

Department of Natural Resources

# ECOLOGICAL LANDSCAPE ANALYSIS PARRSBORO SHORE ECODISTRICT 910

**PART 1:** Overview of Ecodistrict

**PART 2:** Linking the Landscape to the Woodlot



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## ***Ecological Landscape Analysis, Ecodistrict 910: Parrsboro Shore***

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos, and resources of the Parrsboro Shore Ecodistrict.

The Ecological Landscape Analyses (ELAs) were analyzed and written from 2005 – 2009. They provide baseline information for this period in a standardized format designed to support future data updates, forecasts and trends. The original documents are presented in three parts: Part 1 – *Learning About What Makes this Ecodistrict Distinctive* – and Part 2 – *How Woodland Owners Can Apply Landscape Concepts to Their Woodland*. Part 3 – *Landscape Analysis for Forest Planners* – will be available as a separate document.

Information sources and statistics (benchmark dates) include:

- Forest Inventory (1995) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

### **Conventions**

Where major changes have occurred since the original ELA report was written, the new information will be provided in *italics*, so that the reader can see how some conditions have changed since the benchmark date of the ELA.

A glossary of definitions is provided for words that are underlined.

REPORT FOR ELA 2015-910

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## Ecodistrict Profile

### Ecological Landscape Analysis Summary Ecodistrict 910: **Parrsboro Shore**

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 Parrsboro Shore Ecodistrict 910. 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 Parrsboro Shore Ecodistrict curls around the north shore of the Minas Basin, from Economy Mountain in the east and continuing west to Sand River and Chignecto Bay.

This ecodistrict can be characterized as a series of small rolling hills dissected by steep banks of rivers and streams flowing from the Cobequid mountains. There are also several smooth outwash plains, such as the lands around Parrsboro and Advocate.



Coastal plains with farmlands, forest and rolling hills of red spruce forests and cultivated wild blueberry fields are typical features of this ecodistrict.

Overall elevation seldom exceeds 125 metres, but the rapid descent to sea level creates the impression of a more significant rise. The local climate is significantly affected by the proximity to the cold waters of the Bay of Fundy. Summer temperatures are cool and fog is a common occurrence even though hot and humid conditions may exist a short distance away, in places such as Truro.

The area of the ecodistrict is about 41,000 hectares. Private land ownership accounts for 81.5% and 16.3% is under provincial Crown management. Most of the remaining lands are in transportation corridors and inland waters.

The exposed basalt cliffs in Cape d'Or are important habitat for several rare species of arctic-alpine plants.

Eighty-one percent of the Parrsboro Shore Ecodistrict is forested. Coastal forests of white spruce and red spruce skirt the headlands along the Minas Basin and slopes of Cape Chignecto, but the forests quickly revert to shade-tolerant hardwoods and softwoods a short distance from the shore. Red spruce is the dominant softwood and will be associated with hemlock and white pine on the lower slopes and hummocky lands. Forests of tolerant hardwoods, such as beech, yellow birch, and sugar maple, are associated with well-drained soils, usually occurring on the slopes of hills and hummocky terrain.

Numerous corridor systems follow the main river valleys and provide linkages to the adjacent Cobequid Hills and the Cumberland Hills ecodistricts. The forests within most of these corridors, notably Fox River at Port Greville, Farrells River at Parrsboro and Bass River of Five Islands and East River at Five Islands, have been significantly altered by human land use, settlement, farming, transportation systems, utility corridors, and forestry.



Rugged coastlines and extensive forests of red spruce provide a wilderness destination for hikers at the Cape Chignecto Provincial Park.

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 nine key landscape elements – one dominant matrix element, seven smaller patch elements, and a corridor element – in Parrsboro Shore.

**Tolerant Mixedwood Hills** is the matrix element, representing 38.5% of the ecodistrict. This element naturally supports a climax forest of shade-tolerant hardwoods, such as sugar maple, yellow birch, and beech on the upper slopes. Red spruce dominates on the middle and lower slopes, the current forest reflects the impacts of harvesting. Much of the area is early successional forests.

**Red and Black Spruce Hummocks**, the largest patch element, is mainly located in four large areas in Birch Hill, West Bay, Greenhill, and Five Islands. The softwood covertime of red and black spruce and balsam fir dominates, covering more than half of the element. The other patch elements, in order of size, are **Tolerant Mixedwood Slopes**, **Red and Black Spruce Flats**, **Spruce Pine Hummocks**, **Red Spruce Hummocks**, **Wetlands**, and **Salt Marsh**. *The ecodistrict also contains a tiny Coastal Beach element.*

In **Valley Corridors**, a linear element associated with major watercourses, conversion to other uses exceeds 50% due to activities such as farming, road systems, and harvesting.

## Forest Ecosystem Management For Parrsboro Shore 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 Parrsboro Shore Ecodistrict 910. 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 does not represent current inventory, but instead provides baseline conditions for the time when the report was researched, which in the case of the Parrsboro Shore Ecodistrict was up to about 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 DNR, such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011-2020 ([http://novascotia.ca/natr/strategy/pdf/Strategy\\_Strategy.pdf](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 Parrsboro Shore –*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**

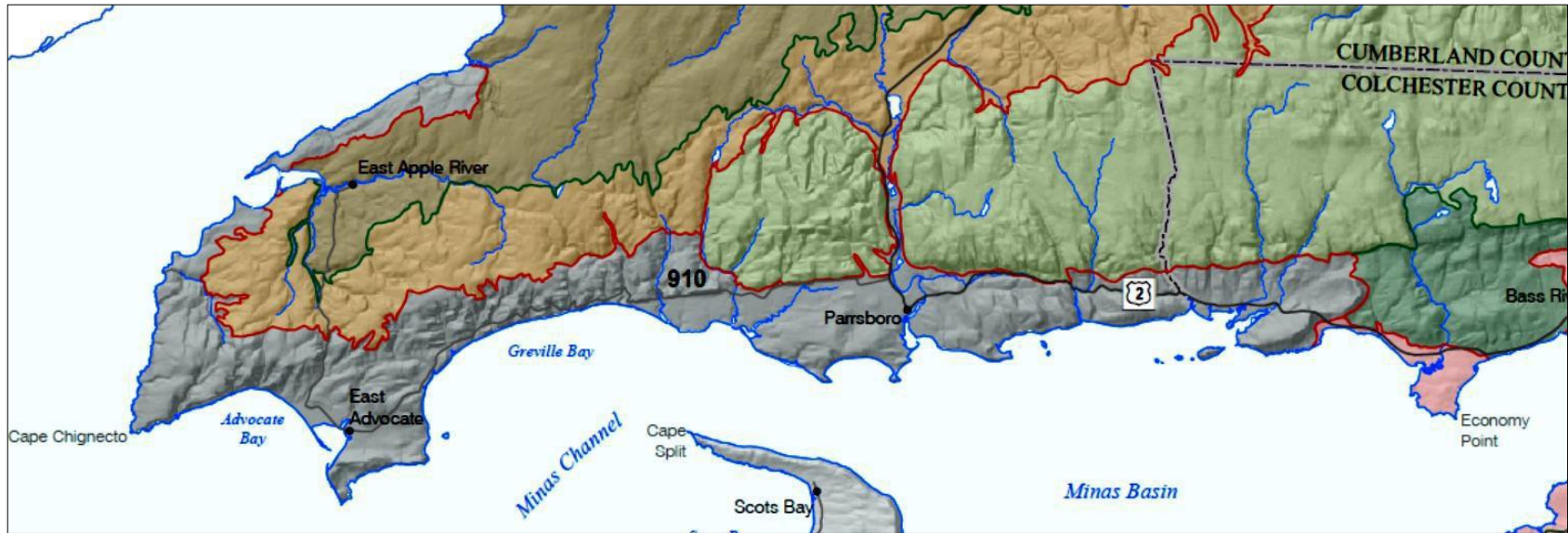
Nestled up against the Cobequid Hills Ecodistrict 340, Parrsboro Shore can be characterized as a series of small rolling hills dissected with steep canyons of rivers and streams flowing from the Cobequid mountains to the Minas Basin. Total ecodistrict area is 41,000 hectares.

The ecodistrict has three major faults running its length, with a series of minor faults throughout which have created a varied landscape with resistant basalts and erodible sandstones side by side. The lowlands are underlain by the soft sandstone, but where capped by basalt, high steep-sided hills are formed (e.g. Economy Mountain). Large glacial outwash plains can be found at Parrsboro and Advocate.

The predominant shaly and sandy loams cover the steep slopes from Five Islands to Advocate. On the lowlands, finer-textured imperfectly drained soils will be found around Parrsboro. The outwash valleys are underlain with rapidly drained coarser-textured soils often with a high content of gravel. Most of the freshwater in the ecodistrict occurs primarily in fast flowing narrow streams and rivers discharging off the Cobequids. The freshwater area is 265 hectares, or 0.6% of the ecodistrict.

Coastal forests of red and white spruce quickly change inland to typical shade-tolerant softwood forests of such as red spruce, hemlock, and white pine, and tolerant hardwoods, such as beech, yellow birch, and sugar maple. Adding to the complexity is the ability of both tolerant softwoods and hardwoods to grow together on many sites.

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



The Parrsboro Shore 910 Ecodistrict curls around Cape Chignecto in southwestern Cumberland County and follows the northern coastline of the Minas Basin to near Economy in Colchester County.

## Land Area

The Parrsboro Shore Ecodistrict is rural and predominately under private ownership at 81.5% (Table 1).

Administration under the provincial Crown accounts for 16.3%.

Table 1 shows the other ownership in the ecodistrict.

<b>Ownership</b>	<b>Area (hectares)</b>	<b>Percent of Total Area</b>
Provincial <u>Crown land</u>	6,668	16.3
Private	33,292	81.5
Federal	13	<0.1
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	900	2.2
<b>Total</b>	<b>40,873</b>	<b>100</b>
*Note: Figures may vary slightly from table to table because of rounding, averaging, and overlapping of categories and other factors.		

## 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, 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).

<b>IRM Land Use Category</b>	<b>Hectares</b>	<b>Percent of Crown Lands</b>
C1 – General Resource Use	464	7
C2 – Multiple and Adaptive Use	1,514	22.7
C3 – Protected and Limited Use	4,687	70.3
Unclassified	3	<0.1
<b>Total</b>	<b>6,668</b>	<b>100</b>

Aside from the public land inside and outside the Cape Chignecto Provincial Park, there is little Crown land within this ecodistrict. There are no camps or special leases. DNR staff issue permits to operate machinery on the beach for seawall or wharf work. These permits run for a short term, probably a few months per job.

## Forests

In the ecodistrict, 33,000 hectares, or 81%, are forested (Table 3).

Of the remaining area, 8% is classified as agricultural, 4% other and wetlands 3%. Urban areas, road, trail and utility corridors and barrens, combined, make up less than 4% of the area.

Softwood (42%) and mixedwood (36%) stands are the dominant forest cover types. Hardwood stands make up 19% with the remaining 3% unclassified.

Within the softwood cover type, red spruce is the dominant species and is associated with hemlock and white pine on hummocks. Red and black spruce-dominant stands are the most common forest community type, accounting for 34% of the area.

Only in the steep ravines will predominately softwood forests of the tolerant species be found such as pine-dominated or mixed spruce pine-dominated stands. These stand types are fairly uncommon as they account for less than 1% of the area.

Tolerant hardwoods, such as beech, yellow birch, and sugar maple, occur on the slopes of hills and steeper hummocky terrain. There are 1,935 hectares of tolerant hardwood stands within this ecodistrict, or approximately 5% of the area.

The relatively high percentage of this area in intolerant hardwood stands, 32% or 10,125 hectares, is

Category	Hectares	Percent
Forested	33,090	81
Wetland	1,357	3.3
Agriculture	3,379	8.3
Barrens	9	<0.1
Urban	887	2.2
Road, Trail, Utility	619	1.5
Other	1,532	3.7
<b>Total</b>	<b>40,873</b>	<b>100</b>



Agriculture accounts for more than 8% of the land use in the ecodistrict.

a reflection of the amount of harvesting that has created large areas of early successional forests dominated with red maple and white birch.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.5 cubic metres per hectare per year (m<sup>3</sup>/ha/yr), based on the ratings in Table 4. The average forest LC for the province is 4.9 m<sup>3</sup>/ha/yr.

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

<b>Table 4 – Area of Forested Land by Land Capability Rating</b>		
<b>Land Capability (LC) Rating (m<sup>3</sup>/ha/yr) *</b>	<b>Hectares</b>	<b>Percent</b>
2 or less	3,888	11.7
3	2,675	8.1
4	3,975	12.0
5	16,493	49.8
6	5,529	16.8
7 or more	531	1.6
<b>Total</b>	<b>33,091</b>	<b>100</b>
*Based on growth potential for softwood species.		



The forests in Parrsboro Shore 910 extend to the sea.

## Water Resources

Most of the freshwater in the ecodistrict occurs primarily in fast flowing narrow streams and rivers discharging off the Cobequids. Total freshwater area is 265 hectares, or 0.6%. There are no major lakes in this ecodistrict. There are numerous rivers and streams flowing from the Cobequid mountain range. The larger rivers include the Harrington, Moose, and Diligent.



Bass River of Five Islands flows into the Minas Basin.

## Minerals, Energy and Geology

The Parrsboro Shore Ecodistrict lies on and to the south of the Cobequid-Chedabucto fault system. The system comprises several faults generally running east and west, though several smaller faults run north and south, resulting in a significant change in topography between the highlands of the Cobequid mountains and the lowlands to the north and south.

The abundant fault movements give rise to varied geology in the Parrsboro Shore Ecodistrict. There are numerous significant mineral occurrences hosted by a wide range of rocks, many of which are related to mineralizing fluids moving along the fault zones.

There is good potential for iron-oxide, copper and gold deposits along the fault system.

Overlying the bedrock in many parts of Parrsboro Shore are recent glacial sediments. Most of the slopes are covered with a thin layer of glacial till with significant glacial fluvial deposits containing important sand and gravel deposits. These contribute to the development of soils. A significant peat deposit occurs near Diligent River.

There has been recent exploration for conventional oil and gas adjacent to and within the Parrsboro Shore Ecodistrict. The Carboniferous rocks of Nova Scotia have been subject to seismic survey exploration as recently as 2008. High energy prices will likely result in continued exploration. The sandstones and shales of the Horton Group are of particular interest in oil and gas exploration since they contain good source rock and reservoirs for hydrocarbons.

Past mining includes iron at Lower Economy, copper at Cape d'Or, and coal at East River of Five Islands, Kirkhill, and Brookville.

Since 2003, numerous mineral claims have been issued along the Cobequid-Chedabucto Fault Zone, permitting exploration for deposits of iron oxide, copper, and gold. This interest arose from the development of a new geological model based on characteristics of giant deposits being explored and mined in other parts of the world.



The red cliffs of the Parrsboro Shore Ecodistrict, which show a basalt layer on top of sandstone, are among the most distinctive in Nova Scotia.

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**

The Parrsboro Shore Ecodistrict includes 4,688 hectares of designated provincial parks and park reserves. The area encompasses Cape Chignecto and Five Islands Provincial Park, along with

seven protected parks (Partridge Island, Riverside, Lower Cove, Sand River, West Apple River, Port Greville, and Fox Point).

The Five Islands Provincial Park rises from the shores of the Minas Basin and features 90 metre sea cliffs that overlook the world's highest tides. The park features a campground with 90 sites, two picnic areas, an unsupervised beach, playground, and comfort station facility. The park also offers 14 kilometres of hiking trails, opportunities for beachcombing, rock collecting, clam digging, and nature appreciation.

Cape Chignecto Provincial Park towers 180 metres above sea cliffs that rise from the Bay of Fundy. This is a world-class wilderness park that features 29 kilometres of pristine coastline, deep valleys, sheltered coves, rare plants, and remnant old-growth forest. The park offers 40 kilometres of wilderness trails and remote walk-in campsites.



Cape d'Or, with its lighthouse and accommodation, is a major tourism attraction along the Parrsboro Shore.

Kayaking is popular around the entire shore but more so in the Cape Chignecto Three Sisters area. Recreational boating and fishing are common along the shoreline, as well as inland sport fishing on most of the river systems. Nova Scotia is promoted as a “Seacoast Destination” and the Glooscap Trail is a popular route along Highway 2 and Highway 209 that follow the shoreline from Truro to Apple River.

There are no wilderness areas (managed by the Department of Environment) that exist in the ecodistrict. Hunting for deer, ruffed grouse, pheasant, ducks, and geese along with trapping is fairly common throughout the ecodistrict and along the shorelines.

Cape d'Or is 45 kilometres from the scenic town of Parrsboro and is considered one of the primary locations along the Glooscap Trail. The site includes a lighthouse and a lookout platform which offers views of Cape Split and Isle Haute. The site also includes a restaurant and a converted lighthouse keeper's residence which serves as a guest house that offers travelers a view of a spectacular sunset and a place to spend the night.

The most current and up-to-date information for parks and protected areas in this ecodistrict can be found at: <http://novascotia.ca/parksandprotectedareas/plan/interactive-map/>.

## **Wildlife and Wildlife Habitat**

Wildlife in the Parrsboro Shore 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 Parrsboro Shore 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 DNR staff. Information on important sites is documented by DNR 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 Parrsboro Shore Ecodistrict includes the coastal area extending from Sand River to Economy along the Bay of Fundy. This area is largely influenced by the coastal climate and can be characterized as a series of small rolling hills dissected with steep ravines and streams flowing from the Cobequid Hills.

Along the coast, white spruce forests are common as they reclaim the fields that were once farmland. Old farmland has also been converted into blueberry fields that are scattered throughout this ecodistrict. As you move inland forests quickly change to tolerant hardwood and softwood species.



A captive breeding program in the 1970s involved the release of 72 peregrine falcons in the Parrsboro Shore Ecodistrict.

Several areas along the coast boast impressive cliffs which are some of the best peregrine nesting sites in the province. The peregrine is a medium-sized raptor that feeds almost exclusively on birds. These falcons nest on steep cliff ledges along the coast of this ecodistrict and have been recorded near Parrsboro, Five Islands, and Greenhill. Populations declined across North America with the falcon almost disappearing because of the use of DDT, which was banned in the 1970s.

With the decline of the peregrine falcon in the 1970s, a captive breeding program was initiated with hopes to restore the population over its former range. Both Cape d'Or and later Five Islands Provincial Park were release sites. Between 1982 and 1991, 34 birds were released at Cape d'Or and another 38 at Five Islands Provincial Park. The reintroduction program, along with the DDT ban, has seen populations increase.

Several rare plants have been identified in this ecodistrict. The exposed basalt cliffs in Cape d'Or are important habitat for several rare species of arctic-alpine plants. The steep headlands are dissected by ravines, and provide habitat for other rare plants including white snakeroot. The fertile hardwood slopes provide habitat for another group of rare plants including lance-leaved grape-fern, and rattlesnake plantain. Eastern white cedar has been identified along the boundary of a bog on the northern end of this ecodistrict.

There are a few small islands off the coast including Spencers, The Brothers, Pinnacle, Egg, Long, Diamond, and Moose. These islands provide important nesting opportunities for seabirds, colonial birds, and bald eagles. Moose Island was once inhabited and farmed; currently it is mostly forested and is part of Five Islands Provincial Park.

Migratory shore birds can be seen along the tidal flats and salt marshes at Advocate Harbour. Smaller numbers of shorebirds are found here than in other areas of the Bay of Fundy, and include species such as black-bellied plovers and ruddy turnstone.

This ecodistrict provides wintering area for white-tailed deer that move down from the higher elevations of the Cobequid Hills during harsh winters. Deer seek cover during the winter under mature softwood stands. These stands provide reduced snow depths, overhead thermal cover, higher nighttime temperatures, higher relative humidity, and reduced wind speeds. These factors will help to reduce heat loss and energy demands placed on deer during the winter when food is scarce and of lower nutritional value.

Recreational and commercial fishing is common and economically important in this area. Fishing weirs can be seen along the tidal flats in places like Soley Cove, Five Islands, and Partridge Island, where flounder, striped bass, and shad are caught. Clamming is also a common sight along the tidal flats. Although the number of clam diggers has been dwindling over the years, it is a common pastime for those who live along the shore.

Several small rivers flow through this ecodistrict. Sea trout come up the rivers and at one time these rivers also had salmon runs, but Bay of Fundy salmon are now listed as endangered. This emphasizes the need for special management zones along watercourses to protect the habitat for salmon and other species.

*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 DNR 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.

Natural forest disturbance agents in the ecodistrict are primarily associated with hurricanes and are of an infrequent nature. As such, old growth forests may develop with an uneven-age structure.

Fire is not considered a significant factor in forest disturbance in this ecodistrict due to its coastal climate. Insects that have had an impact on the softwood forests include the spruce budworm and the spruce bark beetle. The balsam woolly adelgid is currently causing damage in balsam fir forests. Insect damage can be lessened with colder winter temperatures of -30 degrees Celsius. The beech bark canker, introduced in the 1890s, has reduced the beech to an understory species although scattered disease-free individuals are not uncommon. The yellow birch dieback of the 1940s has been a significant agent in the Fundy forest.

An increase in average annual temperature due to global warming may have significant impact on forest composition, especially the abundance of black spruce and balsam fir. Soil moisture may not change since precipitation amounts are not expected to decrease with climate change. However, the frequency and extent of natural disturbances, such as fires caused by lightning and the blowdown of large forested tracts by hurricanes, may increase.

Notable disturbances, their approximate dates and the type of forests they affected are:

Spruce budworm	1985-1987	red spruce forests
Hemlock looper	1985	balsam fir forests
Yellow birch dieback	1940s	yellow birch in the upland hardwood forests
Beech canker	1900+	beech on all sites
Saxby Gale	1869	extensive damage throughout northern NS
Ice storm	March 2003	hardwoods

## 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.

## Parrsboro Shore – 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 nine distinctive elements in the Parrsboro Shore Ecodistrict – one matrix, seven patches, and a corridor (Table 5a). A matrix is the dominant community type. Patches are smaller yet still distinctive community types. Corridors are natural linear communities, such as river valleys, that link parts of the ecodistrict.

**Tolerant Mixedwood Hills** is the matrix element, representing 38.5% of the ecodistrict. This element naturally supports a climax forest of shade-tolerant hardwoods, such as sugar maple, yellow birch, and beech on the upper slopes. Red spruce dominates on the middle and lower slopes, the current forest reflects the impacts of harvesting. Much of the area is early successional forests.

**Red and Black Spruce Hummocks**, the largest patch element, is mainly located in four large areas in Birch Hill, West Bay, Greenhill, and Five Islands. The softwood covertime of red and

## 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.

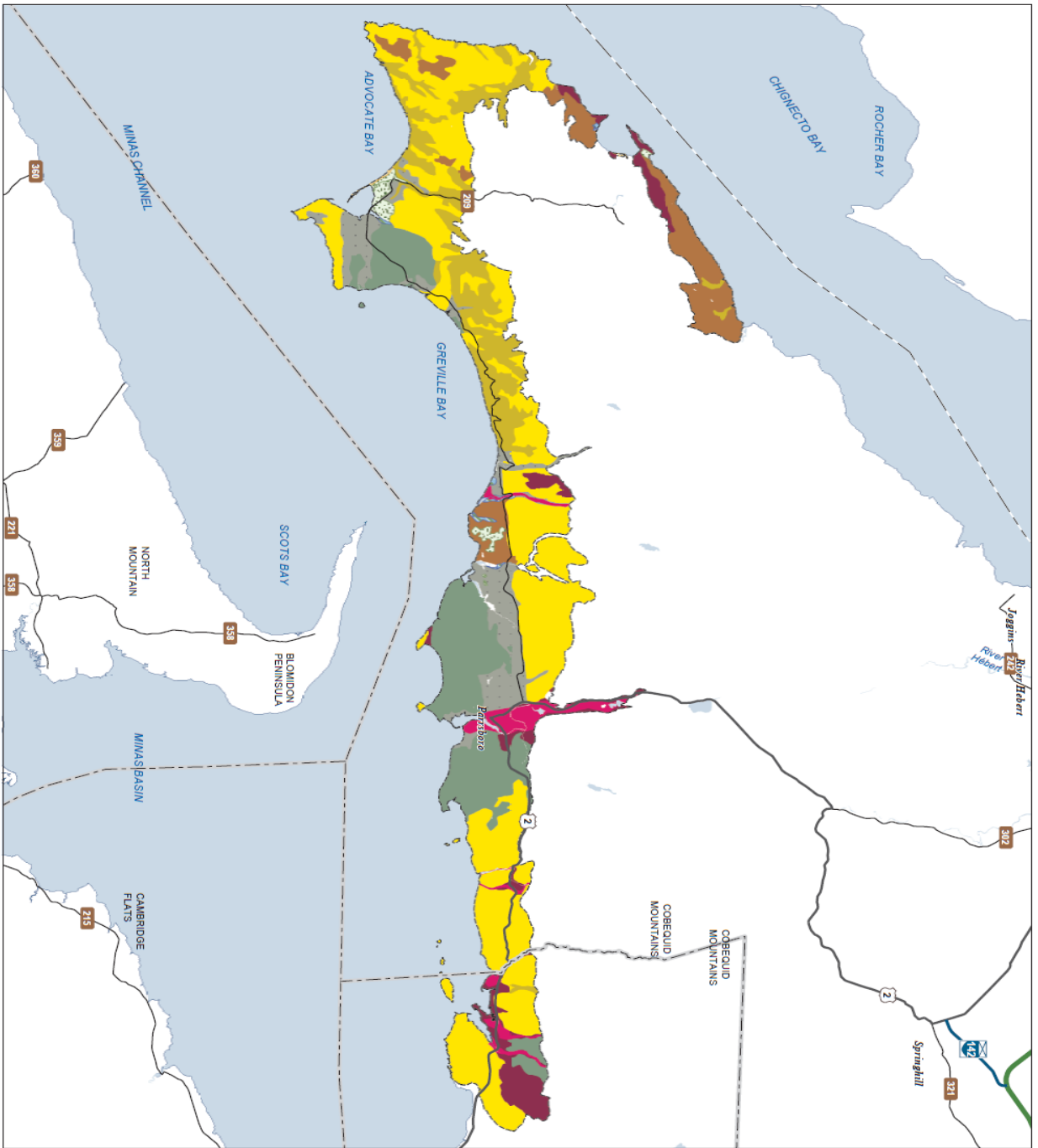
– From *Part 1: Vegetation Types (2010) of Forest Ecosystem Classification for Nova Scotia*  
<http://www.gov.ns.ca/natr/forestry/veg-types>

black spruce and balsam fir dominates, covering more than half of the element. The other patch elements, in order of size, are **Tolerant Mixedwood Slopes, Red and Black Spruce Flats, Spruce Pine Hummocks, Red Spruce Hummocks, Wetlands,** and **Salt Marsh.** *The ecodistrict also contains a tiny Coastal Beach element.*

In **Valley Corridors**, a linear element associated with major watercourses, conversion to other uses exceeds 50% due to activities such as farming, road systems, and harvesting.

# Map of Elements in Ecodistrict

Date: 6/25/2015



## Ecological Landscape Analysis

### Map A

### Elements

Parrsboro - Ecodistrict 910

#### Legend

- Ecodistrict Boundary
- Valley Corridors
- Coastal Beach
- Red Spruce Hummocks
- Red and Black Spruce Flats
- Red and Black Spruce Hummocks
- Salt Marshes
- Spruce Pine Hummocks
- Tolerant Mixedwood Hills
- Tolerant Mixedwood Slopes
- Wetlands
- Water



#### Map Notes

Base data derived from the Nova Scotia Topographic Database (NSTDB). Copyright Province of Nova Scotia. All rights reserved. The NSTDB is available on Science Nova Scotia's website at [www.science.nova Scotia.ca](http://www.science.nova Scotia.ca).

Additional information derived from Nova Scotia Department of Natural Resources, Geographic Information Systems (GIS) databases.

#### Disclaimer

The information on this map may have come from a variety of government and non-government sources and is subject to change without notice. The Nova Scotia Department of Natural Resources is not liable for any errors, deficiencies, or faults on this map.



## Forest Stands Within Elements

Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR 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 DNR, 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.



A hardwood stand of trees in winter, their leaves gone, is surrounded by softwood and mixedwood stands.

**Table 5a – Elements Within Parrsboro Shore**

Element	Size (Hectares)	Element Description
Tolerant Mixedwood Hills (Matrix)	15,639 38.5%	Tolerant Mixedwood Hills is a matrix element in this ecodistrict and occurs on the well-drained, medium to coarse-textured soils derived from various glacial tills. These productive soils, primarily on the hilly terrain, yield forest stands comprised of shade-tolerant hardwood species such as sugar maple, yellow birch, and beech. As soil moisture progressively increases towards middle-slope positions, or where the slope terraces, yellow birch and red maple become more common in mixedwoods with red spruce. Finally, on the lower slopes softwood forests become dominant comprised of red spruce. The exception is the coastal exposed slopes of Cape Chignecto where these same site conditions of soil and moisture yield a coastal red spruce forest from upper slope to lower. Much of this matrix forest has been altered by harvesting but very little has been converted to other uses such as agriculture or settlement.
Red and Black Spruce Hummocks (Patch)	7,309 18%	This is the largest patch element, comprising almost 18% of the ecodistrict. It occurs on imperfectly drained fine-textured soils. These soils, due to their clay content and the gentle relief of the hummocky to hilly terrain, are seldom well-drained. But where they are, red spruce and tolerant hardwoods, such as yellow birch and sugar maple, are possible. For the most part, this element is dominated by red, black, and the hybrid spruce and balsam fir on imperfectly drained soils. As the site get progressively wetter on lower slopes or level terrain, black spruce, tamarack, and red maple are more prominent. Due to the shallow rooting for trees on these moist soils, stand-level disturbances caused by storms and hurricanes is frequent. Early successional forests may include shade intolerant hardwoods such as red maple, white birch, and aspen with balsam fir.
Tolerant Mixedwood Slopes (Patch)	5,510 13.6%	In this element, along the streams and rivers that originate on Cape Chignecto, steep-sided ravines are well to rapidly drained coarse-textured soils, often stony or colluvium and/or shallow to bedrock. Red spruce is the dominant softwood with white pine and hemlock. Occasionally yellow birch is in the mix with very few occurrences of sugar maple and beech. On steep slopes facing the Advocate and Greville bays, soils are well-drained medium-textured glacial tills possibly shallow over bedrock and/or colluvium. The typical forest is usually sugar maple, yellow birch, and beech on the well to rapidly drained upper slopes, progressing to more mixedwood conditions including red spruce and possibly hemlock.
Red and Black Spruce Flats (Patch)	3,817 ha 9.4%	On the well-drained soils, red spruce is dominant but as the drainage gets progressively poorer balsam fir becomes more prevalent with black spruce and tamarack creating wet forest on the poorest-drained soils. Occasionally small floodplain forests of sugar and red maple develop on riparian sites where soils are enriched with annual alluvial deposits. Stand-level disturbances in the red spruce forests often revert to earlier successional stages of intolerant hardwoods such as grey and white birch, red maple, and a variety of woody shrubs. Natural disturbances are frequent on the moist sites but stands may have time to develop into older forests on the very best of the well-drained portions.

**Table 5a – Elements Within Parrsboro Shore**

Element	Size (Hectares)	Element Description
Spruce Pine Hummocks (Patch)	3,814 9.4%	This is a black spruce-dominated patch-level element that occurs on ridged or hummocky terrain underlain with well to imperfectly drained coarse-textured soils derived from sandstone till. It is also found embedded on imperfectly drained soils found within other elements. Forests of black spruce are typical but where there are better-drained soils of higher fertility, red and hybrid spruce and balsam fir are common. White pine is scattered in the mature stands. However, where this patch level element occurs immediately along the shore of Chignecto Bay, the abundant precipitation and fog creates the conditions for a red spruce-dominated forest similar to that which drapes the slopes of Cape Chignecto. As the coastal influence wanes, forests revert to black spruce and pine.
Red Spruce Hummocks (Patch)	2,399 5.9%	All sites support a forest dominated by red spruce and scattered white pine with black spruce only occurring on the poorly drained soils. On headland sites along Cape Chignecto the red spruce forest may take on a coastal complexion. Following infrequent stand-level natural disturbances such as windthrow, early successional forests may include shade-intolerant hardwoods such as red maple, white birch, and softwoods such as balsam fir and white spruce. Stands may have time to develop into older forests on sites where exposure to coastal winds is minimal. Much of the area has been converted to other land uses especially blueberry fields.
Wetlands (Patch)	491 1.2%	The Parrsboro Shore Ecodistrict has only three main wetland areas identified (about 1% of the ecodistrict) although smaller disjoint wetlands are often embedded within other elements, especially the Red and Black Spruce Flats and where level terrain occurs on the gentle slopes. Wetlands are generally treeless or sparsely forested woodlands. For the most part sites are underlain by poorly drained mineral soils or organic soils derived from peat (sphagnum mosses) or sedges.
Salt Marsh (Patch)	128 0.3%	The twice daily tidal actions of the Bay of Fundy created several small areas of salt marsh between Diligent River and Port Greville. Deposits of silty clay loam sediments with semi-decomposed grasses and sedges trapped in the accumulating layers, formed along the tidal shores and in estuaries found at the mouths of rivers and streams subjected to tidal conditions
Valley Corridors (Corridor)	1,550 3.8%	This ecodistrict borders on the northern shores of the Minas Basin and all the streams and river systems empty into the basin. The rivers dissect the ecodistrict at Port Greville, Parrsboro, Moose River, Lower Five Islands, and Five Islands. These corridors still have a good mixture of seral stages, development classes, and overtypes.
<i>Coastal Beach (Patch)</i>	29 <0.1%	<i>Movement of sand and gravel along the shore by tidal currents has created a beach form called spits. These have formed at Advocate Harbour and West Apple River as an abrupt change of shoreline orientation or diminishing currents caused the deposition of sediment.</i>
<b>Total</b>	<b>40,686*</b>	*Area is not the same as in Table 1 because water has not been included.

**Table 5b – Forest Vegetation Types<sup>1</sup> Within Elements in Parrsboro Shore**

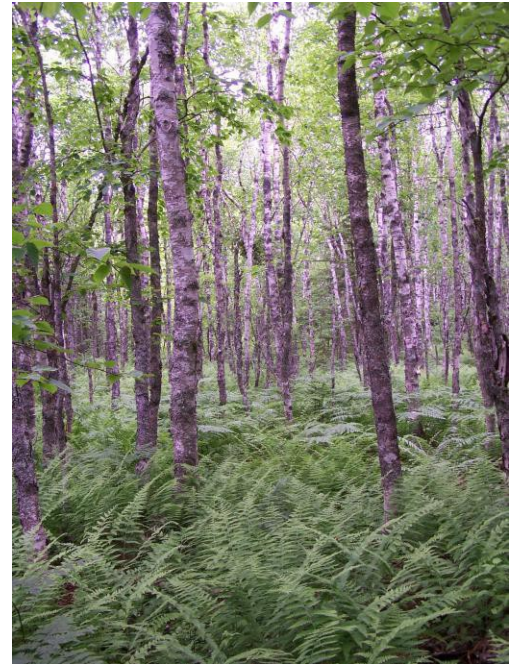
Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Red and Black Spruce Flats	IH4, IH6, MW4, MW5	28	MW2, SH8, SH9	28	<b>SH6, SP7</b>	38
Spruce Pine Hummocks	IH6, MW4, MW5	21	SH5, SH6, SH9	42	<b>SP7 (CO3)</b>	34
Red and Black Spruce Hummocks	IH4, IH6, MW4, MW5	27	MW2, SH8, SH9	30	<b>SH5, SH6, SP7</b>	30
Red Spruce Hummocks	IH4, IH6, MW4, MW5	20	MW2, SH7, SH8	32	<b>SH5, SH6</b>	36
Tolerant Mixedwood Hills	IH4, IH6, OF1	24	IH7, TH7, TH8	34	<b>TH1, TH2, TH3, TH4, (CO3)</b>	31
Tolerant Mixedwood Slopes	IH4, IH6	22	MW2, MW4, MW5, SH5, SH8	40	<b>MW1, MW3, SH3</b>	33
Salt Marsh	Grasslands of <i>Spartina spp.</i>					
Coastal Beach	<i>CO7, Beach grass, Bayberry, Rose spp., White spruce</i>					
Wetlands	WC1, WC2, WC5, WC6, WC7, WD2, WD3, WD6, WD8, SP7					
View forest groups and vegetation types at <a href="http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp">http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp</a>						
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by DNR 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)						
<b>Bolded vegetation types</b> indicate typical late successional community						
<sup>1</sup> 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.



Sugar maple / New York fern – Northern beech fern (TH2) is a late successional vegetation type found in the Tolerant Mixedwood Hills matrix element.



White birch – Red maple / Sarsaparilla – Bracken (IH6) is an early successional vegetation type found in the Red and Black Spruce Hummocks patch element.



Balsam fir / Wood fern / Schreber's moss (SH8) is a mid-successional vegetation type found in the Tolerant Mixedwood Slopes element.



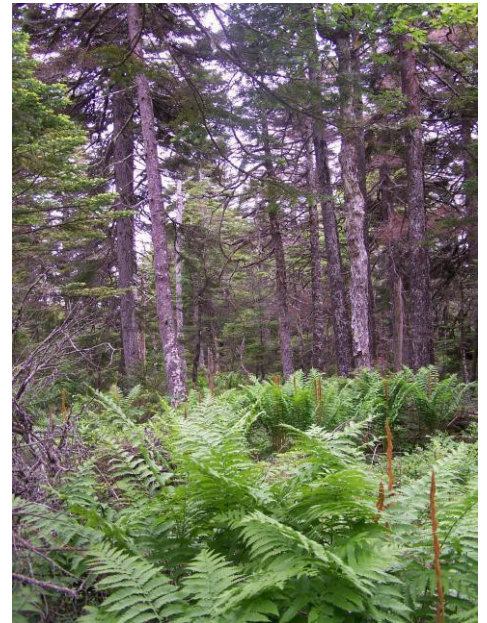
Trembling aspen / Wild raisin / Bunchberry (IH4) is an early successional vegetation type found in the Red and Black Spruce Flats patch element.



Red spruce – Balsam fir / Schreber's moss (SH5) is a mid or sometimes late successional vegetation type found in the Red Spruce Hummocks element.



Red spruce / Mountain ash / Foxberry (CO3) is a late successional vegetation type often found in coastal locations in the Spruce Pine Hummocks element.



Red spruce – Balsam fir / Cinnamon fern / Sphagnum (WC5) is one of two wet red spruce forests in Nova Scotia found in the Wetlands 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 DNR is employing to try and realize this objective. DNR 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.

In the Parrsboro Shore Ecodistrict, infrequent stand-initiating disturbance are the predominant natural disturbance regime. 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 trees. In these disturbance regimes it is favourable to have the forest skewed slightly toward a mature development class and seral stage.

### 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 / Old Forest Policy)

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 DNR 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 DNR website (<http://novascotia.ca/natr/library/forestry/reports/NDRreport3.pdf>).

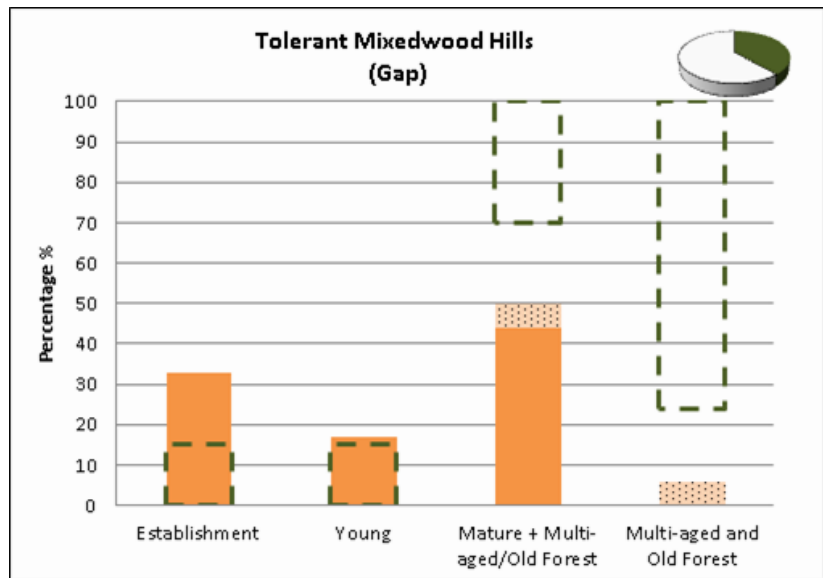
<b>Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)</b>				
<b>Natural Disturbance Regime</b>	<b>Development Class</b>			
	<b>Forest Establishment</b>	<b>Young Competing Forest</b>	<b>Mature Forest (including multi-aged and old forest)</b>	<b>Multi-aged and Old Forest</b>
<b>Frequent Stand Initiating</b>	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
<b>Infrequent Stand Initiating</b>	5 - 20%	5 - 20%	>60% most in mid and late seral stages	>16%
<b>Gap Replacement</b>	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.

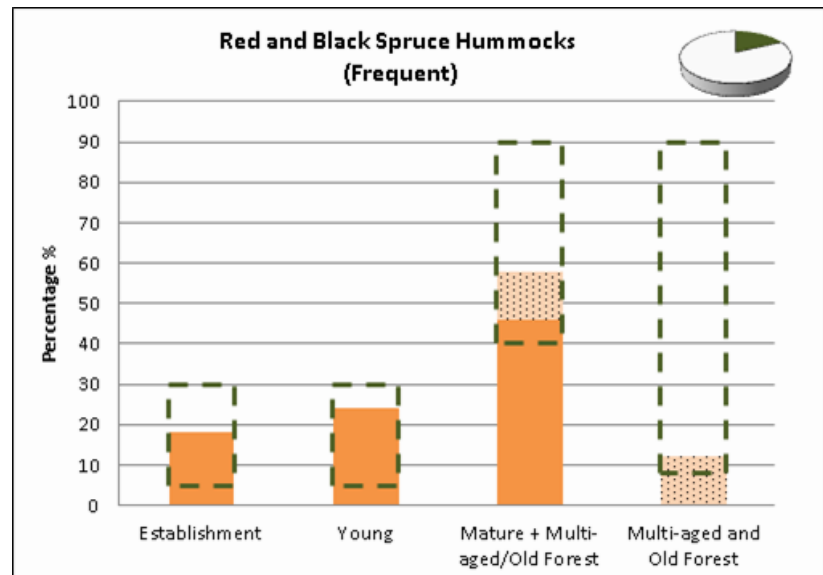
## Development Class Targets by Element

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.

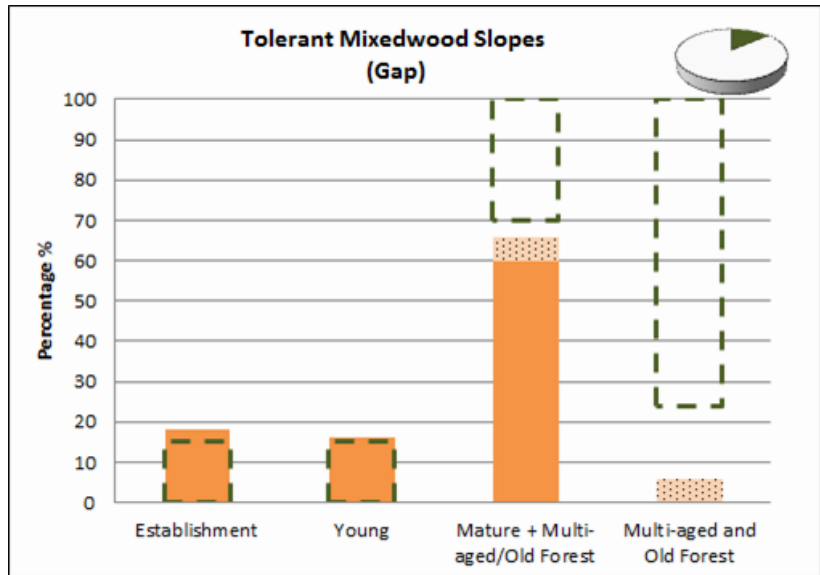
In the **Tolerant Mixedwood Hills** matrix element, the mature and the multi-aged/old forest classes are below target ranges. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development. Favouring climax species in establishment and young forests will provide future mature forest opportunities. Considerable opportunity for mixedwood and spruce/hemlock climax also exists in this element.



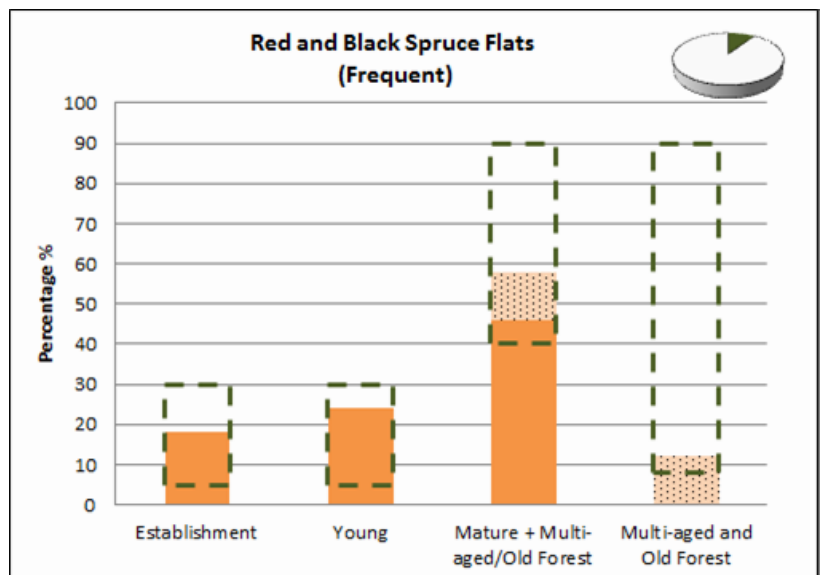
Development classes in the **Red and Black Spruce Hummocks** matrix element are all within target ranges. This will support habitat diversity and continuity of mature forest, as well as provide management flexibility. Extended rotations, natural regeneration, and promotion of late seral species are most appropriate. Much of this forest is shallow-rooted and susceptible to blowdown, thus partial harvesting may be risky.



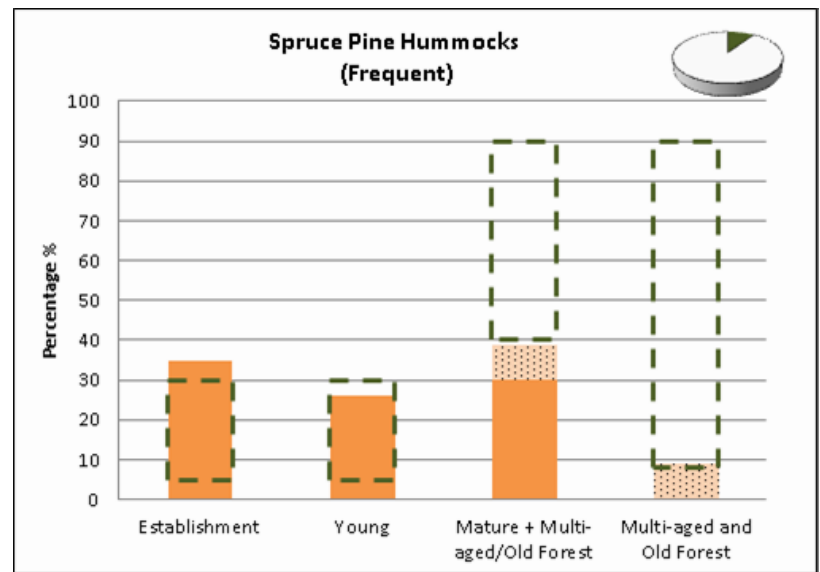
In **Tolerant Mixedwood Slopes** young forest and establishment currently exceed target levels for gap disturbed ecosystems, and mature forest and old multi-aged and old forest are below. Much of the area is on steep inaccessible slopes. Where opportunities for management exist, partial harvesting in mature forests to maintain canopy and promote mixed ages is appropriate. Pre-commercial thinning in young stands can favour climax species.



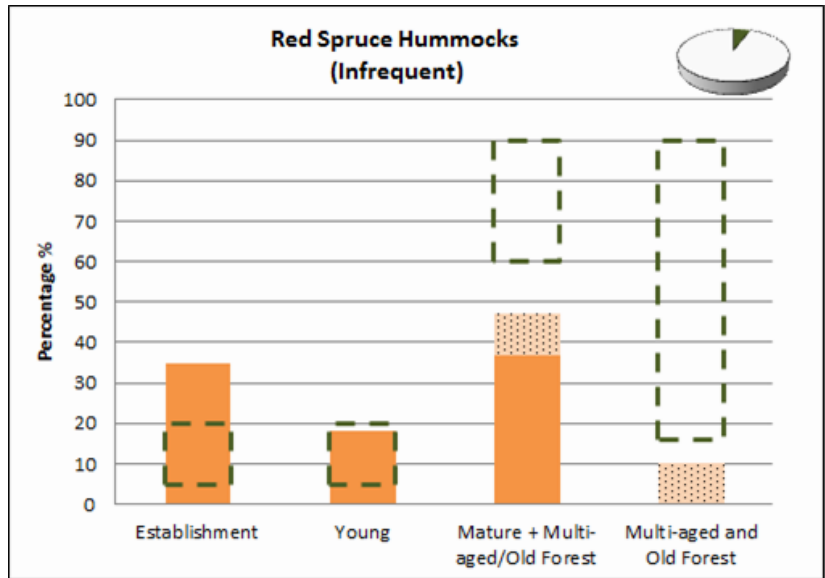
Development classes in the **Red and Black Spruce Hummocks** element are within target ranges. This will support habitat diversity and continuity of mature forest, as well as provide management flexibility. Extended rotations, natural regeneration, and late seral species are most appropriate. Some partial harvesting may be possible on the more sheltered upland sites, while even-aged practices are appropriate on more windthrow susceptible areas.



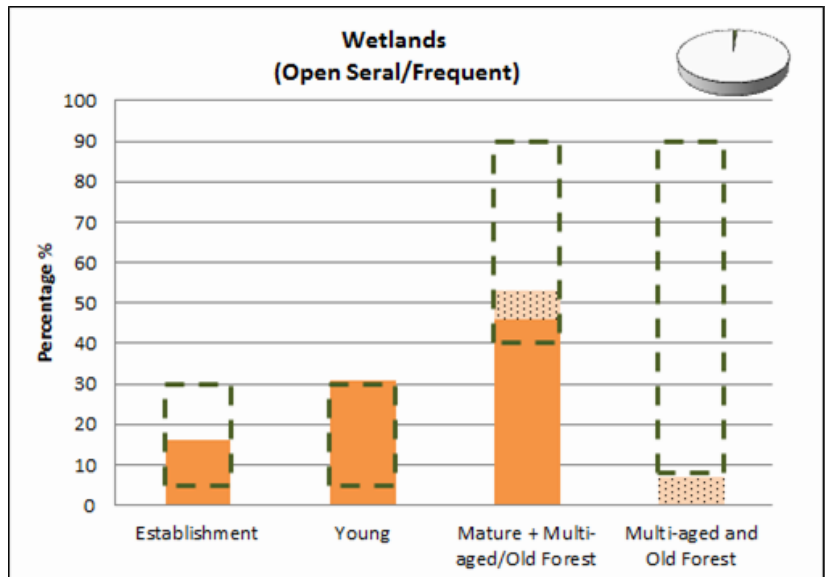
Composition in the **Spruce Pine Hummocks** element is close to target ranges. These forests support periodic stand-initiation events that favour establishment of an even-aged forest, often with scattered surviving mature pine that provide large seed trees. Along the coast this element supports stands of red spruce that favour longer rotations and abundant natural regeneration.



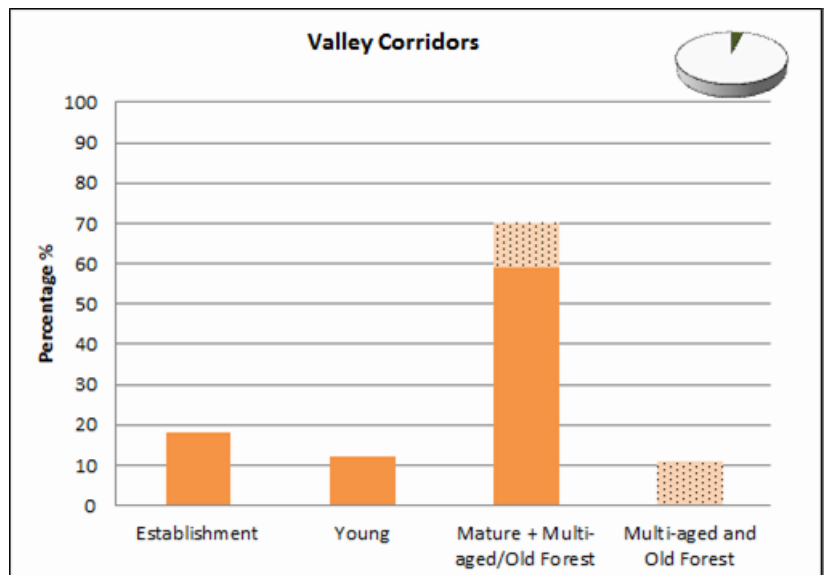
Composition of the **Red Spruce Hummocks**, patch element has excessive establishment stage and is below the desired levels of mature and multi-aged forest. Pre-commercial thinning in the young and establishment stages will provide opportunities to restore climax species and increase diameter growth rates to hasten mature forest development. Mature stands can be maintained with extended rotations and uneven-aged management in sheltered sites.



The small **Wetlands** patch element has very little forested area. This is variably composed of mature forest interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure.



The **Valley Corridors** element includes parts of several elements and does not have a specific disturbance regime or composition target. The current dominance of mature conditions should enhance forest cohesion and support connectivity functions along this linear element feature.



## **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	<p>The proportion of biological components within a specified unit such as a stand or landscape:</p> <p><b>Stand or Species Composition.</b> 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.</p> <p><b>Landscape Composition.</b> The proportion of each community type within a landscape. Community type may be defined by vegetation type, covertype, seral stage, or development class (age).</p>
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.
Covertime	Refers to the relative percentage of softwood versus hardwood species in the overstory of a stand. In this guide, covertime classes are: <b>Softwood:</b> softwood species compose 75% or more of overstory <b>Hardwood:</b> hardwood species compose 75% or more of overstory <b>Mixedwood:</b> 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 DNR 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 <u>extinction</u> . 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 growth. Mature forests include multi-aged and old growth. 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 growth.
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	<p>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:</p> <p><b>Frequent:</b> 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.</p> <p><b>Infrequent:</b> 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.</p> <p><b>Gap replacement:</b> 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.</p>
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).