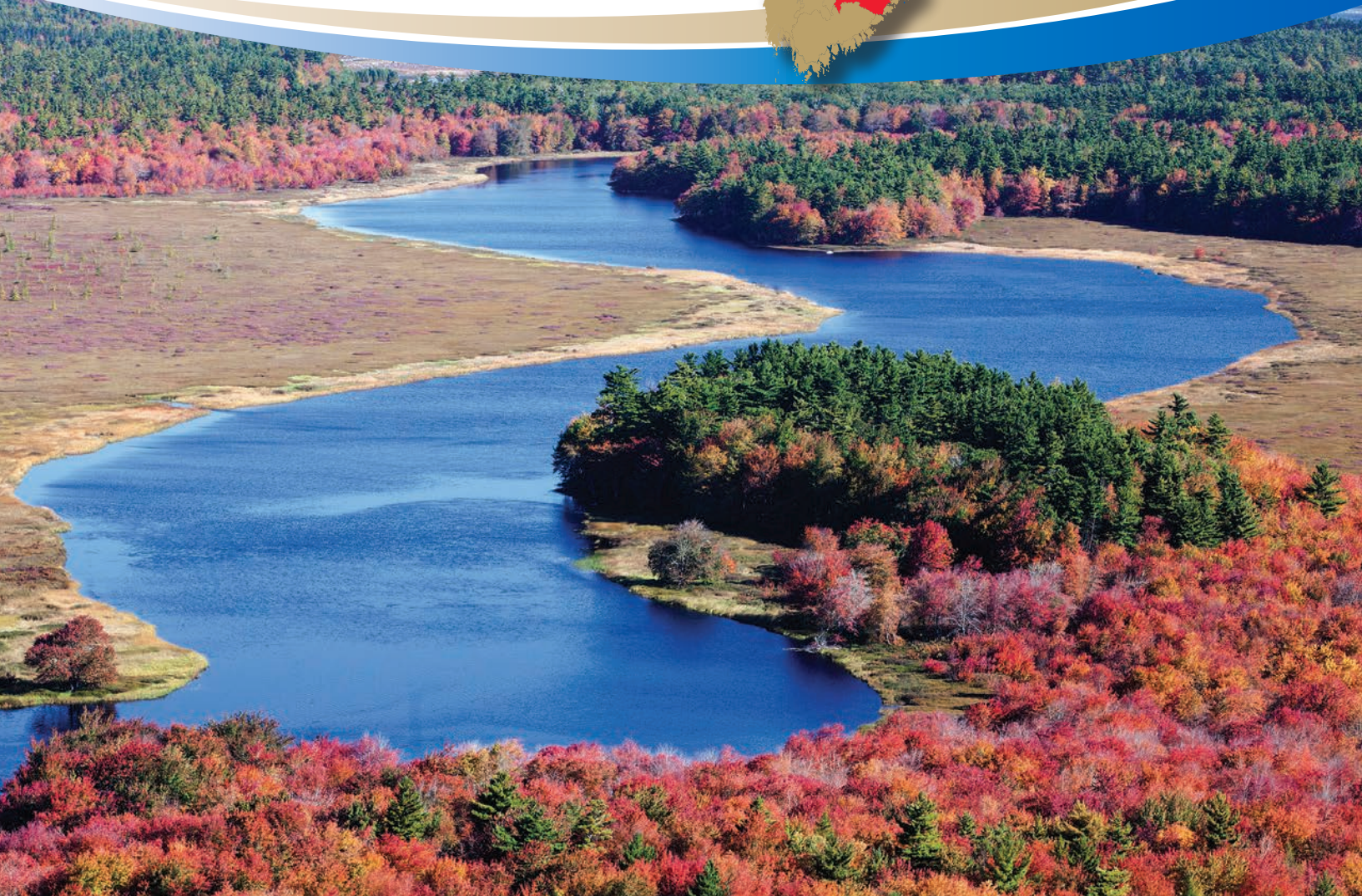


Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS ROSSIGNOL ECODISTRICT 750

PART 1: Overview of Ecodistrict

PART 2: Linking the Landscape to the Woodlot



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Ecological Landscape Analysis, Ecodistrict 750: Rossignol

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

The 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 (2002) – 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 2015-750

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Ecodistrict Profile

Ecological Landscape Analysis Summary Ecodistrict 750: **Rossignol**



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 Rossignol Ecodistrict 750. 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 Rossignol Ecodistrict is one of eight ecodistricts in the Western Ecoregion. This ecodistrict, with a total area of 1,179 square kilometres, is bounded by LaHave Drumlins Ecodistrict on the north and east, Sable and South Mountain ecodistricts on the west, and the South Shore Ecodistrict on the south.

Rossignol is mostly made up of low hills, along with drumlins and flutes, which are mounds, small hills, or ridges of glacial till.

There is an abundance of waterways in the ecodistrict. The Mersey and Medway rivers are the major river systems. Lake Rossignol, the largest freshwater lake in Nova Scotia, is also an impoundment to generate power.



White pine forest along the shores of Lake Rossignol, Nova Scotia's largest inland body of freshwater. Hydroelectricity dams along the Mersey River have increased the size of the original lake.

At least one of the forested islands in Lake Rossignol is used by nesting great blue herons. Wetlands, most often bogs and fens, are scattered through the ecodistrict. The Shelburne River was designated a Canadian Heritage River in 1977.

The ecodistrict contains several species at risk or of conservation concern. These include American marten, Canada warbler, Blanding's turtle, eastern ribbonsnake, Atlantic salmon, monarch butterfly, Carolina redroot, goldencrest, coastal plain Joe-pye-weed, large St. John's wort, Long's bulrush, and southern twayblade.

About 71% of the land is forested. The forest cover consists of about 53% softwood trees, 40% Mixedwood, and 7% hardwood. Red spruce and white pine are common softwoods, along with lesser amounts of black spruce and hemlock. Mixedwoods often contain red spruce or pine with red maple, or with tolerant hardwoods of sugar maple, beech, and ash.

The Lake Rossignol Wilderness Area, on the northeastern shores of Lake Rossignol, lies largely within the ecodistrict. *In 2012, under the Wilderness Areas Protection Act, about 225 hectares of provincial Crown land at Maclean Lake, Queens County, was added to the Lake Rossignol Wilderness Area.*

The ecodistrict contains large peat deposits, some of which reach fuel grade and could be an important energy source in the future. There are also two gold districts.

The majority of area of the Rossignol Ecodistrict, nearly 64%, or 75,398 hectares, is in private land ownership. A total of 14,743 hectares is under provincial management, which considers multiple values through an Integrated Resource Management (IRM) approach.

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

Element descriptions promote an understanding of historical vegetation patterns and the effects of current disturbances. This landscape analysis identified and mapped seven key landscape elements – one dominant matrix element, five smaller patch elements, and a corridor element – in Rossignol.

Spruce Hemlock Pine Hummocks and Hills is the matrix element comprising a little more than half of the ecodistrict. This element supports a tolerant softwood climax community of red spruce, hemlock, and white pine. This forest is still abundant in the ecodistrict.

The two largest patches – **Spruce Pine Flats** and **Spruce Pine Hummocks** – cover about one-quarter of the ecodistrict, with climax communities of black spruce and white pine.



Red spruce, white pine and hemlock are among the climax species in the ecodistrict.

The **Wetlands** patch element includes large areas near Lake Rossignol and smaller areas scattered throughout the ecodistrict. **Tolerant Mixedwood Drumlins** is the only element in Rossignol with a tolerant mixedwood climax community of red spruce, white pine, hemlock, sugar maple, yellow birch, and beech. The tiny **Floodplain** element along the Medway River near Mill Village has seen more than one-third of this patch element with a climax forest of red spruce, white pine, and hemlock converted to other uses.

Valley Corridors, a linear element associated with the major watercourses in the ecodistrict, is usually well-forested with mature or multi-aged softwood.

Forest Ecosystem Management For Rossignol 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 Rossignol Ecodistrict 750. 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 Rossignol Ecodistrict was up to 2008. 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 Natural Resources (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).

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 Rossignol – *Learning About What Makes This Ecodistrict Distinctive*

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

Ecodistrict Characteristics

The Rossignol Ecodistrict is one of eight ecodistricts in the Western Ecoregion. This ecodistrict, with a total area of 117,919 hectares, is bounded by LaHave Drumlins Ecodistrict on the north and east, Sable Ecodistrict and South Mountain Ecodistrict on the west and the South Shore Ecodistrict on the south.

The bedrock beneath the ecodistrict is mostly quartz and slate and the soils are derived from glacial drift. The soils are moderately coarse, stony and shallow and, where not impeded by poor drainage, support good forest growth.

There is an abundance of waterways in the ecodistrict. Freshwater lakes and rivers make up close to 5% of the area. The Mersey and Medway Rivers are the major river systems. Lake Rossignol, the largest freshwater lake in Nova Scotia, is used to generate electricity. Wetlands, mainly bogs and fens, are found in the ecodistrict.

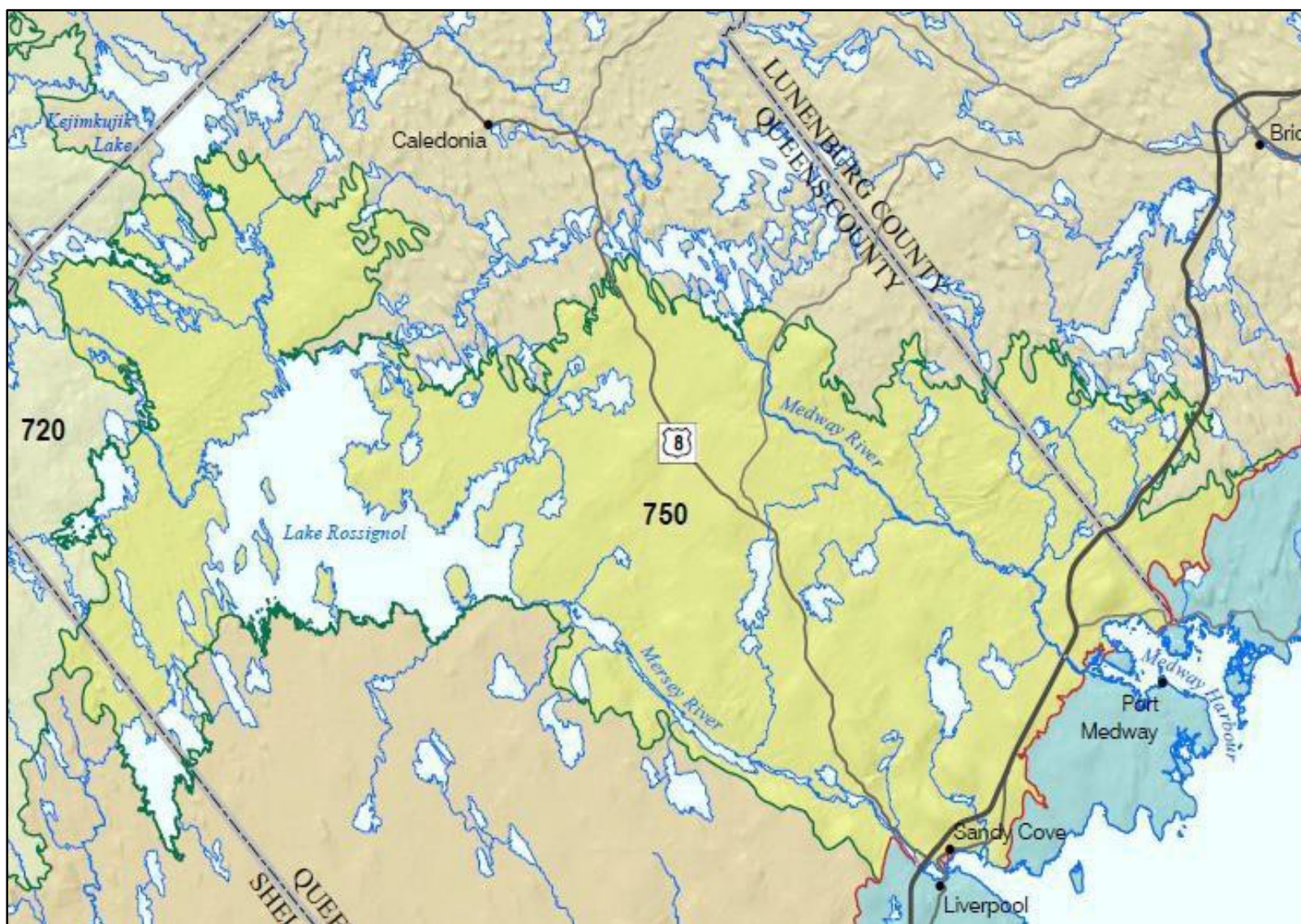
Rossignol is mostly made up of low hills. Some drumlins are present on the periphery of the ecodistrict.

The climax forest over much of the ecodistrict is a mainly shade-tolerant softwood community of red spruce, white pine, and hemlock. This type of forest is most often found on the lower slopes of small hills and on the better-drained soils between the hills.

The imperfectly drained soils, on flatter terrain, support a climax of predominately black spruce with white pine on better drained sites. The higher areas of the well-drained sites, particularly where seepage enriches the site, have a climax forest of shade-tolerant hardwoods – generally yellow birch, often of large size, and some sugar maple.

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

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Rossignol Ecodistrict 750 is mainly in Queens County, with small sections in Lunenburg and Shelburne counties. (From Ecodistricts of Nova Scotia map 2007)

Land Area

The majority of the land is held by a large number of private owners (Table 1).

The largest Crown block (now a Wilderness Area) is adjacent to Lake Rossignol. Some of the other large parcels in the area are at Cow Moose Lake, Pleasantfield, Black Lake, Georges Lake, and Middlefield. The ecodistrict is rural in nature. The town of Liverpool is along the ecodistrict's eastern boundary. Ponhook Lake Indian Reserve is within the ecodistrict.

Table 1 – Land Area by Ownership in the Rossignol Ecodistrict*		
Ownership	Area** (hectares)	Percent of Total Area
Provincial Crown land	14,743	12.5
Federal Crown land	5,559	4.8
Aboriginal land	106	0.1
Private	75,398	63.9
Other (Includes inland water bodies and transportation corridors)	22,113	18.7
Total	117,919	100
<p>*Note: Figures may vary slightly from table to table because of rounding, averaging, and overlapping of categories and other factors. **Major changes in land ownership occurred in 2013, reflecting the province's purchase of former Bowater Mersey Paper Company Limited lands. Provincial Crown land increased to 52,385 hectares, representing 44.4% of total area. Ownership of private and other lands decreased to 65,534 hectares, representing 55.6% of total area.</p>		

IRM Resource Classification for Provincial Crown Lands

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

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	1,315	8.9
C2 – Multiple and Adaptive Use	9,279	62.9
C3 – Protected and Limited Use	4,085	27.7
Unclassified	64	0.4
Total	14,743	100

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).

Nearly two-thirds of the provincial lands are C2 and more than one-quarter is C3.

Small sections of the abandoned CN Rail Line run along the ecodistrict's eastern boundary. The long term-plan for this land is trail development. There are a few campsite leases in the ecodistrict.

The ecodistrict comes in contact with the Atlantic shoreline in a few locations at the upper end of major inlets, such as Liverpool and Medway. Land below the mean high water mark is provincial Crown land.

Forests

Within the Rossignol Ecodistrict, about 71% is forested (Table 3).

Non-forested land includes barrens, agriculture, and urban sites. Wetland accounts for less than 5.6% of the area. Other types of land use include areas of brush, alders, other small bushes, gravel pits and barrens, totaling 25,647 hectares. There are 944 hectares of road, trail and utility corridors.

The current forests contain 43,782 hectares of softwood stands (defined as having more than 75% softwood species) which account for 52.5% of the forest cover. Common softwood tree species are red spruce, hemlock, white and red pine,

black spruce, and balsam fir. Black spruce is present on the imperfectly drained sites. Hemlock, red spruce, and white pine are found on the lower slopes and better-drained sites.

Mixedwood stands of 32,566 hectares account for 39% of the forested land. White pine and red spruce are often mixed with the hardwoods. Hardwood stands (more than 75% hardwood composition) occupy 5,908 hectares, or 7.1%, of the forest cover. Forests of sugar maple, yellow birch, scattered white ash, hemlock, and red spruce will be found on the larger hills. Sugar maple and yellow birch are often found on the crests and upper slopes of some drumlins. Red oak is common on sites that have been frequently disturbed by fire.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	83,454	70.8
Wetland	6,635	5.6
Agriculture	140	0.1
Barrens	144	0.1
Urban	955	0.8
Road, Trail, Utility	944	0.8
Other	25,647	21.8
Total	117,919	100



White pine is one of the main softwood species in Rossignol.

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

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

More than 70% of the ecodistrict has an LC rating of five or higher. This softwood rating indicates the Rossignol Ecodistrict has good potential for forest growth.

An area of 6,700 hectares, or 8%, of the forested area is considered not suitable for growing fibre ($\text{LC} \leq 3$). This area consists mainly of poorly drained soils.

Table 4 – Area of Forested Land by Land Capability Rating		
Land Capability (LC) Rating ($\text{m}^3/\text{ha}/\text{yr}$) *	Hectares	Percent
2 or less	1,246	1.5
3	5,519	6.6
4	16,346	19.6
5	39,181	46.9
6	20,343	24.4
7 or more	819	1
Total	83,454	100
*Based on growth rating for softwood species.		

Water Resources

Inland waters make up 21,585 hectares, or 18.3%, of the Rossignol Ecodistrict. Water is often acidic and of poor natural productivity.

The majority of the ecodistrict is drained by a large number of small streams within either the Mersey River or Medway River drainage systems. A section of the Shelburne River, flowing into Lake Rossignol, is in the northwestern portion of the ecodistrict. Many of the lakes have their long axis pointing in a southerly direction, a reflection of past glacial activity.

Lake Rossignol, the largest freshwater lake in Nova Scotia, was flooded in the 1920s as a means of providing hydroelectric power. The Mersey River, an outflow of Lake Rossignol, has six dams and accompanying generating stations, all of which are controlled by Nova Scotia Power. In some cases, NS Power owns the submerged land and in other instances the company has flowage rights on leases for the land that was flooded when dams were installed.



Lake Rossignol, the largest freshwater lake in Nova Scotia, was man made and combined five lakes in the 1920s to produce hydroelectric power. The lake is part of the Rossignol Ecodistrict.

Minerals, Energy and Geology

The Rossignol Ecodistrict is dominated by metamorphic rocks formed from sedimentary rocks of the Meguma Group, which are about half a billion years old.

The Meguma Group covers nearly all of the Rossignol Ecodistrict and is divided into the Goldenville Formation and overlying Halifax Formation.

The Goldenville Formation comprises varying amounts of metamorphic sandstone and metamorphic siltstone – sandstones and siltstones that have been changed by heat and pressure – and this formation contains many of the province's gold deposits.

There are two gold districts in the Rossignol Ecodistrict: Mill Village Gold District and the Fifteen Mile Brook Gold District. Both areas have produced gold in the past and are current prospecting and exploration targets. The Mill Village Gold District produced about 1,000 ounces of gold from 1886 to as recently as 2001. The Fifteen Mile Brook Gold District produced about 880 ounces of gold between 1880 and 1958, and tungsten has been reported there as well.

There are numerous abandoned mine openings associated with the past gold production within the Mill Village Gold District and the Fifteen Mile Brook Gold District. The mine openings are located on both provincial Crown and private lands.

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.

The Halifax Formation comprises slate and siltstone, and contains abundant pyrite and other minerals. When disturbed and exposed at the surface, some of these minerals can generate acid. Both the Goldenville and Halifax formations were metamorphosed and folded into a series of rock layers during the Acadian mountain-building period about 400 million years ago.

About 1% of the ecodistrict consists of rocks from the 300- to 410-million-year-old South Mountain Batholith, a large slab of granite formed from molten rock deep in the earth's crust and exposed at the surface after millions of years of erosion.

A concern in the Rossignol Ecodistrict is the presence of sulphide-rich slates in the Halifax Formation. The physical disturbance of these sulphide-bearing slates can lead to oxidation of the sulphide minerals that can possibly generate Acid Rock Drainage (ARD). This can threaten water quality, sedimentation, integrity of building materials, and vegetation management.

The oxidation of high concentrations of arsenopyrite – a metallic mineral containing arsenic – in the slate can adversely affect the quality of drinking water by releasing arsenic into the water table.

Large peat resources, diatomaceous earth deposits (containing fossil remains of ancient organisms known as diatoms), a few glacial deposits of sand and gravel, and a relatively thick till cover dominate the area around Lake Rossignol. Some of the peat deposits reach fuel grade and could be an important energy source in the future.

Parks and Recreation / Protected Areas

The Lake Rossignol Wilderness Area, on the northeastern shores of Lake Rossignol, lies largely within the ecodistrict. *In 2012, under the Wilderness Areas Protection Act, about 225 hectares of provincial Crown land at Maclean Lake, Queens County, was added to the Lake Rossignol Wilderness Area.* A small part of the Tobeatic Wilderness Area, near Mullins Lake, extends into Rossignol.

The Tobeatic Wilderness Area touches the ecodistrict boundaries on the western shores of the Tobeatic Lake.

The area north of Jordan Lake that is within the ecodistrict is part of the Tobeatic Wildlife Management Area. The Shelburne River, designated a Canadian Heritage River in 1977, flows into Lake Rossignol.

A site of ecological significance, containing very large, old hemlocks can be found along the Shelburne River. The only designated picnic park within the ecodistrict is at Ten Mile Lake. A park reserve with river frontage can be found along the Medway River near Charleston. *Nova Scotia's Parks and Protected Areas Plan enables the province to protect 12% of its landmass by 2015.*

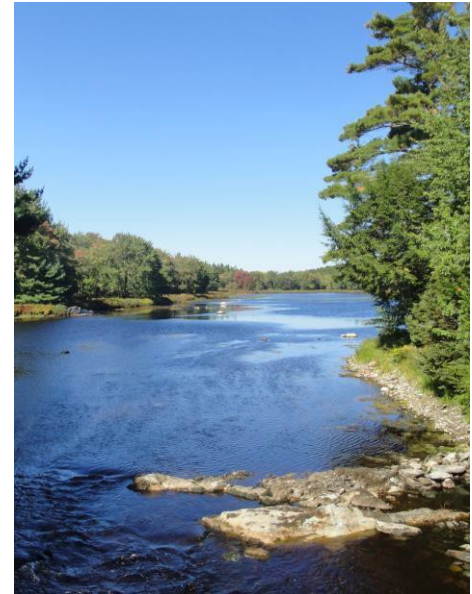
These areas are described in the following categories:

Category A: Existing designated parks, protected areas, and nature reserves. This category includes all properties designated under the Parks Act, Wilderness Protection Act, and Special Places Act.

Category B: Other properties with protection value or for where there is a level of commitment to protect. This category includes non-designated but operational parks, non-designated nature reserves, and properties with some legal obligation or ministerial commitment to protection.

Category C: Other park properties containing highly significant multiple outdoor recreational, natural or cultural values.

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/>.



The Shelburne River was designated a Canadian Heritage River in 1977.



About 225 hectares of provincial Crown land at Maclean Lake, Queens County, was added in 2012 to the Lake Rossignol Wilderness Area.

Wildlife and Wildlife Habitat

Wildlife in the Rossignol 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 Rossignol 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.

Wetlands, Aquatic Habitat and Wildlife

Water is a prominent and significant feature, comprising approximately 18% of this ecodistrict. The character of the Rossignol Ecodistrict terrain can be described as a series of modest hills surrounded by low lying areas. Within these depressions are many lakes, watercourses and wetlands, which provide extensive aquatic and riparian habitat for many species of wildlife, including a number of rare plants.

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

Freshwater wetlands in the ecodistrict are of several types: bog, deep marsh, fen, lakeshore wetland, meadow, seasonally flooded flats, shallow marsh, shrub swamp, wooded swamp, and saltmarsh. Total area in hectares occupied by all wetland types in the ecodistrict is about 6%.

The Rossignol Ecodistrict is rich in wetlands and watercourses. Because of this, there are numerous aquatic plants and invertebrates, supporting: semi-aquatic mammal species, such as beaver and muskrat; waterfowl species, particularly ring-necked duck, common merganser, and black duck; and amphibians and reptiles, including a number of frog, salamander, snake, and turtle species.

The riparian zone – the area where land vegetation meets a watercourse or wetland – is one of the most productive habitat zones on the planet and it cultivates a high diversity of wildlife species. A number of rare plants, notably species of the Atlantic Coastal Plain, are found in riparian habitat in this ecodistrict.

Lake Rossignol, the largest freshwater lake in Nova Scotia, is a major component of this ecodistrict. The lake's many islands provide important habitat for many wildlife species,

particularly waterfowl, loons and other ground-nesting bird species. Several of the forested islands are used by nesting great blue herons and possibly double-crested cormorants. Great black-backed gulls nest on other freshwater islands. Ospreys and bald eagles nest along the shores of many lakes or in close proximity to major water bodies, including the seashore.

Considerable habitat for a number of freshwater spiny-finned fish species, such as white perch and yellow perch, is present. As well, soft-finned fish species, such as brook trout, spawn in small tributaries and inhabit rivers and lakes. However, fish productivity is relatively low throughout this ecodistrict because of high levels of acidity. Several rivers within the Rossignol Ecodistrict still support seasonal runs of diadromous fish – migrating between fresh and salt water – such as Atlantic salmon, gaspereau, American eel, American shad, and rainbow smelt.

Fish availability in turn provides opportunities for fish predators, such as otters, eagles, common loons, and osprey.

Illegal introductions of chain pickerel and smallmouth bass – non-native fish species – to lakes and rivers in the Rossignol Ecodistrict have created a major threat to native salmon and trout populations. These two introduced species are highly aggressive predators of the native fish species. Brook trout have been eliminated or seriously reduced in many of the watersheds in the Rossignol Ecodistrict, but continue to persist in reduced numbers in some locations.

Another important aquatic feature of the Rossignol Ecodistrict is a limited (approximately 25 kilometres) coastline, mostly at the estuary of the Mersey River and a portion of Medway Harbour. The most notable wildlife occurrence in this coastal zone is wintering concentrations of waterfowl, including black duck, common eider, greater scaup, long-tailed duck, and common merganser. These species generally remain close to shore along the coast, and in river estuaries. Salt marsh habitat support groups of black ducks along the coast year-round.

Terrestrial Habitat and Wildlife

Despite little variation in terrain, the ecodistrict contains a mosaic of forest cover in varying species, age classes, and patch sizes, with abundant edges and open areas. This is mainly related to past human activity of forest harvesting, agriculture, and development. Nearly 6% of the ecodistrict is identified as old forest, most of it occurring within Kejimikujik National Park and the Tobeatic Wilderness Area.

The white-tailed deer is a common, but a very high-profile hunted species, which generally prefers a mix of habitat types since its habitat needs vary seasonally. A high proportion of mature softwood trees results in that good winter cover. Regenerating hardwoods from cut-over sites are generally abundant. Winters are usually less severe in this part of Nova Scotia and deep snow conditions do not occur consistently from year to year.

Raptor nests are another important feature of the Rossignol terrestrial wildlife habitat. Information on nest locations has been collected opportunistically and not by any directed surveys. One prominent bird of prey in the ecodistrict is the osprey, which has ample opportunities within this area for nesting near water where fish are available. The mix of open

areas and a variety of forest species and ages also provides considerable habitat for red-tailed hawks, bald eagles, sharp-shinned hawks and various owl species. The goshawk occurs in the ecodistrict and is relatively common because of its association with old forests and large areas of continuous forested habitat.

Species at Risk or of Conservation Concern

The ecodistrict contains several species at risk or of conservation concern.

These include American marten, Canada warbler, Blanding's turtle, eastern ribbonsnake, Atlantic salmon, monarch butterfly, Carolina redroot, goldencrest, coastal plain Joe-pye-weed, large St. John's wort, Long's bulrush, and southern twayblade.



Blanding's turtles are an endangered species found in Rossignol.
(From www.speciesatrisk.ca website)

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 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 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>

Rossignol – Elements Defined

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

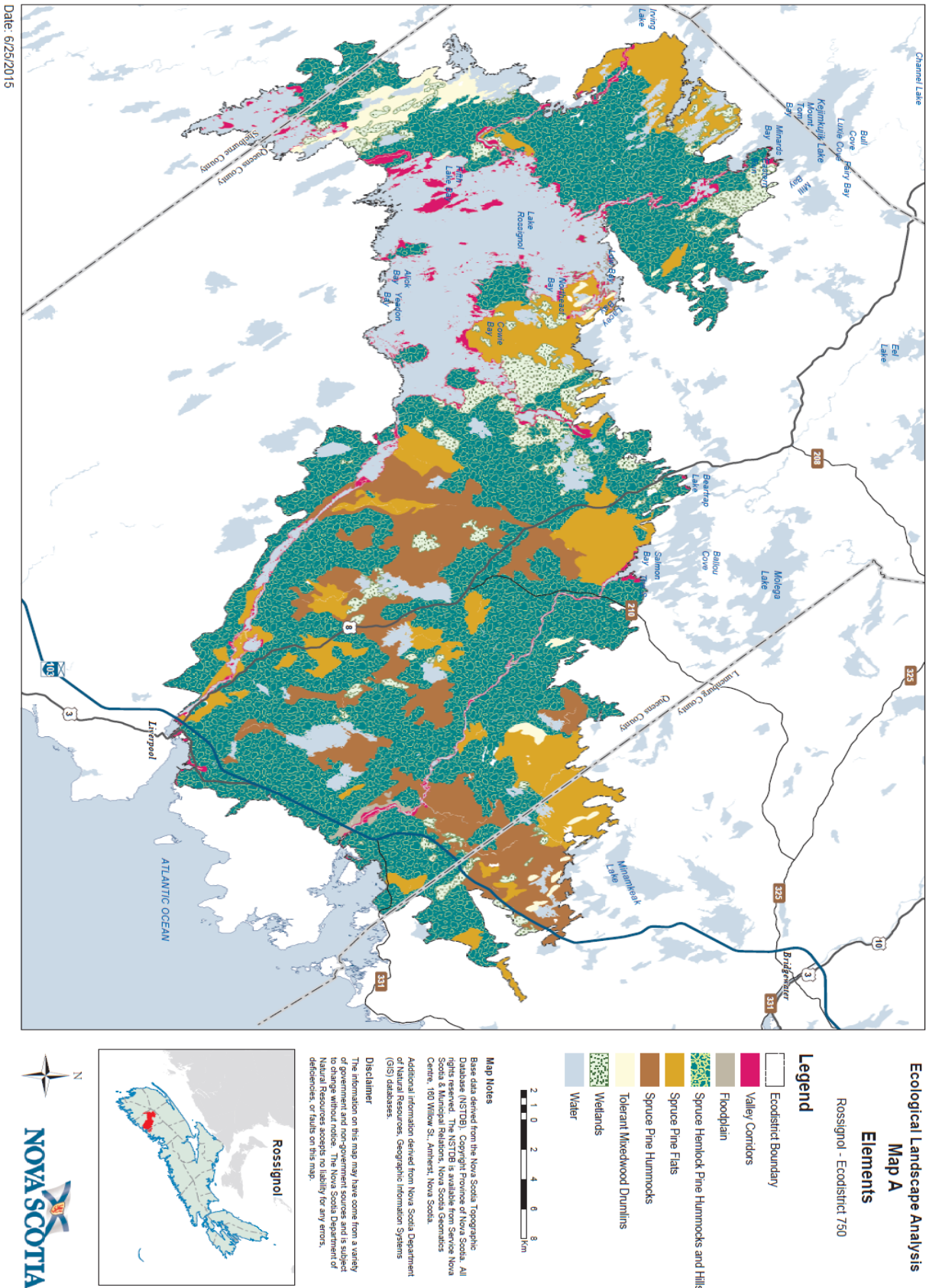
A landscape profile identified and mapped seven distinctive landscape elements in the Rossignol Ecodistrict – one matrix, five patches, and a corridor. A matrix is the dominant community type. Patches are smaller yet still distinctive community types. Corridors are natural linear communities, such as river valleys, that link parts of the ecodistrict.

Spruce Hemlock Pine Hummocks and Hills is the matrix element comprising a little more than half of the ecodistrict. This element features a tolerant softwood climax community, comprising red spruce, eastern hemlock, and white pine.

The largest patch is **Spruce Pine Flats**, with black spruce as the main species on fairly flat land. In the **Spruce Pine Hummocks** element, white pine is present on better drained sites. The **Wetlands** element includes large areas near Lake Rossignol with forests dominated by black spruce. **Tolerant Mixedwood Drumlins** features well-drained drumlins and includes the only tolerant mixedwood climax community in the ecodistrict. **Floodplain** is the smallest element and occurs along the Medway River near Mill Village. **Valley Corridors** is a corridor element found along three major rivers – Mersey, Medway, and Shelburne – and features forests of mature or multi-aged softwood or mixedwood. See Table 5a for more detailed descriptions and Map A for element locations.

The percentage composition of climax species in the current forest is likely less than that found before Europeans began using the land. Largely the result of forestry harvesting activity, there is now a higher shade-intolerant hardwood component.

Map of Elements in Ecodistrict



Forest Stands Within Elements

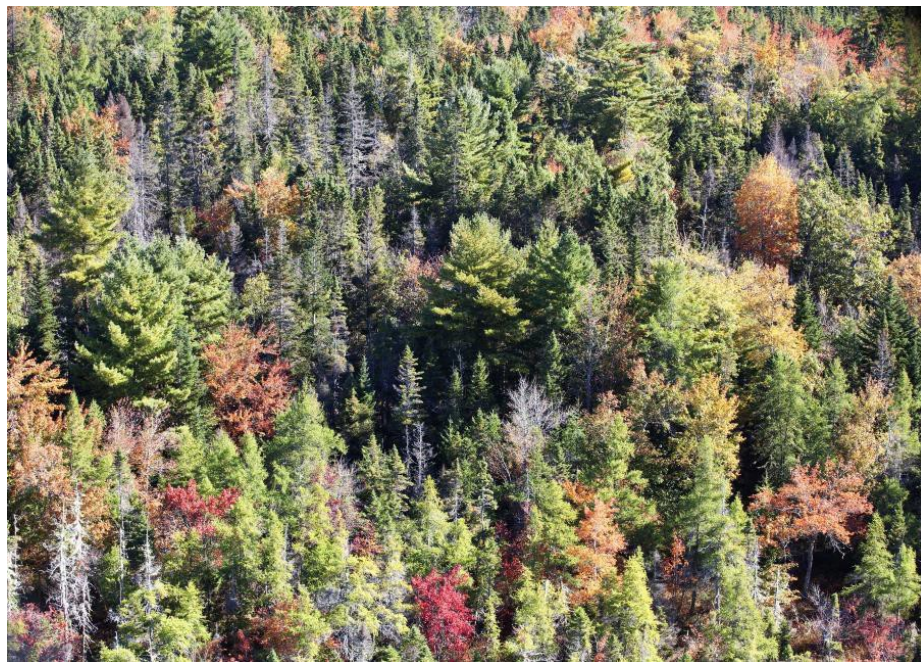
Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR publication *Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)* (<http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp>) is helpful in identifying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

Table 5a –Elements Within Rossignol

Landscape Element	Size (Hectares)	Element Description
Spruce Hemlock Pine Hummocks and Hills (Matrix)	56,973 50.7%	The matrix supports a tolerant softwood climax community comprising red spruce, eastern hemlock, and white pine. These species are abundant in the ecodistrict. This element occurs primarily on well-drained, medium-textured low hills and hummocks. Following infrequent natural disturbance early successional forests may include shade-intolerant hardwoods such as red maple, white birch, and large-tooth aspen. On lower slopes and on level terrain with progressively poorer drainage, black spruce, red maple, and tamarack dominate the forest vegetation.
Spruce Pine Flats (Patch)	14,479 12.9%	The largest patch element in the ecodistrict is located on fairly flat land. Imperfectly drained soil has an influence on climax species associations. Black spruce predominates on much of the land with white pine or other tolerant softwood species on areas of slightly better drainage. As soil drainage gets progressively poorer, wet forests of red maple, alders, false holly, winterberry, and other woody shrubs are common. Embedded within this element are wet open woodlands where stocking to tree species can be very poor. This element is frequently disturbed by windthrow, fire and/or natural aging that limit the potential for old growth forest development.
Spruce Pine Hummocks (Patch)	13,053 11.6%	This element supports a climax community of black spruce and white pine. Mature late seral softwoods of black or red spruce dominate with white pine present on better-drained hills or micro-sites. Most of the element occurs on hummocky terrain but can also be found on low hills and ridged topography where soils are usually shallow to bedrock. A distinguishing feature is the low fertility of the soils which supports the black spruce and pine late successional forest. Early successional forests may include red maple, white birch, aspen, and red oak.
Wetlands (Patch)	6,288 5.6%	Large wetland patches occur near Lake Rossignol with smaller patches scattered throughout the remainder of the ecodistrict. Intermingled is a forest dominated by softwoods, usually black spruce. The element may occur as a large wetland complex associated with rivers and lakes, or as narrow linear communities associated with flow accumulations and small streams. Wetlands are generally treeless or sparsely forested woodlands of slow-growing black spruce with woody heath-like shrubs. For the most part, sites are underlain by poorly drained mineral soils or organic soils derived from peat (sphagnum mosses) or sedges.
Tolerant Mixedwood Drumlins (Patch)	2,004 1.8%	These well-drained drumlins occur around the fringes of the ecodistrict with the largest patch near Spectacle Lake. This is the only element in Rossignol with a tolerant mixedwood (red spruce, white pine, hemlock, sugar maple, yellow birch, beech) climax community. Natural disturbances are gap and stands can develop old forest characteristics. Following harvesting, regenerating areas may have more white pine, balsam fir, and red maple. Historically, drumlins have been extensively used for settlement and farming and natural forests are uncommon. Abandoned agricultural lands tend to revert to forests of white pine and white spruce.

Table 5a –Elements Within Rossignol		
Landscape Element	Size (Hectares)	Element Description
Floodplain (Patch)	236 0.2%	This small patch occurs along the Medway River near Mill Village and supports a forest of hemlock, red spruce, and white pine. Currently, one-third of this element has been converted to other uses as the result of settlement. Old fields, when abandoned, revert to white spruce and white pine. Floodplains along the major rivers of the Western ecoregion comprise glaciofluvial materials deposited as outwash plains, kames, and eskers. They occur as linear, small patch-level elements underlain with rapid to imperfectly drained, coarse-textured soils. Along the Medway River, the gravelly sandy loam soils are derived from quartzite with both granite and quartzite boulders frequently occurring on the surface. Soils are usually very stony.
Valley Corridors (Corridor)	19,426 17.3%	The Valley Corridors element occurs along major rivers, such as the Mersey, Medway, and Shelburne, and interconnected lakes. These well-forested corridors are mainly mature or multi-aged softwood – red spruce and white pine are most common – or mixedwood types. Red maple occurs frequently and red oak occasionally. Red maple sometimes occurs as pure stands. Valley and riparian corridors provide important ecological functions, such as temperature control, nutrients, filters, coarse woody debris, and habitat. These corridors and their tributaries provide linkages to patches within Rossignol as well as adjoining ecodistricts.
Total	112,459	



Many elements within the ecodistrict include a mix of softwoods and hardwoods.

Table 5b – Forest Vegetation Types ¹ Within Elements in Rossignol						
Element	Successional Stage					
	Early	% *	Middle	%	Late	%
Floodplain	IH5, IH6, OF1, MW4, MW5	10	SH5, SH6	41	FP3, MW1, MW3, SH1 , SH2, SH3, SH4	48
Spruce Pine Flats		3		33	SP7	59
Spruce Pine Hummocks	IH1, SP2, SP8	4	IH2, IH6, SP3, SP4, SP6, SH9	36	SP5, SP7 , SP9	54
Spruce Hemlock Pine Hummocks and Hills	IH5, IH4, IH6, MW4, MW5	4	SH5, SH6, MW2	36	SH1, SH2, SH3, SH4 , MW1, MW3	53
Tolerant Mixedwood Drumlins ²	OF3, OF4, IH4, IH5	4	IH6, IH7, MW2, MW4, SH5, SH6	25	TH1, TH2, TH3, TH5, TH6 , TH8, MW1, MW3 , SH1, SH2, SH3, SH4	61
Wetlands	FP3, WC1, WC2, WC4, WC5, WC6, WC7, WC8, WD1, WD2, WD3, WD4, WD6, WD7, WD8, SP7					
View forest groups and vegetation types at http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp						
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by 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)						
Bolded vegetation types indicate typical late successional community						
¹ Forest Ecosystem Classification for Nova Scotia (2010)						
² Red oak can be a component of this element.						
*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.



Red spruce – White pine / Lambkill / Bracken (SH4) is a late successional vegetation type found in the Spruce Hemlock Pine Hummocks and Hills matrix element.



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



White pine / Blueberry / Bracken (SP4) is mid-successional vegetation type found in the Spruce Pine Hummocks patch element.



Tamarack – Black spruce / Lambkill / Sphagnum (WC7) is a vegetation type found in the Wetlands patch element.



Red spruce – Yellow birch / Evergreen wood fern (MW1) is a late successional vegetation type found in the Tolerant Mixedwood Drumlins patch element.



Red maple / Sensitive fern – Rough goldenrod (FP3) is a late successional vegetation type found in the Floodplain patch element.

Landscape Composition and Objectives

Landscapes contribute to the maintenance and conservation of native biodiversity. Managing landscapes for biodiversity requires a variety of planning approaches and tools. Sustaining forest composition diversity by reflecting natural patterns of disturbance and succession is one approach that 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.

The two most prominent natural disturbance regimes in Rossignol are infrequent and frequent.

The infrequent natural disturbance regime is associated with tolerant softwood covertypes (red spruce, white pine, hemlock). The agents of disturbance are often hurricane, fire, and insects. The infrequent disturbance regime can lead to stands of different ages and old growth. Rossignol has an abundance of area in the potentially long-lived (125+ years) tolerant softwood climax coertype.

Areas with sandier soils are susceptible to drying out in the hotter times of the year when the threat of fire increases. Wind damage, particularly on the shallow-rooted red spruce and hemlock, occurs quite often. Hurricanes have occurred in the past.

In the frequent disturbance regime, stand development is interrupted again by a major disturbance before the stand becomes uneven-aged. Fire and wind are the usual disturbances. The black spruce-white pine community type in Rossignol is understood to be dominated by frequent fire disturbance events.

Two other natural disturbance regimes, gap and open seral, are less common in this ecodistrict.

The gap disturbance regime is a feature of the tolerant mixedwood climax covertime. This regime favours the development of uneven-aged structure, shade-tolerant species, and formation of old growth conditions. Tree mortality is a result of insect infestation, disease, blowdown, and senescence due to old age. Regeneration occurs under openings (gaps) created in the canopy after death of individual or small patches of trees. Usually shade-tolerant species regenerate in the openings and as more gaps are created in the overstory, the regeneration is released into the canopy and shares the space with surviving old forest trees.

Open seral regimes occur where site conditions restrict or limit tree growth, creating sparse forest cover. The Wetlands element in Rossignol, where excessive moisture, thick organic peat layers, or heath-like species hinder tree growth, is an illustration of the open seral regime.

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 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>).

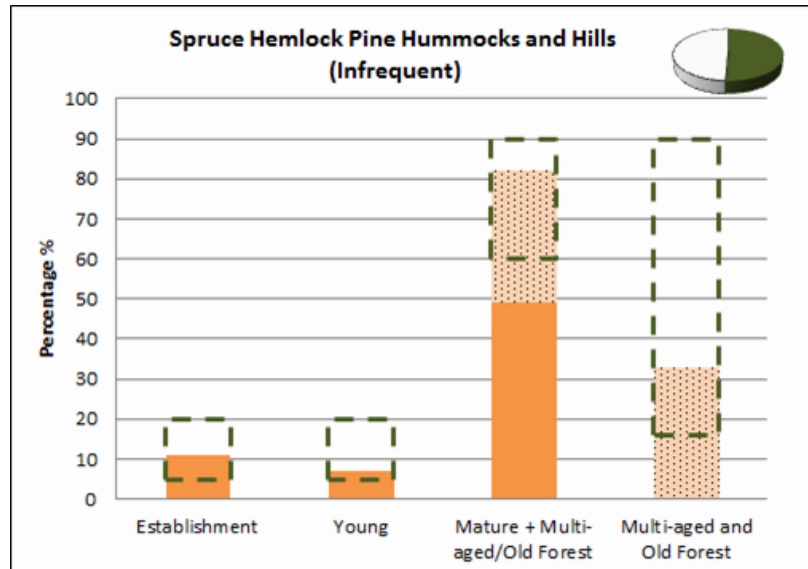
Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)				
Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi- aged and old forest)	Multi- aged and Old Forest
Frequent Stand Initiating	5 - 30%	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.

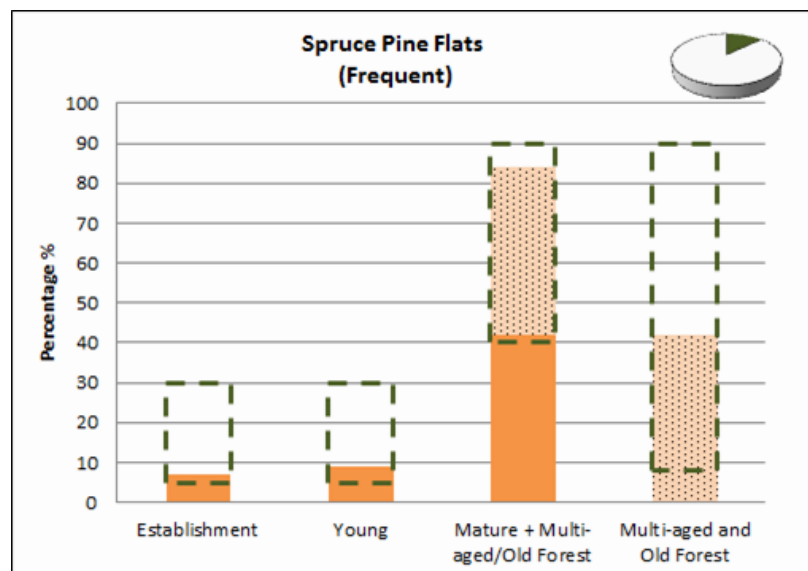
Development Class Targets by Element

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 (NDR). The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage of each development class at the time the original data was gathered. The dotted area in the mature class shows the amount of multi-aged and old forest area included. The coloured portion of the small pie chart in the corner of the graphic shows the relative size of the element within the ecodistrict.

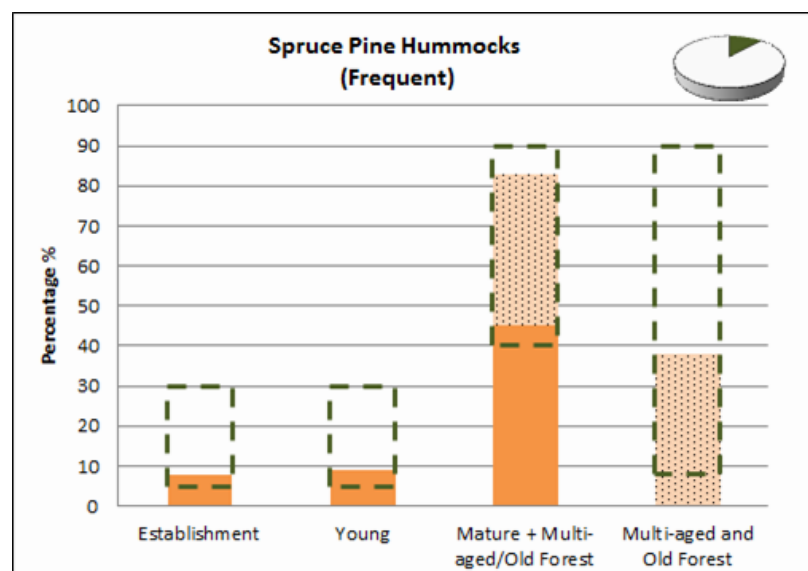
The **Spruce Hemlock Pine Hummocks and Hills** matrix meets the development class target ranges. This will support habitat diversity and continuity of mature forest, as well as provide management flexibility. Extended rotations, natural regeneration, late seral species, large trees, and uneven-aged practices are most appropriate for infrequent NDR forests.



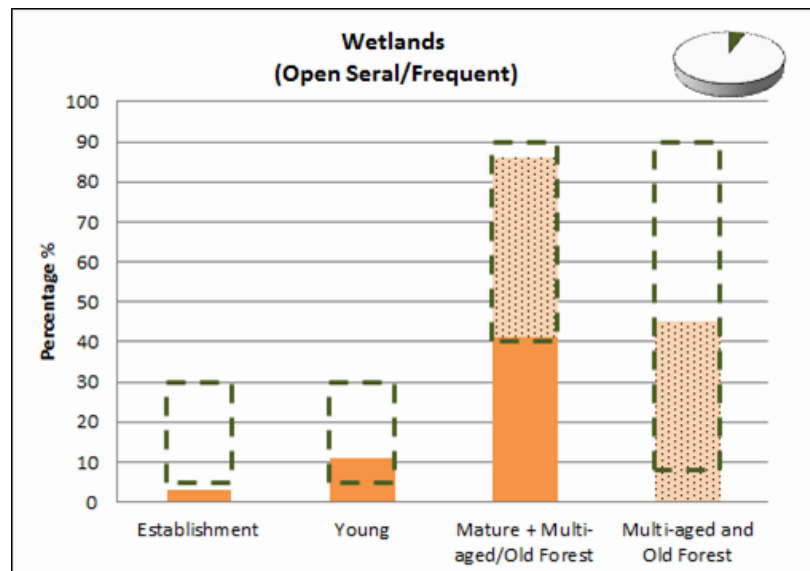
The **Spruce Pine Flats** element is dominated by mature and multi-aged forest, with low levels of establishment and young. The age structure of this element is similar across the Western ecoregion. Periodic stand-initiating events favour even-aged forests, often with a patchy structure due to variable site conditions. In the absence of disturbance, multi-aged stands of black spruce may develop through vegetative layering.



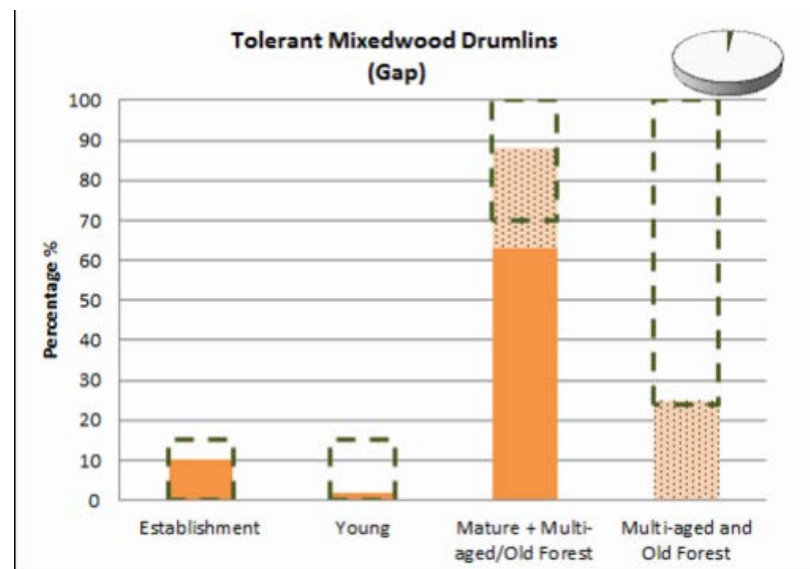
The **Spruce Pine Hummocks** patch element is dominated by mature and multi-aged forest. These frequent NDR forests support periodic stand-initiation events that favour establishment of an even-aged cohort, often with surviving mature pine that provide large seed trees and super canopy structure. This element forms the matrix in the adjacent Sable Ecodistrict 760.



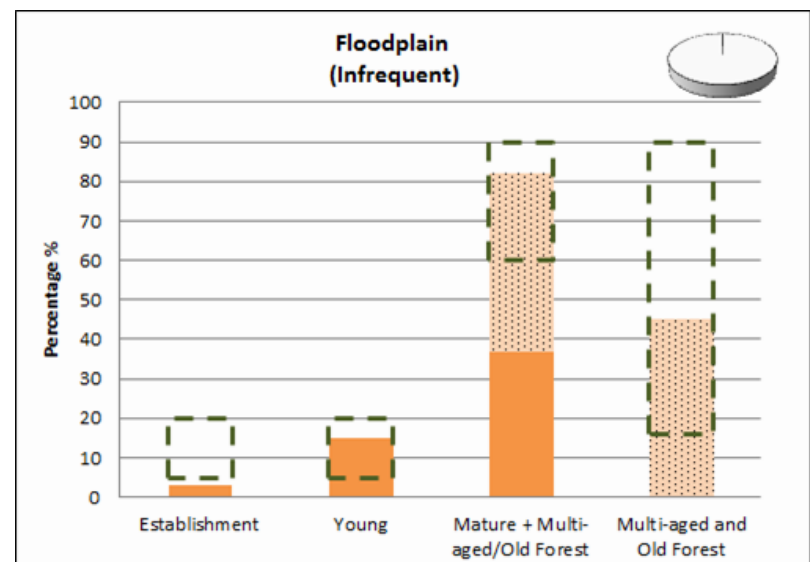
The forested component of the **Wetlands** element is predominately mature and multi-aged, with a lack of establishment class habitat. This small patch element is variably composed of mature forest interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure.



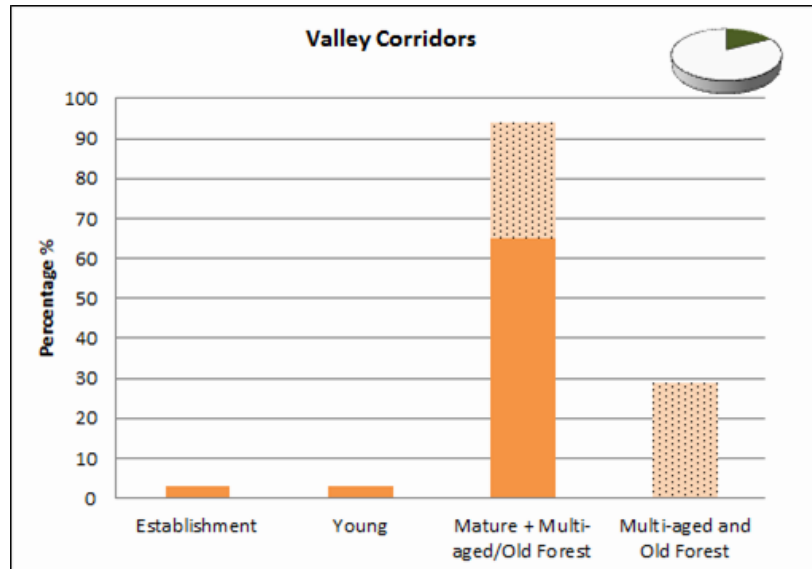
The **Tolerant Mixedwood Drumlins** element currently has abundant mature forest and few young developing stands. This small element occurs in a few patches near the boundary with the LaHave Drumlins ecodistrict, where it forms the matrix. Partial harvests, including retention of large old trees, will promote multi-aged forests of mixed climax species appropriate for this element.



The small **Floodplain** element is located along the Medway River near Mill Village. Management to restore climax red spruce, hemlock, white pine in mature and uneven-aged forest is most appropriate for this uncommon element.



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. This is particularly valuable in riparian zones, where closed canopies and small openings are most appropriate.



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>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.</p> <p>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).</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: 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 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 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	<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>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.</p> <p>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.</p> <p>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.</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 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).