes.
Coastal Beach (Patch)	57 0.1%	Coastal beaches are wave-dominated deposits composed of a mixture of sand, gravel, cobbles, and other sizes of sediments, occurring under a variety of circumstances leading to several types of beach landforms. In this ecodistrict, bars or spits are quite common. Pinkneys Point and Yarmouth Bar are two good examples. There are also many smaller spits on the islands at the mouth of Lobster Bay. Tombolos are beaches formed in the lee of islands where wave action is reduced, forming a connection between the mainland and an island. A good example connects two islands at Cape Forchu.
Total	**39,840***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Tusket Islands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Coastal Spruce	OW1, OW2, CO5, SP1	3.2	OW1, OW2, CO5, SP1	46.1	**CO1, CO2, CO4**, SP4	50.7
Coastal Red Spruce Hills and Drumlins	OF1, OF2, OF4, CO4, CO5	4.8	OF1, OF2, OF4, CO4, CO5	47.0	**CO3**, CO6	48.2
Coastal Spruce Flats	CO1, **SP7**, WC1, WC2					
Coastal Spruce Islands	**CO1,** CO2, CO4					
Coastal Spruce Ridges	**CO1,** CO2, CO4					
Salt Marsh	Grasslands of *Spartina*					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	WC1, WC2, WC3, WC6, WC7, WD3, WD4, WD6, 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)
*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.

White birch – Balsam fir / Foxberry – Wood aster (CO5) is a mid-successional vegetation type found in the Coastal Spruce matrix element.

Red maple – Birch / Bunchberry – Sarsaparilla (CO6) is a late successional vegetation type found in the Coastal Red Spruce Hills and Drumlins element.

Balsam fir / Cinnamon fern – Three seeded hedge / Sphagnum (WC6) is a vegetation type found in the Wetlands element.

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

Black spruce – Balsam fir / Foxberry / Plume moss (CO1) is a climax vegetation type found in the Coastal Spruce Islands patch element.

White spruce – Balsam fir / Foxberry – Twinflower (CO2) is a mid to late successional vegetation type found in the Coastal Spruce Ridges patch element.

White spruce / Bayberry (CO7) is a vegetation type found in the Coastal Beach 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 ELA 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.

The most common natural disturbance regime in the Tusket Islands Ecodistrict is frequent. This regime is typical of black spruce communities. The interval between stand-initiating events is generally shorter than the longevity of the climax species. This disturbance is intense enough that there is rapid mortality and a new even-aged forest becomes established. Another disturbance occurs before the stand becomes uneven-aged.

Agents of disturbance in this ecodistrict are usually associated with hurricanes and storm damage due to the proximity to the Atlantic Ocean. Much of the forest is on imperfectly drained soils and is prone to blowdown and, once started, can quickly expand small areas into large ones.

The less common infrequent natural disturbance regime occurs when the interval between stand-initiating disturbance events is longer than the longevity of the climax species. This disturbance regime is associated with tolerant softwood covertypes (such as red spruce, white pine, hemlock). Agents of disturbance are often hurricane, fire, and insects. If the interval between major disturbances is long enough, the area may take on old growth characteristics with multiple canopy layers.

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%

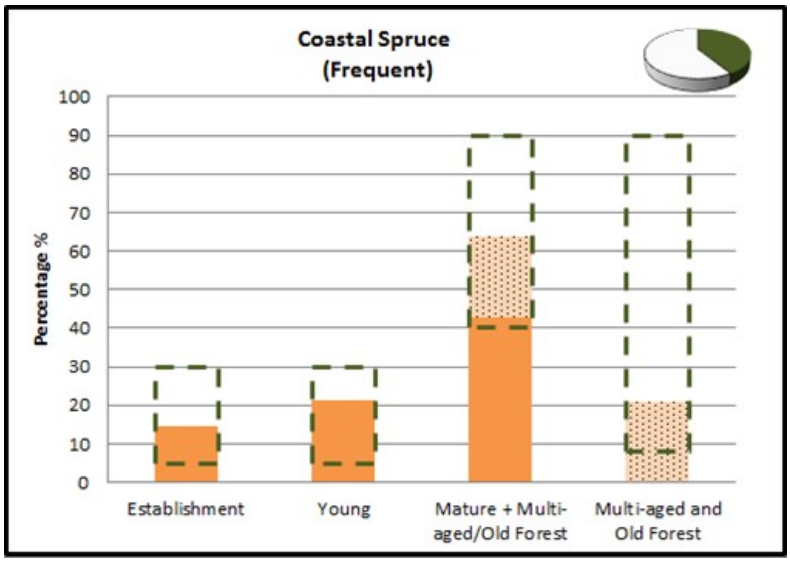
Table 6 indicates that for frequent stand-initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively 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.

Development Class Targets by Element

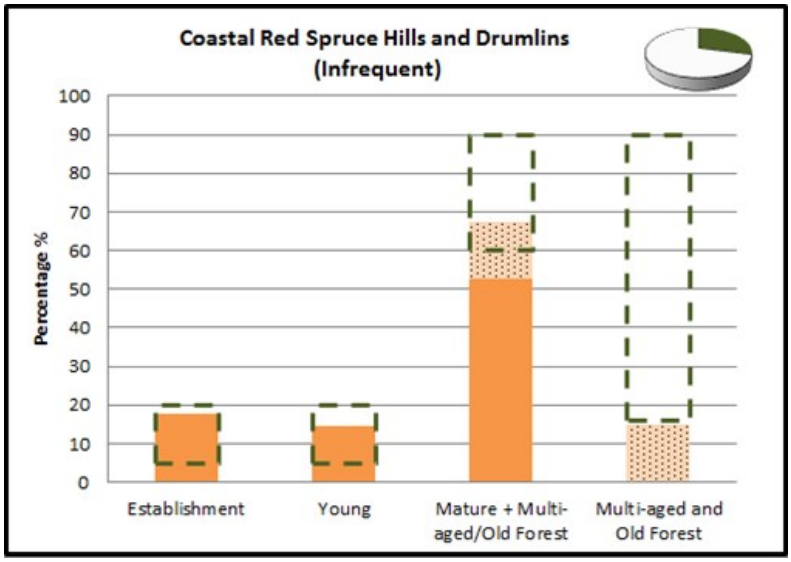
The series of charts that follow combine data on development classes for each element with desired or target percentages, based on the type of natural disturbance regime. The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage 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.

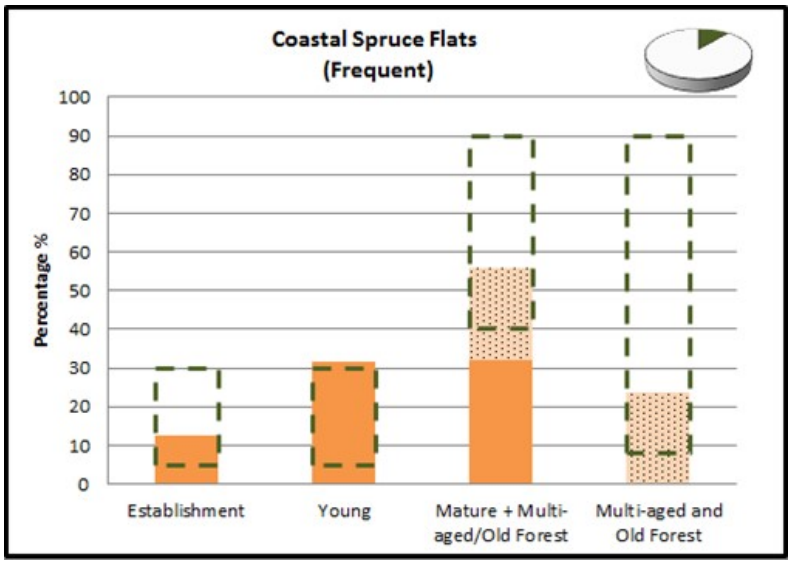
In **Coastal Spruce**, forest harvesting of mature and rapidly declining stands can continue with patch sizes consistent with those created by natural disturbances. Adequate advanced regeneration of fir and spruce at time of harvest will hasten ecosystem recovery. Young and mature forests on wind farm sites may be partially harvested to enhance and maintain mature and old forest conditions on the landscape.



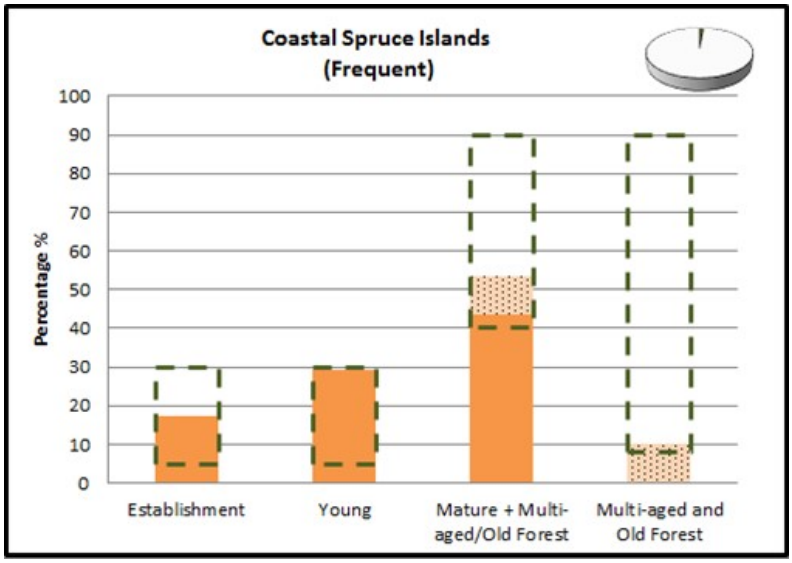
In **Coastal Red Spruce Hills and Drumlins**, all forest development classes are at or near their target levels except for multi-aged/old forest which falls slightly below minimum range. Forest harvesting in this element can continue, and where site conditions favour red spruce, partial harvesting is an option to increase and maintain mature and old forest conditions. Young forests of red spruce on wind farm sites can be commercially thinned.



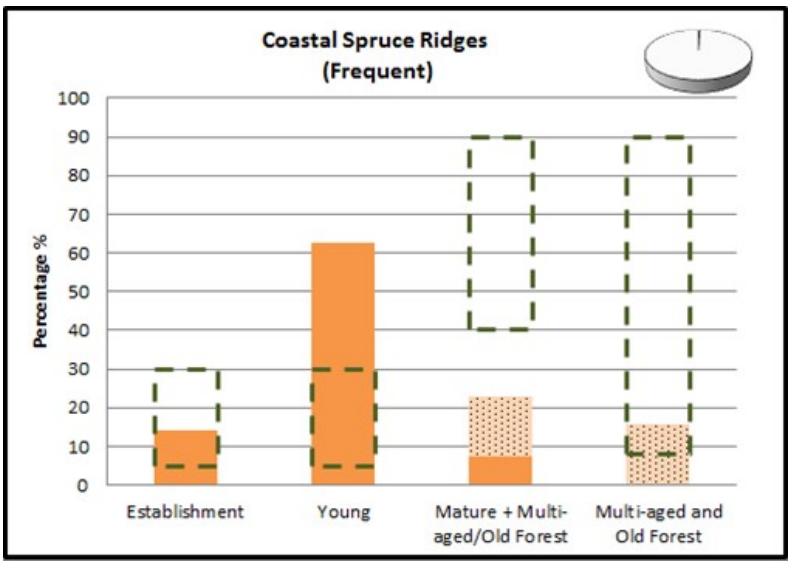
In **Coastal Spruce Flats**, forest harvesting of mature and rapidly declining stands can continue with patch sizes consistent with those created by natural disturbances. Adequate advanced regeneration of fir and spruce at time of harvest will hasten ecosystem recovery. Partial harvesting in this element is difficult due to the shallow rooting of spruce and fir on the imperfectly drained soils.



The Tusket Islands archipelago and the islands in the Chebogue estuary are the **Coastal Spruce Islands** element. The development classes strongly reflect the natural disturbances associated with the islands. Forests are important habitat for seabirds. There is little timber value other than specialized products associated with the fishery. Forestry practices are difficult due to the isolation from the mainland, negligible timber quality, and the severity of the local climate



The **Coastal Spruce Ridges** element receives the brunt of the coastal exposure. Windswept ridges with exposed bedrock or soils very shallow over bedrock support a stunted forest of white spruce with limited timber value. Forestry practices are difficult due to negligible timber quality and the severity of the local climate.



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 diversity of 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).