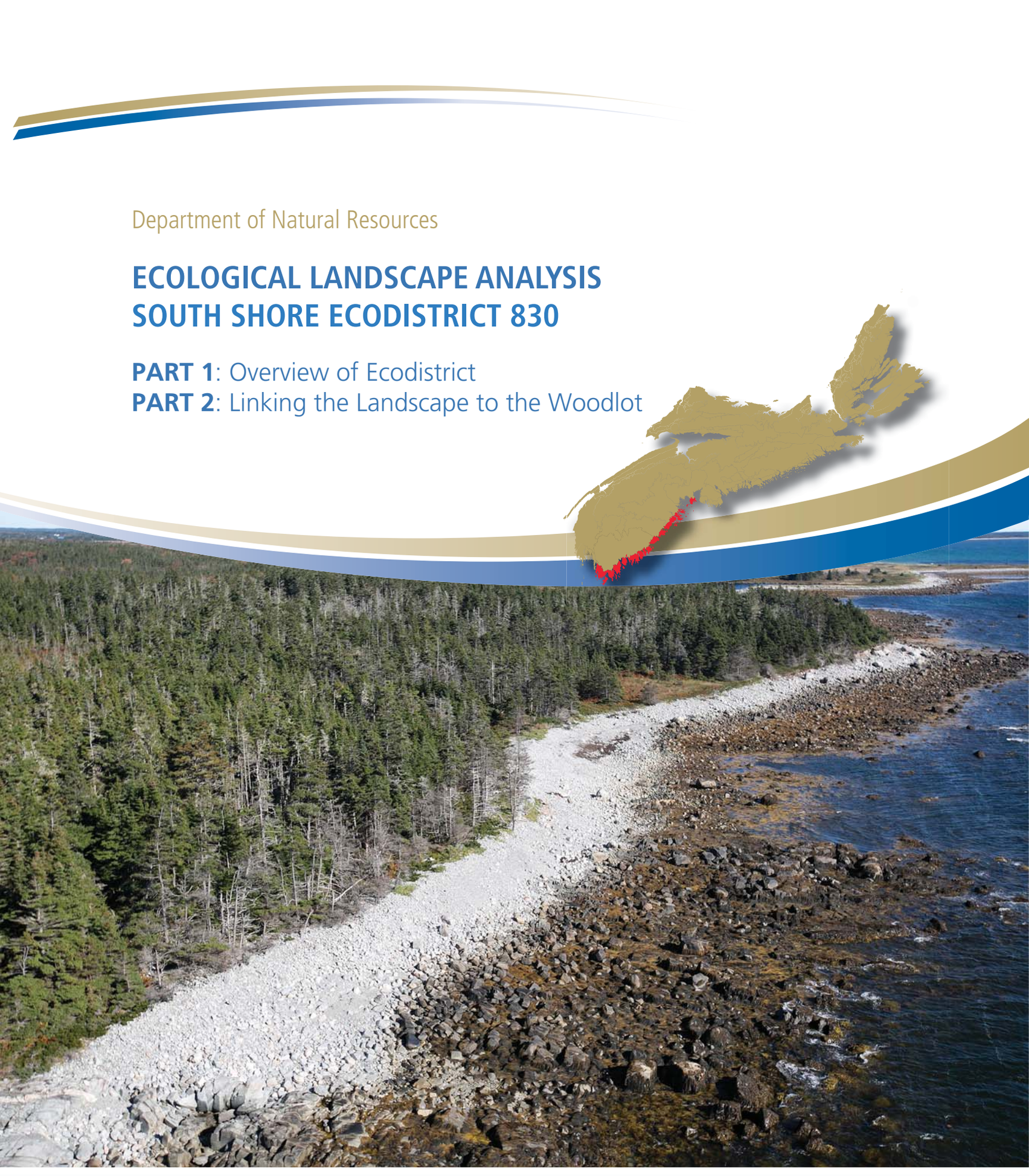
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS SOUTH SHORE ECODISTRICT 830

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



ELA 2015-830

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 830: South Shore

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

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A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

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

This Ecological Landscape Analysis (ELA) provides detailed information on the forest and timber resources of the various landscape components of South Shore Ecodistrict 830. 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 South Shore Ecodistrict follows the Atlantic Ocean coastline 180 kilometres from the Aspotogan Peninsula, near St. Margarets Bay, in the east to Pubnico Harbour in the west. The ecodistrict extends inland about 10 kilometres.

The coastline is irregular, with many bays, inlets, headlands, and islands, reflecting the inland geology and landforms of the adjacent ecodistricts. South Shore includes bedrock of granite, slates, and quartzites and a landscape of low hills and hummocks, extensive flats, and scattered drumlins.

Coarse, sandy beaches are common along with small scattered salt marshes. Coastal barrens and headlands can be extensive throughout this ecodistrict, particularly in the western portion.

The South Shore Ecodistrict includes beaches, salt marshes, forests, and coastal communities.

The climate of South Shore is influenced by the warmer waters of the Gulf Stream more than the Eastern Shore and Cape Breton Coastal ecodistricts, which are cooled by the colder waters of the Labrador Current. The South Shore Ecodistrict is cooler in summer and milder in winter than adjacent inland ecodistricts. Periods of foggy weather are common.

Coastal headlands, such as this one near Baccaro, are common in the ecodistrict. Winds off the Atlantic Ocean severely stunt trees, resulting in forests of black and white spruce and balsam fir.

Black spruce is the dominant species along the shore, along with white spruce and balsam fir. The coastal headlands receive the brunt of Atlantic winds, resulting in coastal forests of black and white spruce where the trees are severely stunted. Further inland from the wind, other tree species – such as red maple, white pine, red oak and yellow birch – will become established.

Private land ownership accounts for 79% of the South Shore Ecodistrict, which has an area of 136,171 hectares. About 15% is held by the provincial Crown and the remainder by other owners.

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

In the **Coastal Spruce** matrix element, representing 42% of the ecodistrict, forests of black spruce with lesser amounts of white spruce and balsam fir are typical. Earlier successional forests will have red maple and white birch but these species are quickly overtaken by the spruce.

Coastal Bogs and Hummocks, the largest patch element representing 13% of the ecodistrict, comprises treeless bogs and low hummocks forested with slow growing black spruce, balsam fir, and tamarack. The element occurs primarily between Round Bay and Barrington. The other patch elements, in order of size, are **Coastal Spruce Pine Hummocks**, **Coastal Mixedwood Hills and Drumlins**, **Coastal Spruce Ridges**, **Coastal Spruce Flats**, **Wetlands**, **Coastal Spruce Pine Oak Hills and Hummocks**, **Coastal Beach**, and **Salt Marsh**.

Valley Corridors, a linear element associated with major watercourses in the ecodistrict, plays an important role in regulating water temperature, input of nutrients, and erosion control.

Forest Ecosystem Management
For South 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 South Shore Ecodistrict 830. 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 South Shore 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 the 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 South 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

The South Shore Ecodistrict extends 180 kilometres along the Atlantic Coast of Nova Scotia from the Aspotogan Peninsula to Pubnico Harbour and extends inland approximately 10 kilometres.

The ecodistrict is 1,350 square kilometres and makes up 28% of the Atlantic Coastal Ecoregion. The coastline is irregular and features long, narrow bays, inlets, headlands, and islands. South Shore excludes the inner islands of Mahone Bay, which for the most part are within the LaHave Drumlins Ecodistrict.

The ecodistrict is generally hummocky terrain with little relief, though a few drumlins are found at Lockeport Harbour.

The bedrock along the South Shore is mostly greywacke and granite. The soil is thin and coarse-textured with imperfect to poor drainage. Orstein (cemented layers) are found in the soils over some of the ecodistrict. Orstein layers and the effects of fire have resulted in the formation of barrens. Sand and cobblestone beaches are a feature of the coastline.

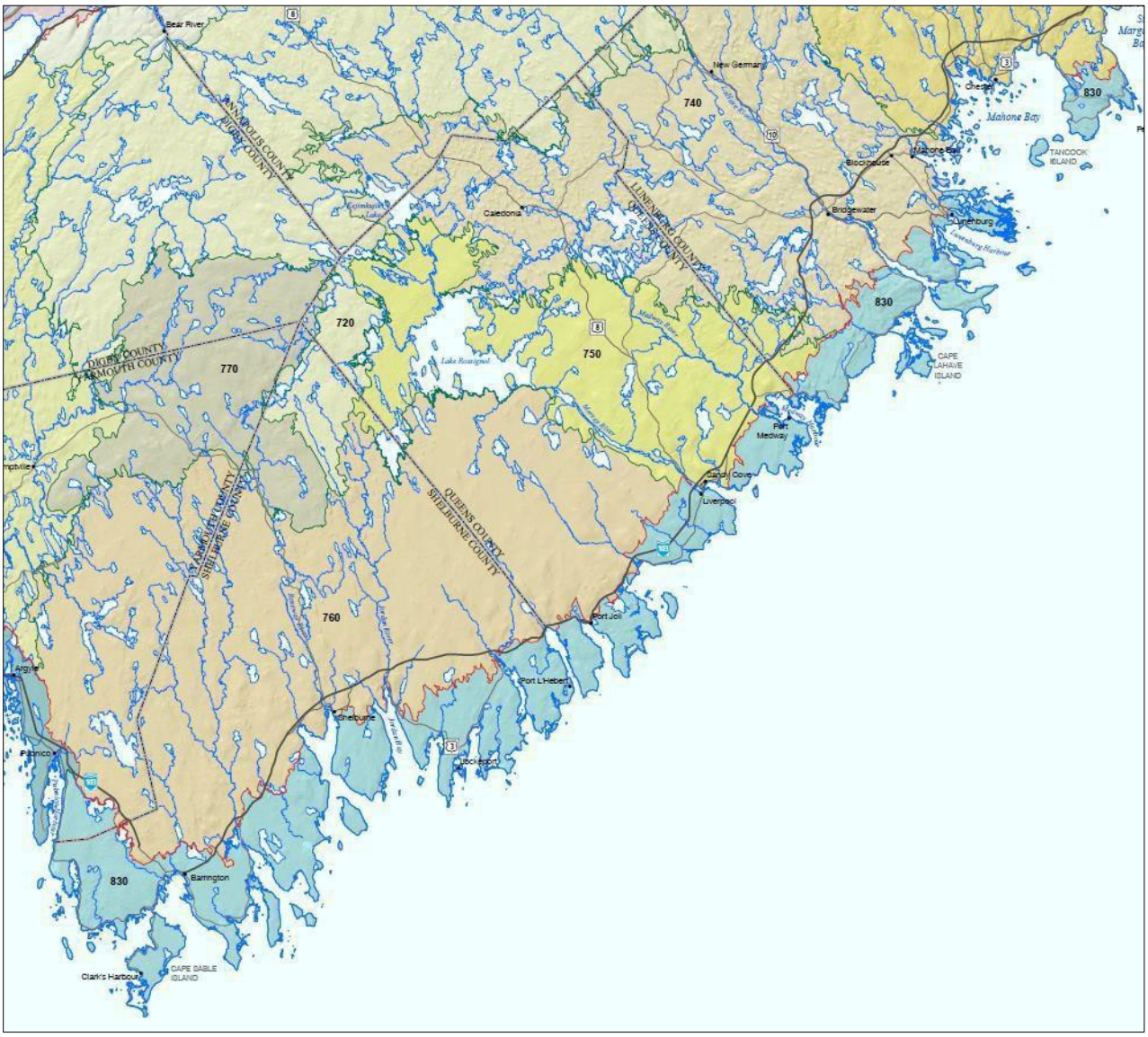
The low fertility of much of the soils in the coastal ecodistrict, especially in the western portion and on many of the ridged areas near Lunenburg, has created ecosystems vulnerable to fire, especially the barrens with its heath-like vegetation and poorly stocked spruce forests.

Black spruce is the dominant species along the shore. White spruce and balsam fir are also common. The absence of red spruce, except for the most sheltered locations in the ecodistrict, is usually an indicator of the coastal influence of the Atlantic Ocean. The climax forest on hills and drumlins with well-drained soils is often a mixedwood forest of red oak and white pine. In wet, peaty areas, black spruce, larch, and alders are found.

Insect defoliation has not been a significant factor in forest disturbance although the balsam woolly adelgid is currently damaging and causing mortality in balsam fir forests throughout the ecodistrict – only colder winter temperatures (-30 C) will reduce its impact on the forests.

About 3.5% of the ecodistrict is covered with lakes and streams. Large bogs are a common wetland feature. Large river systems draining inland watersheds travel through the ecodistrict to the Atlantic Ocean.

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



The South Shore Ecodistrict extends along Nova Scotia's Atlantic coast from Aspotogan Peninsula, near St. Margarets Bay, to Pubnico Harbour.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

The majority of land in the South Shore Ecodistrict is held in private ownership at 79% (Table 1).

Crown blocks are scattered throughout the ecodistrict, but most of the larger ones are in the western portion, in areas such as Woods Harbour, Canada Hill, Villagedale, Jordan Bay, and the Bowers Meadows Wilderness Area.

Table 1 – Land Area by Ownership in the South Shore Ecodistrict*

Ownership	Area** (hectares)	Percent of Total Area
Provincial Crown land	19,665	14.5
Private	107,219	79.3
Federal	2,206	1.6
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	6,081	4.5
Total	**135,171**	**100**

*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 22,087 hectares, representing 16.3% of total area. Ownership of private and other lands decreased to 113,084 hectares, representing 83.7% of total area.*

Federal land is located at the Kejimkujik National Park Seaside Adjunct.

The ecodistrict is rural in character with permanent and seasonal residences scattered along the coastline. A few of the larger towns and communities are Lockeport, Port Mouton, Barrington Passage, Port Medway, and Clarks Harbour. Fishing, forestry, and tourism are among the primary industries.

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).

In South Shore, Crown lands designated C2 is the largest category at 41%, followed by C3 at 30%, C1 at 19%, and unclassified at 10%.

The former Canadian National rail line runs through the ecodistrict. The rail line is generally 30 metres wide, but wider at old station and siding sites. The long-term plan for this land is trail development. Local trail groups or municipal governments now have trail development agreements for almost all the abandoned rail line in Lunenburg, Queens, and Shelburne counties. A number of multi-use or non-motorized trails have been completed and are open to the public.

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	3,783	19.2
C2 – Multiple and Adaptive Use	7,999	40.7
C3 – Protected and Limited Use	5,853	29.8
Unclassified	2,030	10.3
Total	**19,665**	**100**

Trails on former rail line lands present a number of administration issues. There are a large number of existing private crossings and applications for new crossings. Numerous encroachments are present along the rail corridor.

There are a number of campsite leases administered by the DNR in the ecodistrict.

Almost all land below the mean high-water mark is provincial Crown land. Permits are required from DNR for activities that take place on this land. These activities include wharf construction, bank stabilization, and installation of salt water intake and outflow pipes. Because of the large amount of coastline and the importance of the fishing industry a large number of these types of permits have been issued.

Table 3 – Area Distribution by Land Category for All Owners		
Category	**Hectares**	**Percent**
Forested	83,236	61.6
Wetland	21,434	15.9
Agriculture	1,223	0.9
Barrens	9,051	6.7
Urban	7,266	5.4
Road, Trail, Utility	2,051	1.5
Other	10,910	8.1
Total	**135,171**	**100**

Forests

The South Shore Ecodistrict has 62% of its area classified as forested (Table 3).

Much of the remaining area is wetland or barrens, totaling nearly 23%.

Only 1%, of the ecodistrict is used for agriculture, while 5% is urban. Other lands include areas of brush, alders, and gravel pits.

Black and white spruce and balsam fir are the most common species along the ecodistrict's coastline. Insect and wind damage are agents of renewal as shown above.

Softwood species are the climax species over much of the ecodistrict. Black spruce is dominant along the shore along with white spruce and balsam fir. If shelter is provided by topography, conditions may be suitable for other species such as red maple, white pine, red oak, and yellow birch.

The current forest covertype is made up of 58% softwood, 31% mixedwood, 9% hardwood, and 2% unclassified.

Softwoods are usually late seral dominated by black spruce with lesser amounts of white spruce, balsam fir, and white pine.

Mixedwoods are often mid-seral and have a high softwood component of spruce, fir, and pine with shade-intolerant hardwoods, such as red maple, white birch, and aspen. The hardwood covertype is predominately intolerant.

The absence of red spruce, except for the most sheltered inland locations in the ecodistrict, is usually an indicator of the coastal influence of the Atlantic Ocean.

The climax forest on inland hills and drumlins with well-drained soils is likely a mixed forest of red oak and white pine. In wet, peaty areas, black spruce, larch, and alders are found.

Human activity has had a heavy impact on forests in this ecodistrict.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.2 cubic metres per hectare per year (m^3/ha/yr), based on the ratings in Table 4. The average forest LC for the province is 4.9 m^3/ha/yr.

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

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	2,565	3.1
3	12,696	15.2
4	38,883	46.7
5	25,600	30.8
6	3,303	4
7 or more	190	0.2
Total	**83,236**	**100**

*Based on growth potential for softwood species.

Water Resources

Many of the province's longer rivers travel through this ecodistrict (e.g. Sable, Clyde, Roseway, Mersey, and Medway) to empty into the Atlantic Ocean. Small shallow lakes and ponds are found throughout. Wetlands, generally in the form of bogs, are common, imparting a characteristic brown colour to the acidic surface water.

Water is an important provincial resource that must be considered in the context of IRM in general, and specifically within individual ecosystems. The Environmental Goals and Economic Prosperity Act, which was enacted in early 2007, has committed the province to prepare a comprehensive water strategy. This strategy will include a high-level evaluation of water resources.

Nova Scotia's water strategy can be found at http://www.novascotia.ca/nse/water.strategy/docs/WaterStrategy_Water.Resources.Management.Strategy.pdf

Small, shallow ponds and lakes, along with wetlands, are found throughout the South Shore Ecodistrict.

Minerals, Energy and Geology

The South Shore Ecodistrict is located along the Atlantic Ocean and extends from Aspotogan Peninsula in the east along the coast to the Pubnicos in the west. The area is dominated by metamorphic and sedimentary rocks of the Meguma Supergroup that are about 500 million years old.

The bedrock geology is predominately slate rocks of the Meguma Supergroup and covers about 85% of the ecodistrict. The Meguma Supergroup comprises the Goldenville Group and overlying Halifax Group.

The Halifax Group consists mostly of black and grey slates with areas of abundant pyrite, pyrrhotite, and arsenopyrite which can be acid-generating when disturbed and exposed at surface.

The Goldenville Group consists of varying amounts of metamorphic sandstones and siltstones and – as its name implies – is the source of many gold occurrences and deposits found in Nova Scotia.

There are three gold districts located in this ecodistrict, at Voglers Cove, Indian Path, and The Ovens. Production from all three sites has been minimal. At the Indian Path Gold District, tungsten is also present and recent exploration (in 2008) has occurred at this site.

There are a number of abandoned mines associated with exploration and gold production at all three gold districts and caution should be exercised if accessing these areas.

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.

Mineral occurrences in this ecodistrict are mainly beryllium located in the Port L'Hebert and Port Joli areas. There are a number of small granitic plutons – rocks formed when magma solidifies below the earth's surface – that may be host to unique mineralization.

From an industrial minerals perspective, the area holds great potential. In the western end of the ecodistrict, some parts of the granitic plutons and the Shelburne Dyke are quarried for aggregate as well as dimension stone.

The Shelburne Dyke, formed about 200 million years ago, is one of the unique geological features in this ecodistrict. This is the most prominent dyke in Nova Scotia and extends from Lower West Pubnico, along the southern part of the ecodistrict, to Sambro Island for a distance of 200 kilometres with an average width of 100 metres. The dyke is a black gabbro with a fine-grained chill margin next to the country rocks and a coarser grained interior. In South Shore, the dyke is located west of Shelburne and northeast to Port Mouton and from there it extends under the Atlantic Ocean.

The granitic plutons comprise approximately 10% of the ecodistrict, consisting of igneous rocks from Barrington Passage, Shelburne, and Port Mouton plutons, the Shelburne Dyke and several small plutons of unknown affinity. The plutons are found in the eastern end of the ecodistrict.

Slate rocks in the ecodistrict are used as a source of aggregate. Large boulders from till deposits and glacial erratics are used for shoreline protection and enhancement along waterways and coastlines. Glaciofluvial deposits (kames, eskers, and glacial outwash fans) are excellent sources of sand and gravel.

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

The remaining 5% of the ecodistrict is Windsor Group rocks that can be found in small outliers along the coast around Mahone Bay. These rocks are made of marine sediments and are an important source rock for salt, limestone, gypsum, and to a lesser extent, base metals. This bedrock unit is susceptible to karst topography through surface and subsurface weathering.

Coastal erosion has sometimes exposed bedrock, particularly near headlands, in the South Shore Ecodistrict.

A major concern in the South Shore Ecodistrict is the presence of sulphide-rich slates in the Halifax Group, specifically the Cunard 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.

In addition, the oxidation of high concentrations of arsenopyrite in the slate can adversely affect the quality of drinking water by liberating arsenic into the water table.

Parks and Recreation / Protected Areas

The South Shore Ecodistrict contains many bays and inlets that are popular for residents and visitors who engage in boating, kayaking, and other water activities. Summer residences are found throughout this ecodistrict all along the coast.

Abandoned rail road corridors have been developed in several locations and are now multi-use recreational trails.

There are several provincial day use parks, two provincial camping parks, as well as several private campgrounds.

Also located in this ecodistrict is the Kejimkujik National Park Seaside Adjunct. The south shore coastline is a premier destination for many tourists.

The recreational properties are best 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.

	Hectares
Bayswater Beach Provincial Park	8.2
Rissers Beach Provincial Park	101.4
Sand Hills Beach Provincial Park	95.6
Second Peninsula Provincial Park	26.2
Thomas Raddall Provincial Park	615
Bowers Meadows Wilderness Area	4,120
The Islands Provincial Park	78
Port La Tour Bogs Wilderness Area	377
Roseway Beach Provincial Park	30
Northwest Brook Nature Reserve	253
Port L'Hebert Nature Reserve	289
Carters Beach Nature Reserve	74
Summerville Beach Provincial Park	34
Coffin Island Nature Reserve	50
Ragged Harbour Nature Reserve	19
Cherry Hill Beach Nature Reserve	50
Graves Island Provincial Park	46
Blandford Nature Reserve	320
Crow Neck Nature Reserve	22

Category B: Other properties with protection value or 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.

	Hectares
Baker Inlet	1.5
Bear Point	7.6
Blanche	22.2
Broad River	0.6
Bulls Head	3.1
Bush Island	0.1
Cape Negro	9.8
Doctors Cove	7.3

Thomas Raddall, above, and Rissers Beach, below, are the two largest provincial parks in the ecodistrict.

Feltzen South	0.6
First Peninsula	0.2
Hirtles Beach	4.0
Hollahan Lake	16.7
Long Point	0.1
Louis Head Beach	6.8
McNutts Island	21.4
Middle East Pubnico	0.4
Moshers Beach	0.1
North East Point	1.0
Roseway Beach	17.6
Sand Hills Beach	0.3
Summerville Centre	0.1
Upper Blandford	0.1

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

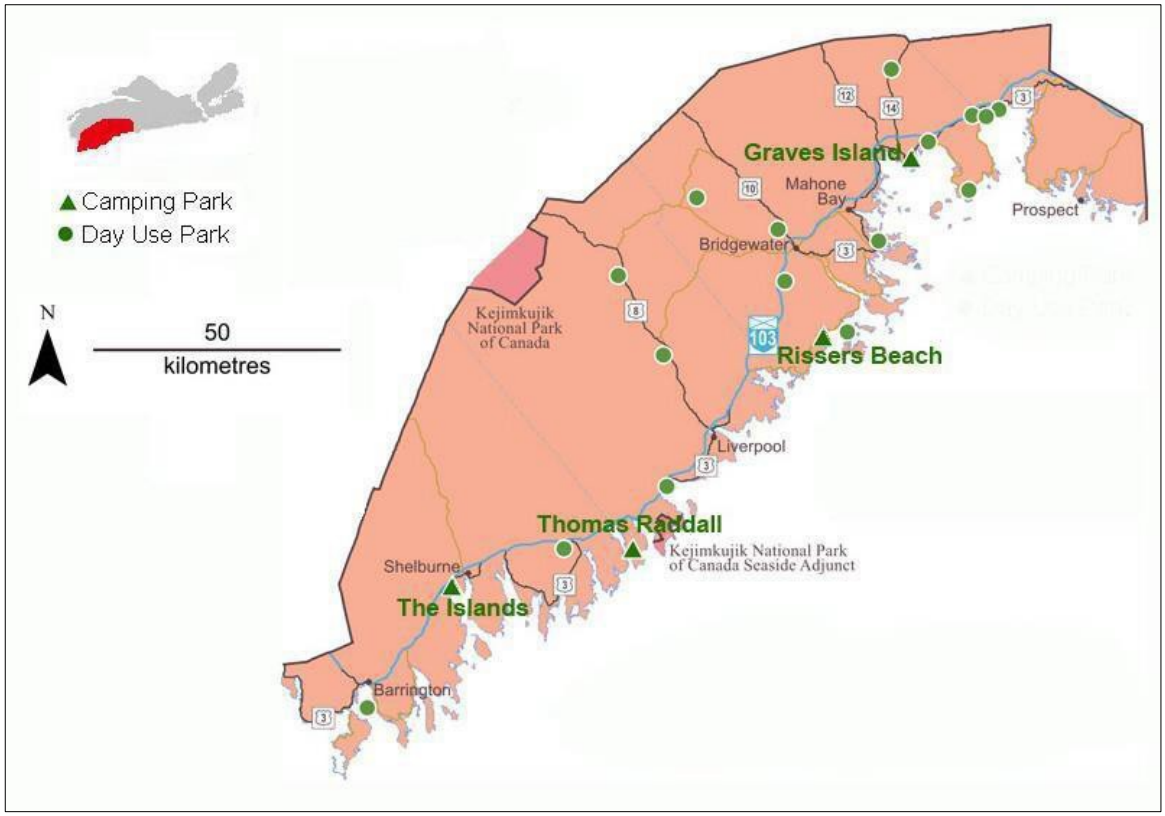
	Kilometres
Designated Abandoned Railway Corridor:	
With letters of Authority	34.3
Without letters of Authority	89.2

National Historic Sites and Parks:

	Hectares
Fort St. Louis National Historic Site	0.4
Kejimkujik National Park Seaside Adjunct	2,200

The Crown owns little land in the ecodistrict that provides access to shoreline.

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/.



Thomas Raddall and Rissers Beach, shown in this map of provincial parks, are two of the popular parks in the South Shore Ecodistrict. *Other parks have been added since the original report was compiled.*

Wildlife and Wildlife Habitat

Wildlife in the South 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 South 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 management of fish resources in Nova Scotia is shared between the federal Department of Fisheries and Oceans and the Nova Scotia Department of Fisheries and Aquaculture. While the Nova Scotia DNR does not have direct responsibilities related to fish, there is some overlap with regard to the aquatic habitat of fish and other wildlife.

Wetlands and Aquatic Habitat

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

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

One of the most striking features of the South Shore Ecodistrict is the abundance of bog habitat, both as the dominant freshwater wetland type and in the land mass as bogs occupy over 18,000 hectares. In terms of total freshwater wetland area in the ecodistrict, bogs account for 89%. Fens, which occur along watercourses, are the next most abundant at 8%. The occurrence of remaining wetland types is relatively minor (less than 1% in several cases).

Coastal wetlands, which provide important habitat to wildlife, are common in the South Shore Ecodistrict in places such as Western Head.

Unlike fens and shrub swamps, bogs receive their water primarily from rainfall, so bogs are not closely associated with watercourses in the ecodistrict, except where streams carry draining water away. Wooded swamps are a common wetland type in Nova Scotia, but they are not common in the South Shore Ecodistrict. Wooded swamps can be under-represented in provincial data because

tree canopies make it difficult to detect them on aerial photographs. Water table data suggest that these wetlands may be much more common than indicated in many of the ecodistricts.

In addition to wetlands, watercourses and their tributaries provide important aquatic and riparian habitat. In these areas aquatic plants and invertebrates support semi-aquatic mammal species such as beaver and muskrat; several species of waterfowl, particularly ring-necked ducks, common mergansers, and black ducks; as well as amphibians and reptiles, including a number of frog, salamander, snake, and turtle species. The riparian zone is one of the most productive habitat zones on the planet and it promotes a rich diversity of wildlife species.

Some significant areas of salt marsh are also found along the coast of the South Shore, with over 2,000 hectares of marsh overall. These salt water wetlands are extremely important ecologically, providing nutrients to marine ecosystems, habitat for marine and terrestrial organisms, and protection of coastline.

Salt marshes are present at many sites along the coastline, but the most extensive marsh complexes are in the southwest part of the ecodistrict, in places such as Osborne Harbour, Port Clyde, and Negro Harbour.

Terrestrial Habitat

Another significant landscape feature of this ecodistrict is coastal barrens. These sites may have a shrub cover, or grasses and sedges may be dominant. In some cases there is undulating ground with hummocks and depressions. The depressions can actually be saturated with water and support wetland plants.

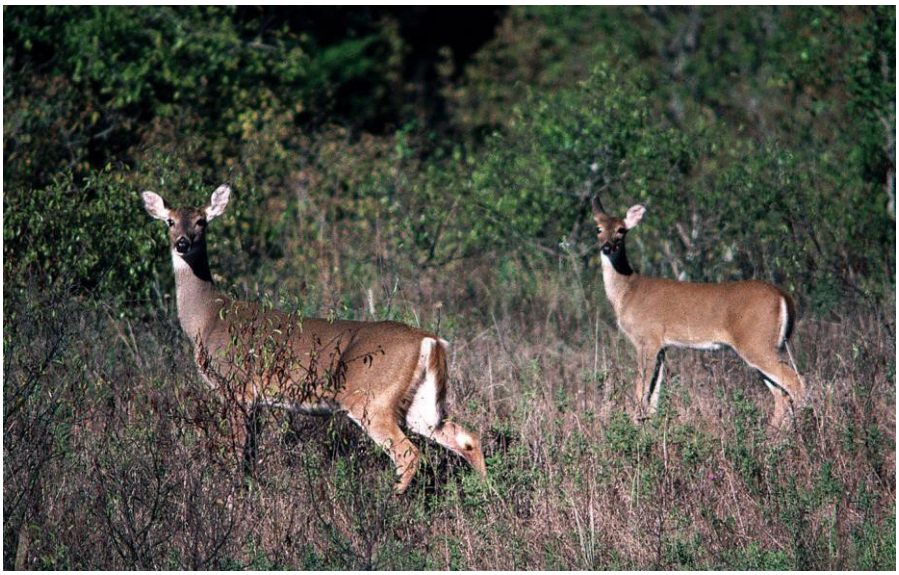
Barrens are frequently adjacent to bogs, adding to extensive open habitat, sometimes with lands with few or no trees stretching for kilometres. Use by wildlife is generally limited to small mammals and predators that can adapt to the barrens, such as hawks, owls, coyotes, and foxes, and for feeding and travel by deer and moose.

Forested wildlife habitat in the South Shore Ecodistrict is predominantly softwood and mixedwood, but wildlife habitat varies depending on location. Black and white spruce are dominant along the coast, but other species are more common inland where the coastal influence is not as great.

Much of the southwestern portion of the ecodistrict is generally of low relief with thin soils and abundant bogs and barrens, while drumlins and richer soils are found at the northeastern end. Moving from northeast to southwest along the ecodistrict, bogs and barrens become more prevalent after Medway Harbour in Queens County. A range of predictable wildlife species associated with the various forest stand species and age compositions, mixed with open bogs and barrens, are expected to occur in these habitats.

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

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



White-tailed deer are common in the ecodistrict.

The difference between the southwestern and northeastern parts of this ecodistrict is reflected in the distribution and abundance of white-tailed deer. In the southwest, much of the forest is currently in the young forest or mature development classes, with relatively little in the way of newly established stands. While intolerant hardwood is a major feature of the mixedwood stands, most is beyond the age when it is most beneficial to deer. There is also relatively little land being used for agriculture. While most of the stands of maturing softwood probably do not provide adequate crown closure to limit snowfall, there would be less of a need for this in the relatively mild climate of the South Shore. It appears then that food availability for deer would be a major factor limiting deer numbers.

In contrast, deer abundance is greater in the northeastern part of the ecodistrict, with its rich drumlin soils and mix of forested and open lands in the form of farmlands and human habitation near the coast. This area is part of a special deer hunting zone implemented to help bring down high deer numbers. It does not appear that regenerating hardwood sites are any more abundant in this area, suggesting that the mix of habitat types and productivity are the key features.

Ideal habitat for snowshoe hare has low dense ground cover, shrubs and regenerating hardwoods and is near open areas that provide access to green plants in summer.

Snowshoe hare in the South Shore Ecodistrict do well in young shade-intolerant hardwood and mixedwood stands.

In the South Shore Ecodistrict as in other areas, snowshoe hare, like deer, do well in the young intolerant hardwood and mixedwood stands, especially where these are near forest openings by way of agricultural lands, wetlands, and barrens.

The number of snowshoe hare and deer in the South Shore Ecodistrict could also be limited somewhat by the apparent absence of wooded swamps, with their rich soils and understory of shrubs and other food plants.

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

Birds of prey (raptors) are high trophic level feeders that occupy large territories and are far less abundant than their prey species. Because they are relatively few in number, raptor species are of concern from a conservation standpoint.

Identifying existing or suspected nest site locations is one important aspect of raptor conservation. Information on nest locations is accumulated opportunistically, and because of their transitory nature, this data requires regular updating.

Raptor habitat requirements vary, but most need large mature trees for nesting.

The red-tailed hawk is a species that hunts a variety of prey in areas of mixed open and wooded habitat, so the South Shore would provide fewer opportunities than other ecodistricts.

Ospreys are a high profile bird of prey in the ecodistrict, specializing in hunting fish along the coast or on inland lakes. Nests are numerous, occurring near water either in trees or on man-made structures such as power poles.

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

Salt marshes, beaches, and islands provide important wildlife habitat in the South Shore Ecodistrict.

Some of these islands annually support communally nesting great blue herons, double-crested cormorants, common eiders, common terns, Arctic terns, Leach's storm petrels, great black-backed gulls, herring gulls, razorbills, Atlantic puffins, black guillemots, and black-legged kittiwakes.

An outstanding wildlife feature of the South Shore Ecodistrict is the relatively high number of species at risk found here. Such species include birds, invertebrates, lichens, and plants including several species of plants belonging to a group known as the Atlantic Coastal Plain Flora (ACPF). These plants became established in southwestern Nova Scotia between 10,000 to 14,000 years ago as a result of a land bridge that existed between Nova Scotia and Massachusetts. As glaciers melted and the sea level gradually rose, the land connection disappeared under the water, isolating the plants.

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

With much of the ecodistrict privately owned, effective wildlife management will to a great extent rely on active, informed stewardship by the many landowners. The 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 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.

Black spruce is the dominant species along the coast, where white spruce and balsam fir are also common. In areas where shelter is provided by topography, conditions may be suitable for other species such as red maple, white pine, red oak, and yellow birch. The climax forest on inland hills and drumlins with well-drained soils is usually a mixedwood forest of red oak and white pine.

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

South 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 11 distinctive elements in the South Shore Ecodistrict – one matrix, nine 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.

In the **Coastal Spruce** matrix element, representing 42% of the ecodistrict, forests of black spruce with lesser amounts of white spruce and balsam fir are typical. Earlier successional forests will have red maple and white birch but these species are quickly overtaken by the spruce.

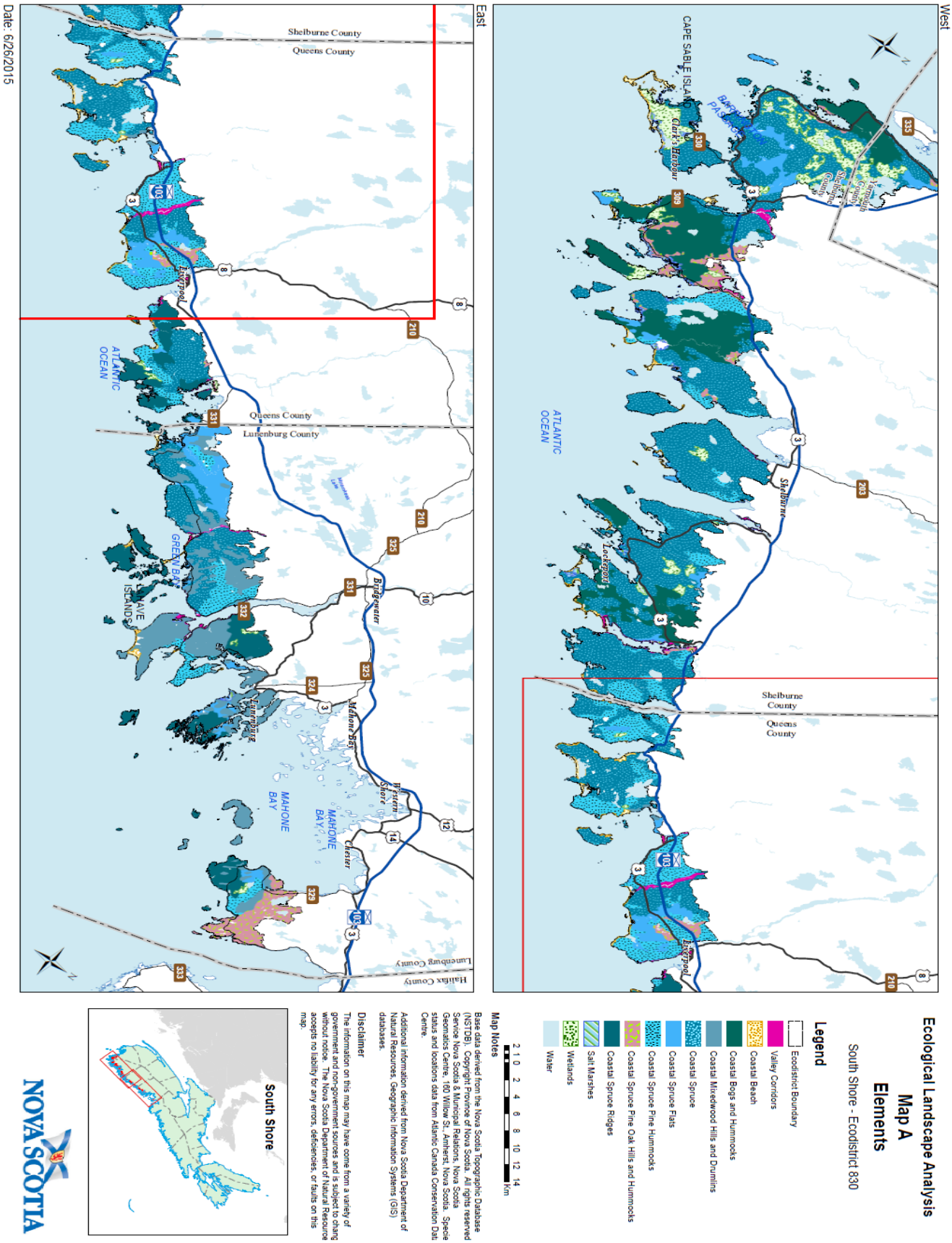
Coastal Bogs and Hummocks, the largest patch element representing 13% of the ecodistrict, comprises treeless bogs and low hummocks forested with slow growing black spruce, balsam fir, and tamarack. The element occurs primarily between Round Bay and Barrington.

The other patch elements, in order of size, are **Coastal Spruce Pine Hummocks**, **Coastal Mixedwood Hills and Drumlins**, **Coastal Spruce Ridges**, **Coastal Spruce Flats**, **Wetlands**, **Coastal Spruce Pine Oak Hills and Hummocks**, **Coastal Beach**, and **Salt Marsh**.

Valley Corridors, a linear element associated with major watercourses in the ecodistrict, plays an important role in regulating water temperature, input of nutrients, and erosion control.

In elements with short-lived softwood species such as balsam fir that are exposed to winds from the Atlantic Ocean, blowdown is common, followed by natural regeneration of young trees.

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 South Shore		
Element	**Size (Hectares)**	**Element Description**
Coastal Spruce (Matrix)	54,989 42.1%	This matrix element occurs on moderately well-drained to imperfectly drained medium-textured soils on hummocky terrain. Forests of black spruce with lesser amounts of white spruce and balsam fir are typical. As soil drainage gets progressively poorer wet forests of red maple, black spruce, tamarack, alders, and ericaceous woody shrubs are common. Embedded within this element are barrens and wet open woodlands, bogs, swamps, fens, and seasonally flooded flats. This element is frequently disturbed by windthrow, insects and/or natural old age which limit the potential for old growth forest development. Earlier successional forests will have red maple and white birch but these species are quickly overtaken by the spruce.
Coastal Bogs and Hummocks (Patch)	17,045 13.1%	This large patch element comprises treeless bogs and low hummocks, with forests of slow growing black spruce, balsam fir, and tamarack. It occurs primarily between Round Bay and Barrington. Lakes and slow moving waterways (stillwaters) are associated with this element. For the most part sites are underlain by poorly drained loams and sandy loam mineral soils or organic soils derived from peat (sphagnum mosses) or sedges. Ericaceous vegetation is extensive, including bog huckleberry and inkberry, two species of the Atlantic Coastal Plain Flora. Other rarer species associated with this group may be expected, especially along lake shores and river frontage.
Coastal Spruce Pine Hummocks (Patch)	16,421 12.6%	This is a large patch element that occurs on well-drained loamy soils on hummocky terrain. Black spruce and white pine form forests on these sites and red oak is a common component. Within the ecodistrict some of the better forests occur in this element, especially farther from the coastal exposure when white pine becomes more prominent in the overstory. Early successional stages following disturbance can be dominated by red maple and white birch with red oak and occasionally aspen. Where forests have been cleared and later abandoned, forests of white spruce and white pine are common.
Coastal Mixedwood Hills and Drumlins (Patch)	10,289 7.9%	Well-drained drumlins and low hills make up the majority of this patch element that is primarily found in coastal Lunenburg County. Black and white spruce with balsam fir are the dominant species on sites exposed to the ocean but inland and on more sheltered sites yellow birch and red maple are co-dominant in the canopy. Red spruce and white pine are also possible on the sheltered sites farther inland. Where forests have been cleared for settlement and later abandoned, forests of white spruce and white pines are common.
Coastal Spruce Ridges (Patch)	8,651 6.6%	This element occurs primarily on bedrock ridged terrain but several areas of flatter topography at Blandford and on a few coastal islands near the LaHave River create a patch element in the ecodistrict. Soils are well to imperfectly drained of medium texture (sandy loams). The climax forest is dominated by black spruce and white spruce and is fully exposed to the coastal climate. Therefore the occurrence of white pine, red maple, and white birch in the canopy is limited to only the best of the sheltered sites. Red maple fens along the major streams and rivers are noteworthy. This element is frequently disturbed by windthrow and/or natural old age which limit the potential for old growth forest development.

Table 5a – Elements Within South Shore		
Element	**Size (Hectares)**	**Element Description**
Coastal Spruce Flats (Patch)	8,068 6.2%	Often occurring as a linear feature, this patch element is found primarily on imperfectly drained soils of medium texture (sandy loams) on flat terrain most often associated with lakes, stillwaters, and watercourses. Wetlands are embedded within this element. Forests of slow growing black spruce are typical. Red maple fens along the major streams and rivers are noteworthy. This element is frequently disturbed by windthrow and/or natural old age which limit the potential for old growth forest development.
Wetlands (Patch)	5,950 4.6%	This element comprises freshwater bogs, fens, swamps, and poorly drained areas (salt marshes are excluded). Where the soils are sufficiently drained to support tree growth, stunted black spruce and tamarack are most likely to be found. Occasionally red maple fens and wooded swamps form a part of this element. Wetlands play an important role in water collection, storage, filtration, and groundwater recharge.
Coastal Spruce Pine Oak Hills and Hummocks (Patch)	5,493 4.2%	The coarse-textured soils of low inherent fertility are characteristic of this element and yield a forest of black spruce, pine, and red oak. On hummocky terrain this patch element is usually associated with waterways (Clyde and Sable Rivers) but is also found in coastal areas (Woods Harbour). A large isolated patch of hilly terrain occurs at Blandford with embedded wetlands. Sites with close proximity to the coast will favour black spruce but farther inland, especially on rapid to well-drained soils, white pine and red oak will be prominent. Imperfectly drained soils will have forests of black spruce. Jack pine with black spruce is unique to the hilly terrain on the Aspotogan Peninsula.
Coastal Beach (Patch)	1,322 1%	Coastal beaches are wave-dominated deposits composed of a mixture of sand, gravel, cobbles, and other sizes of sediments. These beaches occur under a variety of circumstances leading to several types of beach landforms. These can be barrier beaches, spits, tombolos, or pocket beaches. Barrier beaches are common along the South Shore with good examples at St. Catherines River, Summerville, and White Point. These and other beaches (Cherry Hill, Kingsburg) are habitat for the endangered piping plover. These barrier beaches enclose numerous lagoons and lakes.
Salt Marsh (Patch)	941 0.7%	Along the estuaries of the Sable and Jordan rivers, salt marshes have formed from coastal sediments deposited in low-lying, sheltered, intertidal areas or behind spits, bars or islands, and protected bays. Deposits of silt loam sediments with semi-decomposed grasses and sedges trapped in the accumulating layers have formed along the tidal shores.
Valley Corridors (Corridor)	1,318 1%	This element has been delineated along some of the ecodistrict's major river systems. These corridors play important roles in regulating water temperature, input of nutrients, and erosion control. These corridors provide habitat for a diversity of species.
Total	**130,487***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in South Shore

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Coastal Mixedwood Hills and Drumlins	OF1, OF2, OF4	2	CO5	24	**CO4, CO6**	63
Coastal Spruce Pine Hummocks	SP6	15	CO5	46	**CO1,** CO4	35
Coastal Spruce	OW1, OW2, CO5, SP1				**CO1, CO2, CO4,** SP4	
Coastal Spruce Pine Oak Hills and Hummocks	CO4, CO5				CO1, **SP4**	
Coastal Spruce Flats	CO1, **SP7**, WC1, WC2					
Coastal Spruce Ridges	**CO1**, CO2, CO4					
Coastal Bogs and Hummocks	WC1, WC2, WC3, WC6, WC7, WD2, WD3, WD4, WD6, CO1, CO4, SP7					
Salt Marsh	Grasslands of *Spartina spp.*					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	WC1, WC2, WC3, WC6, WC7, WD2, WD3, WD4, WD6, SP7					

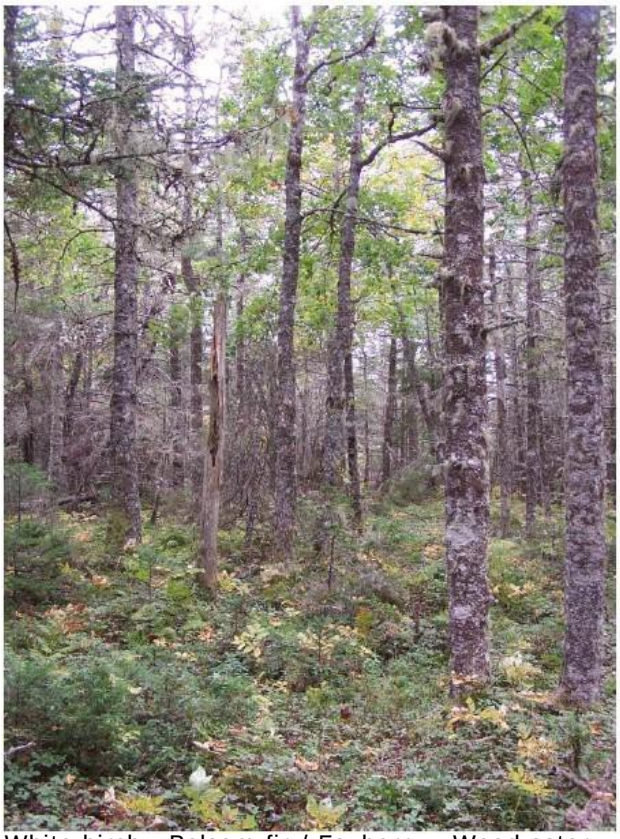
View forest groups and vegetation types at
http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by DNR are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (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)
*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.

Balsam fir / Foxberry – Twinflower (CO4) is a late successional vegetation type found in the Coastal Spruce matrix element.

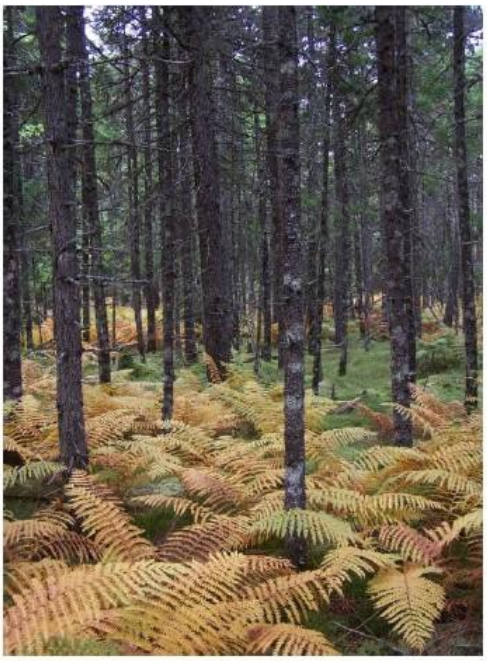
Red maple / Sensitive fern – Lady fern / Sphagnum (WD3) is a vegetation type found in the Coastal Bogs and Hummocks element.



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

White spruce / Aster – Goldenrod / Shaggy moss (OF) is an early successional vegetation type found in the Coastal Mixedwood Hills and Drumlins element.

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



Black spruce / Cinnamon fern / Sphagnum (WC1) is a vegetation type found in the Coastal Spruce Flats element.

Red maple /Poison ivy /Sphagnum (WD4) is a vegetation type found in the Wetlands element.

White pine / Blueberry / Bracken (SP4) is a late successional vegetation type found in the Coastal Spruce Pine Oak Hills and Hummocks 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.

A frequent natural disturbance regime is responsible for the expansive coastal black spruce-white spruce communities of the South Shore Ecodistrict. The interval between stand-initiating events is shorter than the longevity of the climax species. This disturbance regime is intense enough that there is rapid mortality and a new even-aged forest becomes established. Another disturbance occurs before the stand becomes uneven-aged. Wind, fire, and insects can be the disturbance agents.

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)

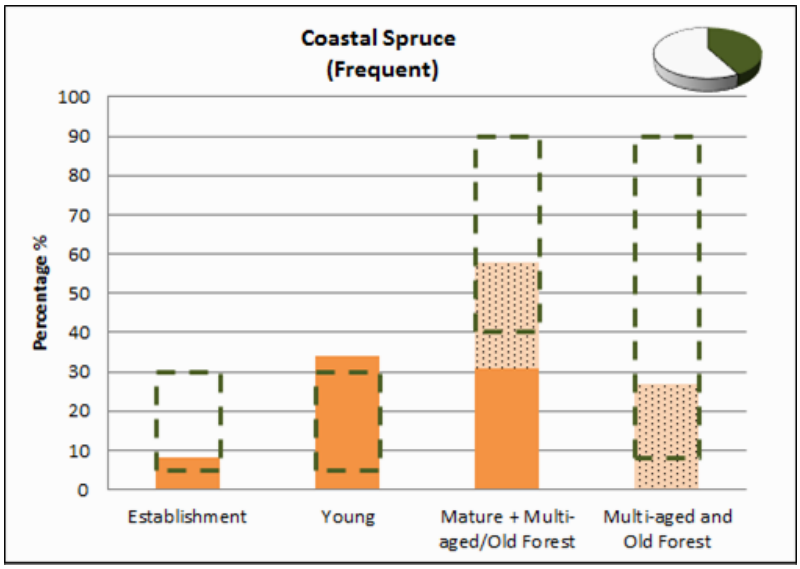
Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5 - 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.

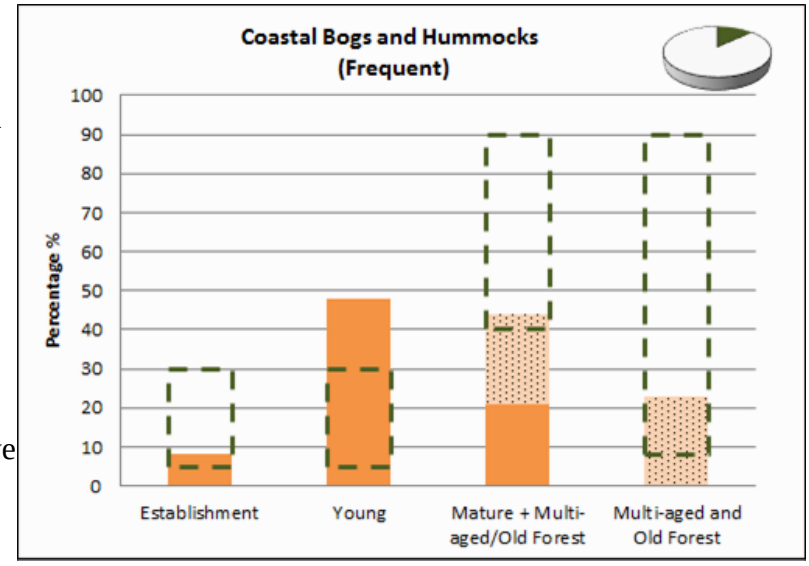
Development Class Targets by Element

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. 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.

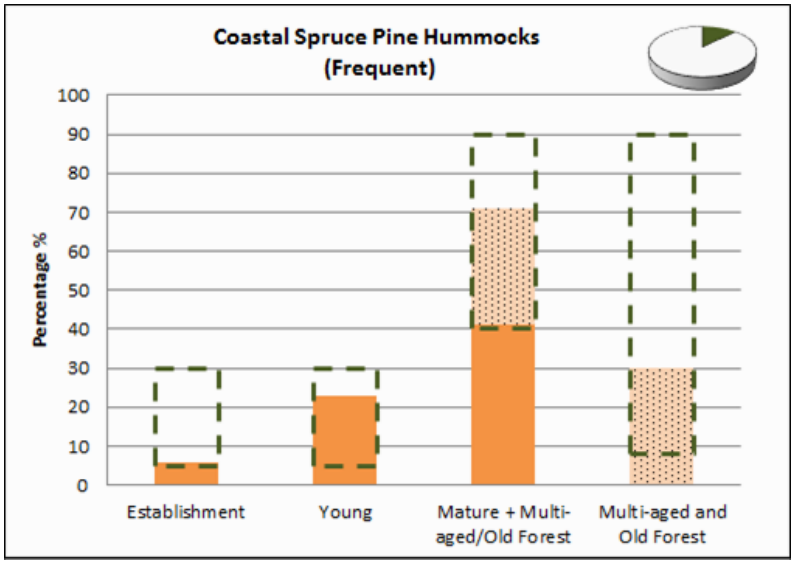
In **Coastal Spruce**, forest harvesting of mature and rapidly declining stands can continue with patch sizes consistent with those created by natural disturbances. Adequate advanced regeneration of fir and spruce at time of harvest will hasten ecosystem recovery. Young and mature forests on wind firm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



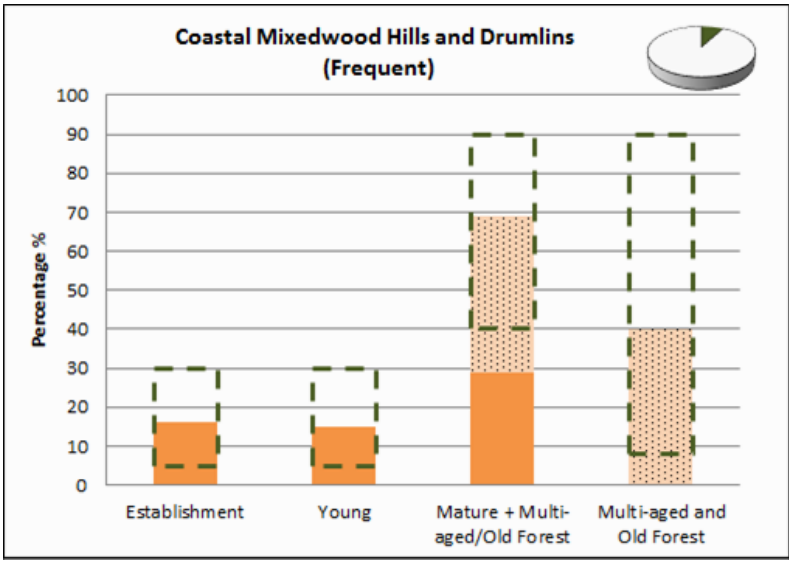
Slow growing, isolated forests provide limited opportunities for management in **Coastal Bogs and Hummocks.** Accessing forested sites across wetlands sensitive to harvesting machinery is problematic. Forestry operations should employ special practices to maintain forested ecosystems and patch harvesting should follow natural boundaries. These forests within a larger wetland matrix have important wildlife habitat value.



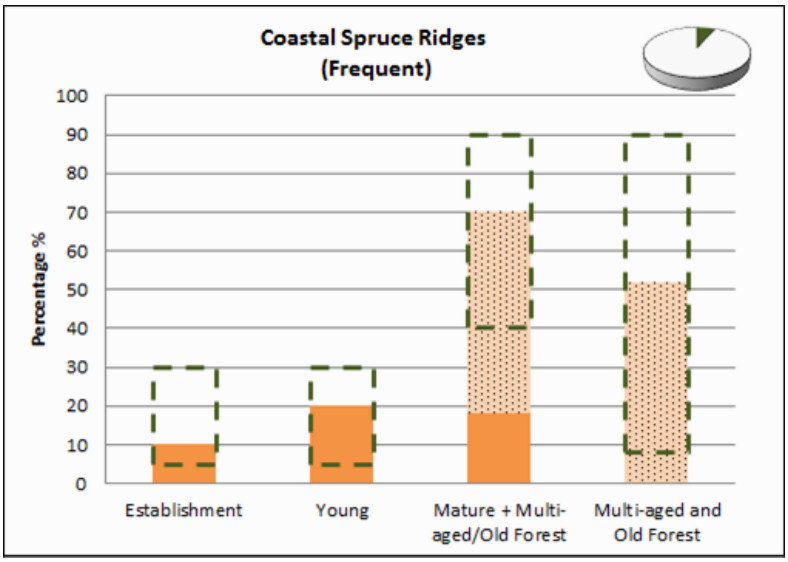
All development classes are within target ranges in **Coastal Spruce Pine Hummocks.** Forest harvesting of mature and rapidly declining stands should create patch sizes consistent with those created by natural disturbances. Adequate advanced regeneration of fir and spruce at time of harvest will hasten ecosystem recovery. Young and mature forests on wind firm sites may be partially harvested.



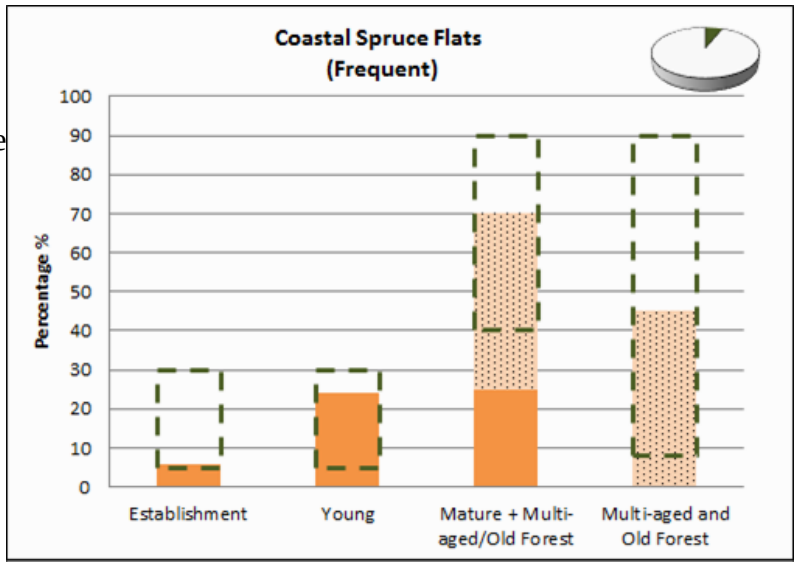
In **Coastal Mixedwood Hills and Drumlins,** all development classes are within target ranges.
Forest and site conditions on this element are better for partial harvesting but exposure can still be severe and windthrow losses significant. Adequate advanced regeneration of fir, spruce, birch, and maple at time of clearcut or partial harvesting will hasten ecosystem recovery.



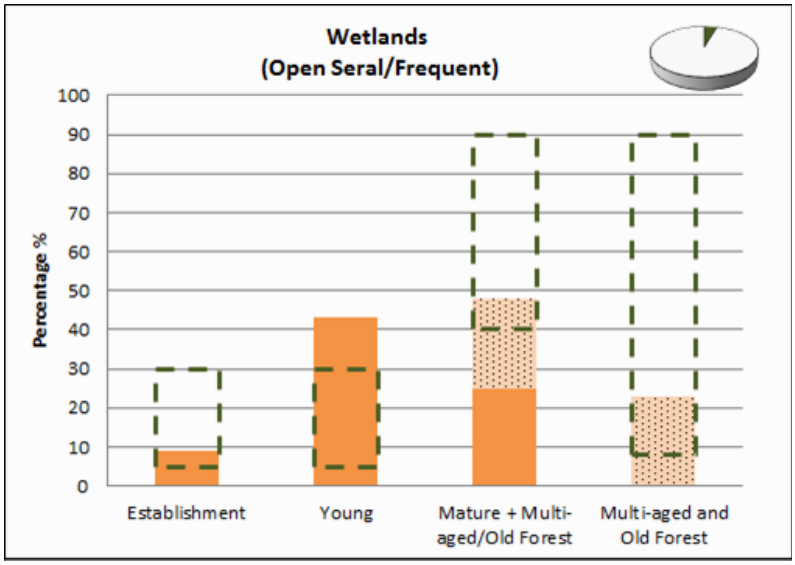
Coastal Spruce Ridges has all development classes within target ranges. Much of the element is windswept ridges with exposed bedrock or soils very shallow over bedrock supporting forests of low timber value. Sites further inland with better forests can be harvested by creating patch sizes consistent with those created by natural disturbances. With adequate advanced regeneration of fir and spruce at time of harvest sites will reforest quickly.



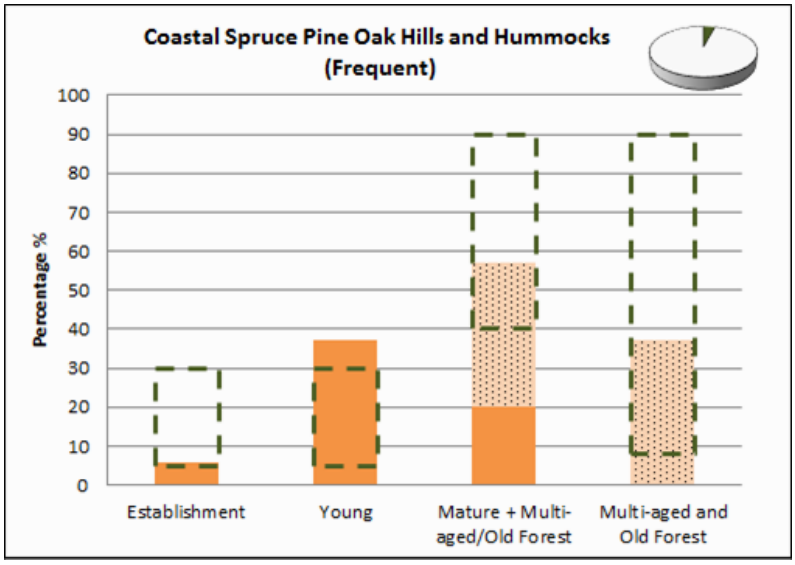
In **Coastal Spruce Flats**, forest harvesting of mature and rapidly declining stands can continue with patch sizes consistent with those cre by natural disturbances.
Partial harvesting in this element is difficult due to the shallow rooting of spruce and fir on the imperfectly drained soils. Sites are sensitive to harvesting machinery.



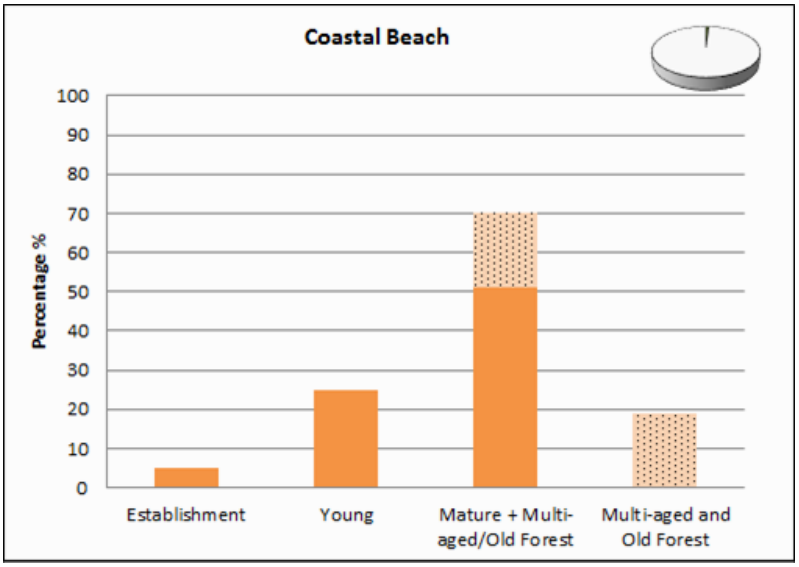
The **Wetlands** element is variably composed of forest, interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure. The relatively high amount of young forest may reflect a misinterpretation of height on poor, wet sites, as well as past harvesting. Some thinning opportunities may exist, along with small patch harvesting following natural boundaries.



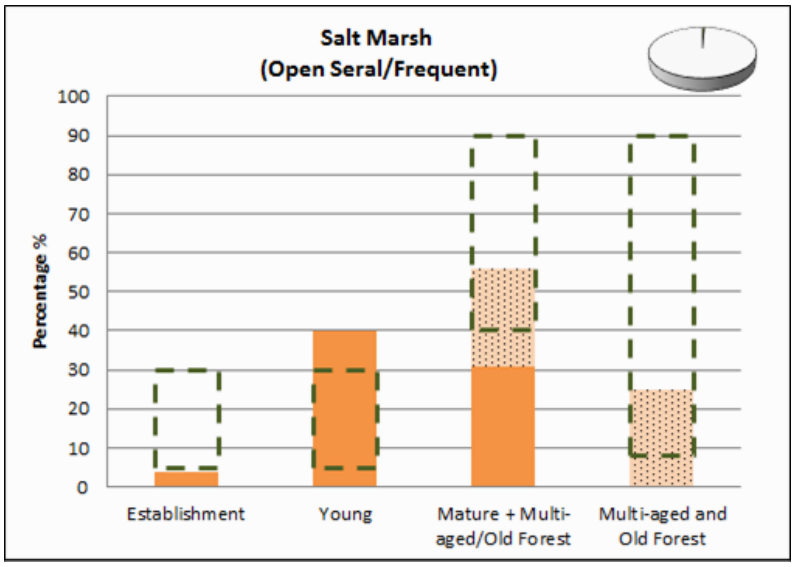
In **Coastal Spruce Pine Oak Hills and Hummocks**, development classes are within target ranges. Well-drained coarse-textured soils with pine and oak can support partial harvesting and uneven-aged management. Black spruce on exposed sites close to the coast and on moist soils can be patch harvested and with adequate advanced regeneration sites will reforest quickly.



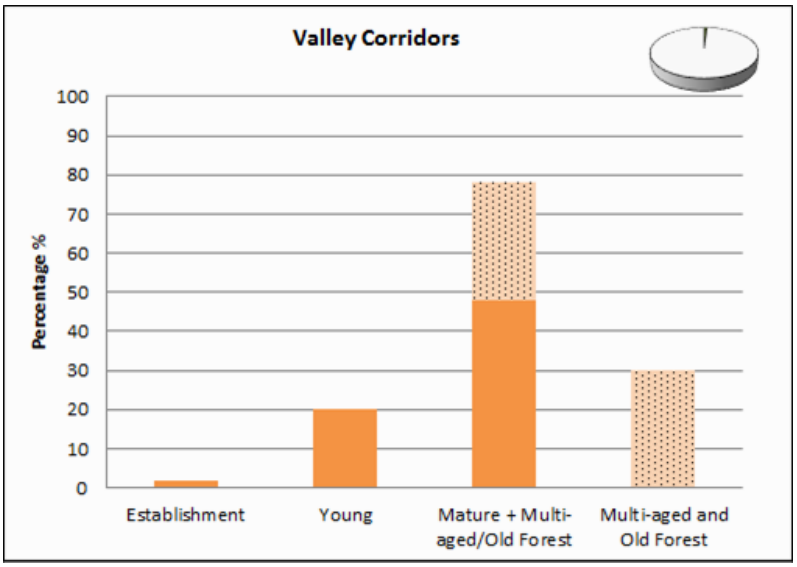
In **Coastal Beach**, the small amount of forest habitat included in this element is important for shore birds. Forestry operations are not applicable and any other land use activity should be aware of the need to protect these sensitive sites.



Isolated forests included in the **Salt Marsh** element create habitat and provide an important interface to the wetland ecosystem. Forestry operations are typically not applicable but where possible should employ special practices to maintain forested ecosystems on these sensitive sites.



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.



Storm beaches are typical coastal features of the South Shore Ecodistrict.

Summary of Parts 1 and 2

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

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

Glossary A: Terms in Parts 1 and 2

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

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

Ecosystem	A functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, pond, field, forest, or the Earth's biosphere – but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, such as a forest ecosystem, old-growth ecosystem, or range ecosystem. Can also refer to units mapped in the 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 extinction. A species listed as endangered under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal Species at Risk Act).
Even-aged	A forest, stand, or vegetation type in which relatively small age differences exist between individual trees. Typically results from stand-initiating disturbance.
Extinct species	A species that no longer exists. A species declared extinct under federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Extirpated species	A species that no longer exists in the wild in Nova Scotia but exists in the wild outside the province. A species declared extirpated under federal or Nova Scotia endangered species legislation (Nova Scotia Species at Risk Act or federal SARA).
Forest management	The practical application of scientific, economic, and social principles to the administration and working of a forest for specified objectives. Particularly, that branch of forestry concerned with the overall administrative, economic, legal, and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection, and forest regulation.
Frequent stand initiating	Disturbances usually occur more frequently than the average lifespan of the dominant species and are of sufficient intensity to destroy most of the existing trees, promoting a new forest within relatively short periods of time.
Gap replacement	An absence of stand-initiating disturbances supports the development of a dominant overstory that is sustained through dynamic processes of canopy gap formation, understory development, and overstory recruitment. Gap formation ranges from individual tree mortality to periodic gap formation events that are rarely of a stand-initiating intensity.

Habitat	The place where an organism lives and/or the conditions of that environment including the soil, vegetation, water, and food.
Impact assessment	A study of the potential future effects of resource development on other resources and on social, economic, and/or environmental conditions.
Infrequent stand initiating	The time between stand-initiating disturbances is usually longer than the average longevity of dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests.
Inherent conditions	Refers to the natural condition of ecosystems based on their enduring physical features. This is the potential condition expected in the absence of human influence.
Integrated Resource Management (IRM)	A decision-making process whereby all resources are identified, assessed, and compared before land use or resource management decisions are made. The decisions themselves, whether to approve a plan or carry out an action on the ground, may be either multiple or single use in a given area. The application of integrated resource management results in a regional mosaic of land uses and resource priorities which reflect the optimal allocation and scheduling of resource uses.
Land capability (LC)	LC values represent the maximum potential stand productivity (m^3/ha/yr) under natural conditions.
Landform	A landscape unit that denotes origin and shape, such as a floodplain, river terrace, or drumlin.
Landscape	An expanse of natural area, comprising landforms, land cover, habitats, and natural and human-made features that, taken together, form a composite. May range in scale from a few hectares to large tracts of many square kilometres in extent.
Matrix	A widespread vegetation forest community which dominates the landscape and forms the background in which other smaller scale communities (patches) occur. The most connected or continuous vegetation type within the landscape, typically the dominant element. (Matrix is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)
Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old forest. Mature forests include multi-aged and old forest. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes, and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old forest.

Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.
Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand-initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand-initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand-initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.
Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.
Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the “matrix, patch, corridor” concept of landscape structure.)
Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain, or standing water body.

Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms that are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened, and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).