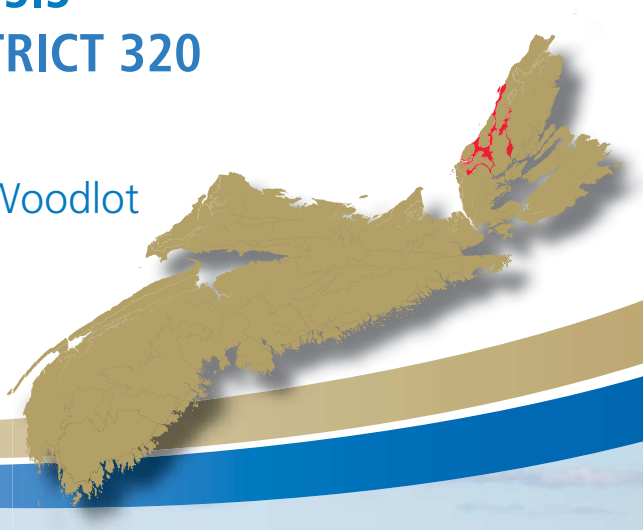
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS
INVERNESS LOWLANDS ECODISTRICT 320

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



ELA 2015-320

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Ecological Landscape Analysis, Ecodistrict 320: Inverness Lowlands

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos, and resources of the Inverness Lowlands 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 (1997-1999) – 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 2015-320

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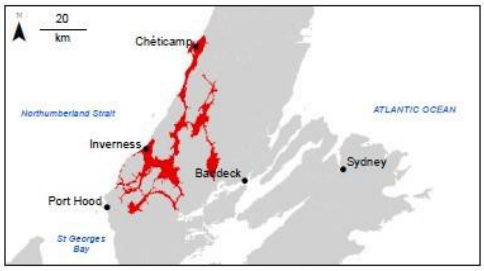
A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 320: **Inverness Lowlands**



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 Inverness Lowlands Ecodistrict 320. 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.

Inverness Lowlands is a small, irregularly-shaped ecodistrict along the river valleys of seven of the main rivers in Inverness County as well as along the shores of the 20-kilometre-long Lake Ainslie, the largest natural freshwater lake in the province.

The fertile soils adjacent to the waterways led to farming and early settlement in the 1750s by European settlers, who established communities throughout the ecodistrict. Many of the original farms have since been abandoned. Currently, 54% of the area is forested and 12% is agriculture.

Inverness Lowlands, one of the smallest ecodistricts in the province, stretches from Chéticamp in the north to Mull River and Whycocomagh Bay in the south. The total area is 48,800 hectares.

The ecodistrict includes the fault valleys of both the Margaree and the Middle rivers. The Margaree has been designated a Canadian Heritage river and is well-known as an excellent spawning area for Atlantic salmon.

Between Mabou and Inverness, erosion has created wide valleys, with steep slopes and gorges, creating beautiful landscapes.

A mix of farmland and forests follow along the Mabou River near the scenic community of Mabou.

Another significant portion of the ecodistrict comprises freshwater wetlands, salt marshes, and coastal beaches. Colonies of gulls, cormorants, and kittiwakes are found nesting on the ocean-side cliffs of Chéticamp Island.

The Northeast Margaree River is home to some of the best Atlantic salmon fishing in Nova Scotia.

The Margaree Valley is known for having some of the coldest temperatures and shortest recorded frost-free periods in the province.

Fossil remains of mastodons have been found in overburden material in the Middle River Valley.

Private land ownership accounts for nearly 80% of the ecodistrict. Five percent of the ecodistrict is under provincial Crown management, with the remainder in other uses.

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 – six patch elements, and a corridor element – in Inverness Lowlands. A matrix is the dominant element, but in this ecodistrict there was not an obvious matrix.

Inverness Lowlands is basically a valley-driven landscape with isolated areas from one end to the other. The main connection is through other ecodistricts, such as the adjoining Cape Breton Hills.

Spruce Fir Hills and Hemlocks is the largest patch element, representing 42% of the ecodistrict. The forests are dominated by black spruce, white spruce, and balsam fir.

Tolerant Hardwood Hills, representing nearly 35% of the ecodistrict, is the second largest patch element. Shade-tolerant hardwood species typical of the Acadian Forest, such as sugar maple, yellow birch and beech, dominate.

The **Floodplain** element, representing 5% of the ecodistrict, is associated with the major rivers. Alluvial deposits occur due to flooding. The other patch elements, in order of size, are **Wetlands**, **Salt Marsh**, and **Coastal Beach**.

Valley Corridors is a linear element associated with major watercourses in the ecodistrict.

Forest Ecosystem Management
For Inverness Lowlands 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 Inverness Lowlands Ecodistrict 320. 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 Inverness Lowlands Ecodistrict was up to 2006. These baseline measurements can be used to assess trends through comparison with present and future inventories.

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

Finally, the relationship between inherent structure and existing conditions is used to guide future direction. The ELA is part of an ecosystem approach that will expand to encompass other initiatives of Department of 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 Inverness Lowlands – *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 underlying geology comprises volcanic rocks, coal, sandstone, shale, gypsum, and limestone.

The area tends to be somewhat sheltered by the surrounding uplands (Cape Breton Hills 310 and Cape Breton Highlands 210), with the exception of the Chéticamp area where a combination of topography and temperature create a unique phenomenon, locally known as "*les suetes.*"

A *suete* begins with winds blowing in off the Atlantic Ocean from the southeast. When conditions are right, the swirling air molecules slide up the eastern slope of the Cape Breton Highlands, then begin the steep downward descent through to canyons on the western side, gathering speed as they go. The strongest *suete* recorded, which struck on March 13, 1993, was officially clocked at 233 km/h.

The first Europeans came to the area in the 1750s to establish fishing stations along the coast. Actual settlement began about 30 years later, with French emigrants settling at Chéticamp and United Empire Loyalists coming to Mabou.

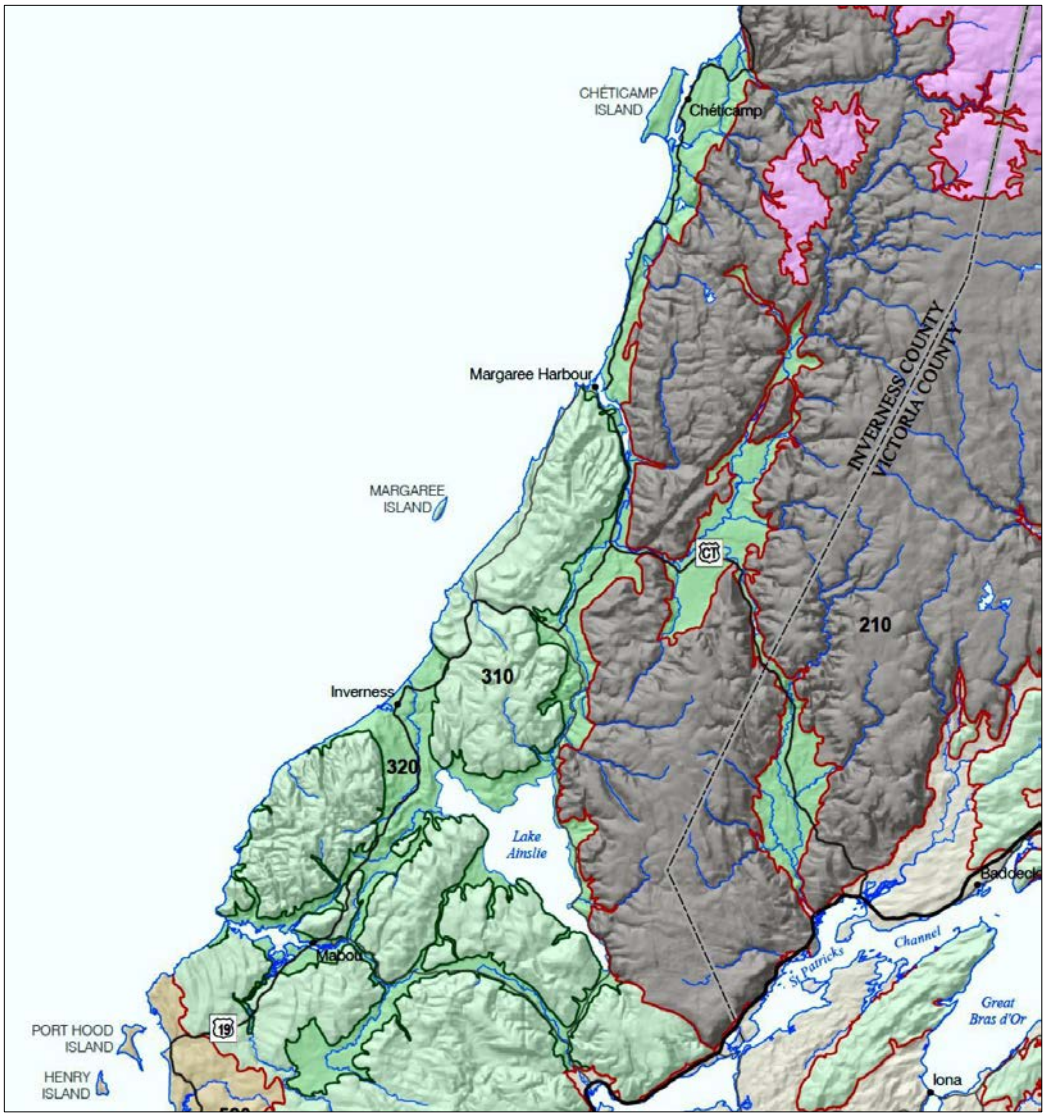
Coal and gypsum have been mined at several locations. Due to heavy settlement in this area, most of the original forest has been severely disturbed, especially on the intervale lands which account for almost 10% of the ecodistrict. On this intervale land, sugar maple, white ash, balsam poplar, and American elm formed the naturally occurring forest.

Extensive areas of black spruce forest are found on the moist soils of this ecodistrict.

Tolerant hardwood forests of sugar maple, yellow birch, and beech will occur in areas where sheltered growing conditions are provided by the hills and uplands and where the soils are well-drained on slopes.

Old field white spruce forests are common where agricultural land has been abandoned.

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



Inverness Lowlands covers low lying parts of western and central Cape Breton Island.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

The ecodistrict is rural and land ownership is as indicated in Table 1.

Private lands account for four-fifths of the area. Other areas, including inland bodies of water such as Lake Ainslie, account for 15%, followed by provincial Crown land at 5%.

Table 1 – Land Area by Ownership in the Inverness Lowlands Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	2,461	5
Private	38,807	79.5
Federal	286	0.6
Aboriginal	4	<0.1
Other (Includes inland water bodies and transportation corridors)	7,275	14.9
Total	**48,833**	**100**

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

IRM Resource Classification for Provincial Crown Lands

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

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

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	808	32.8
C2 – Multiple and Adaptive Use	1,074	43.7
C3 – Protected and Limited Use	550	22.4
Unclassified	28	1.1
Total	**2,460**	**100**

The most common category is C2 (44%), followed by C1 (33%), and C3 (22%).

Forests

Of the total of 48,833 hectares of land in the ecodistrict, approximately 26,352 hectares, or 54%, is classified as forested. Non-forested land includes agriculture (12%), wetland (6%), and urban (5%).

The softwood forests are susceptible to spruce budworm and bark beetles and these two insects have had a significant influence on forest composition in this ecodistrict.

Blowdown of the shallow-rooted spruce forests on the moist soils is common throughout the ecodistrict.

The hardwood forests have also experienced significant mortality with individual species succumbing to pathogens. The birch dieback was widespread in Eastern Canada occurring from 1932 to 1955. The beech canker, introduced to the province in the 1890s, has reduced the once dominant beech to a lower canopy species.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	26,352	54
Wetland	2,726	5.6
Agriculture	6,004	12.3
Barrens	136	0.3
Urban	2,518	5.2
Road, Trail, Utility	775	1.6
Other	10,322	21.1
Total	**48,833**	**100**

Other insects and diseases that cause individual tree mortality in hardwood species include the maple borer, cinder conk in yellow birch, and Dutch elm disease.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.8 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. Two-thirds of the ecodistrict has an LC rating of 5.

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	34	0.1
3	617	2.3
4	5,656	21.5
5	17,762	67.1
6	1,830	7
7 or more	543	2
Total	**26,352**	**100**

*Based on growth potential for softwood species.

Lake Ainslie, the largest natural freshwater lake in the province, is the main water feature of the Inverness Lowlands Ecodistrict.

Water Resources

The main water feature in the ecodistrict is Lake Ainslie, the largest natural freshwater lake in Nova Scotia. The lake is about 20 kilometres long and up to five kilometres wide.

Major rivers include the Middle, Southwest Margaree, Northeast Margaree, and Skye.

Water is an important provincial resource that must be considered in the context of Integrated Resource Management 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 for the entire province. In addition, detailed water resource studies have been completed for approximately 40% of the province and are available from the Nova Scotia Department of Environment. It is anticipated that the ELA, and subsequent ELA documents, will be modified once water resource information is made available. *The water strategy can be found at http://www.novascotia.ca/nse/water.strategy/docs/WaterStrategy_Water.Resources.Management.Strategy.pdf*

Minerals, Energy and Geology

The Inverness Lowlands Ecodistrict includes portions of the Aspy and Bras d'Or terranes – fragments of crust material from one tectonic plate joined to the crust of another plate. The basement rocks are generally overlain by Carboniferous sedimentary rocks (Cumberland, Mabou, Windsor, and Horton groups). The Carboniferous strata include conglomerates, sandstones,

siltstones, shales, mudstones, limestone, gypsum, and anhydrite. Windsor Group rocks are susceptible to stream and coastal erosion and generally underlie areas of lowest relief.

Province-wide, some of the best agricultural land is underlain by the Windsor Group rocks because they tend to break down and weather into soil relatively quickly, and the limestone beds provide good buffering capacity for acid rain.

The Horton Group sandstones and conglomerates are more resistant to erosion and generally form higher ground, including foothills and slopes bordering the surrounding elevated ecodistricts. The Cumberland and Mabou groups are somewhat intermediate, between the Windsor and Horton groups, with respect to susceptibility to erosion.

The regional structural trend is northeasterly. A secondary structural trend follows a northwesterly to northerly course across the regional trend and is illustrated by the offsetting and re-alignment of regional structural features by faults and minor folds associated with this secondary structural trend.

Some of the ecodistrict's narrow valleys have formed along structural features, particularly where softer layers have been downfaulted or downfolded (e.g. Mull-Hay-Southwest Margaree syncline, upper part of the Northeast Margaree River and Middle River).

The surficial geology of the Inverness Lowlands includes glacial till, glaciofluvial, modern fluvial, minor marine, and colluvial deposits and small areas of residue. Glacial retreat and alluvial deposits contain significant sand and gravel resources.

An extensive deposit of glacial stratified sand and gravel occurs between Loch Ban and Inverness. This deposit has dammed the Loch Ban valley, thereby contributing to the present formation of Lake Ainslie by forcing the Lake Ainslie water to flow north by way of the Southwest Margaree river.

Significant sand and gravel deposits occur in a number of the stream valleys (e.g. Southwest and Northeast Margaree, Middle, Mull, and Northeast Mabou rivers). Unconsolidated gravel and sand resources have been extracted at a number of locations, especially in the Margaree, Chéticamp, Inverness, and Whycocomagh to Port Hood areas. Surficial deposits make a major contribution to soil development and may be a source of aggregate. Fossil remains of mastodons have been found in overburden material in the Middle River valley.

Several metallic mineral showings (copper, gold, iron) and a number of industrial mineral showings (gypsum, limestone, dolomite, barite, fluorite, and clay) occur within the ecodistrict. Mineral exploration dates back to the late 1800s, and shafts and adits were driven on several of the more promising showings.

The exact location and character of these old workings are often poorly recorded, and undocumented abandoned mine openings (AMOs) may exist. Some AMOs are difficult to find because they have become overgrown and, in some instances, plugged at the surface with debris.

The long coal mining history, both legal and illegal (bootleg), has left a number of liabilities, including AMOs and areas prone to surface subsidence, as well as acid rock drainage.

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.

It is estimated that between 7,000 to 8,000 tonnes of barite were mined and shipped from the Lake Ainslie area, according to a 1978 report. Gypsum was quarried at Chéticamp (1.3 million tonnes from 1912 to 1940) and a small quantity of gypsum was intermittently quarried at Mabou Harbour (1891 to 1940).

Approximately 100 limestone occurrences (Windsor Group) are known in the ecodistrict, with 70 located in the Lake Ainslie to Mabou areas. Although several of the limestone deposits appear to have the quantity and quality required to support a quarry, development requires favourable economic conditions. Local limestone requirements can easily be met from a number of small high-calcium deposits scattered throughout the area.

The ecodistrict's mineral occurrences and deposits are principally found in the Windsor Group strata. Province-wide, the Windsor Group is a primary source of many minerals, including salt, potash, gypsum, anhydrite, limestone, dolomite, barite, celestite, fluorite, and base metals.

The Windsor Group geology can have a considerable impact on groundwater supplies, surface drainage, and land development and use. Evaporate minerals of the Windsor Group (particularly the Middle and Lower Windsor groups), consisting of gypsum, anhydrite, and salt, can be dissolved by circulating groundwater and contribute undesirable calcium, sodium, sulphate, and chloride to the water. Surface and near-surface evaporate karst terrains present challenges for construction, agriculture, forestry, and development activities.

Although the Inverness and Mabou Mines coalfields (Cumberland Group) lie approximately 10 kilometres apart, they both occur within the Gulf of St. Lawrence Coal Basin. The on-land relationship between the two coalfields is obscured by faulting. The Inverness coalfield produced 7 million tonnes of coal between 1865 and 1966. Intermittent mining in the Mabou coalfield produced 64,000 tonnes of coal between 1899 and 1909. Although both coalfields are believed to contain significant, submarine coal resources, major faults and associated structural complexities prevent their conventional exploitation.

Sedimentary rocks of Carboniferous age are prime targets for oil and gas exploration as they provide both source and reservoir rocks for hydrocarbons. Ten boreholes and five surface locations were reported to have petroleum shows. The petroleum showings are clustered in the Lake Ainslie and Mabou areas.

Reports of oil seepages near MacIsaac Point on Lake Ainslie date back to the 1850s. A number of holes were drilled for hydrocarbons between 1864 and 1912, and one hole drilled near MacIsaac Point yielded 490 litres of oil. Natural gas was reported to be seeping from one of the holes (1898 observation). Oil shales are present in the coal measures strata at Mabou Mines. The commercial viability of coalbed methane extraction is being studied (Inverness and Mabou coalfields). Most of the Carboniferous rocks of the ecodistrict are currently held under petroleum agreements.

The loss of land by coastal erosion can have a significant negative impact on waterfront property values and related investment. Rising sea level is driving sections of the shoreline inland at rates depending on the erosion of the shoreline material, general beach gradient, water depth, and wave exposure.

Provincial mineral and petroleum resources are administered under the Mineral Resources and the Petroleum Resources acts. The rights to most gypsum and limestone (in non-designated areas), ordinary stone, building stone, aggregate, peat, peat moss, and ordinary soil are attached to the ownership of the surface (private or Crown) and are administered under other statutes.

Parks and Recreation / Protected Areas

The Inverness Lowlands Ecodistrict includes provincial parks and provincial protected areas that total approximately 600 hectares.

Two provincial wilderness areas (Margaree River and Sugarloaf Mountain) fall partly within the boundaries of the ecodistrict.

Four provincial parks (West Mabou Beach, South West Margaree, Lake O'Law and, Mabou) are found in this ecodistrict, as well as seven non-designated parks.

Two protected beaches (Margaree Harbour and Inverness) are located in whole or in part in the Inverness Lowlands Ecodistrict.

The ecodistrict includes the Margaree Canadian Heritage River, part of the 120 kilometre Margaree-Lake Ainslie water system that drains a diverse watershed of plateaus, forests, farmland, and floodplains.

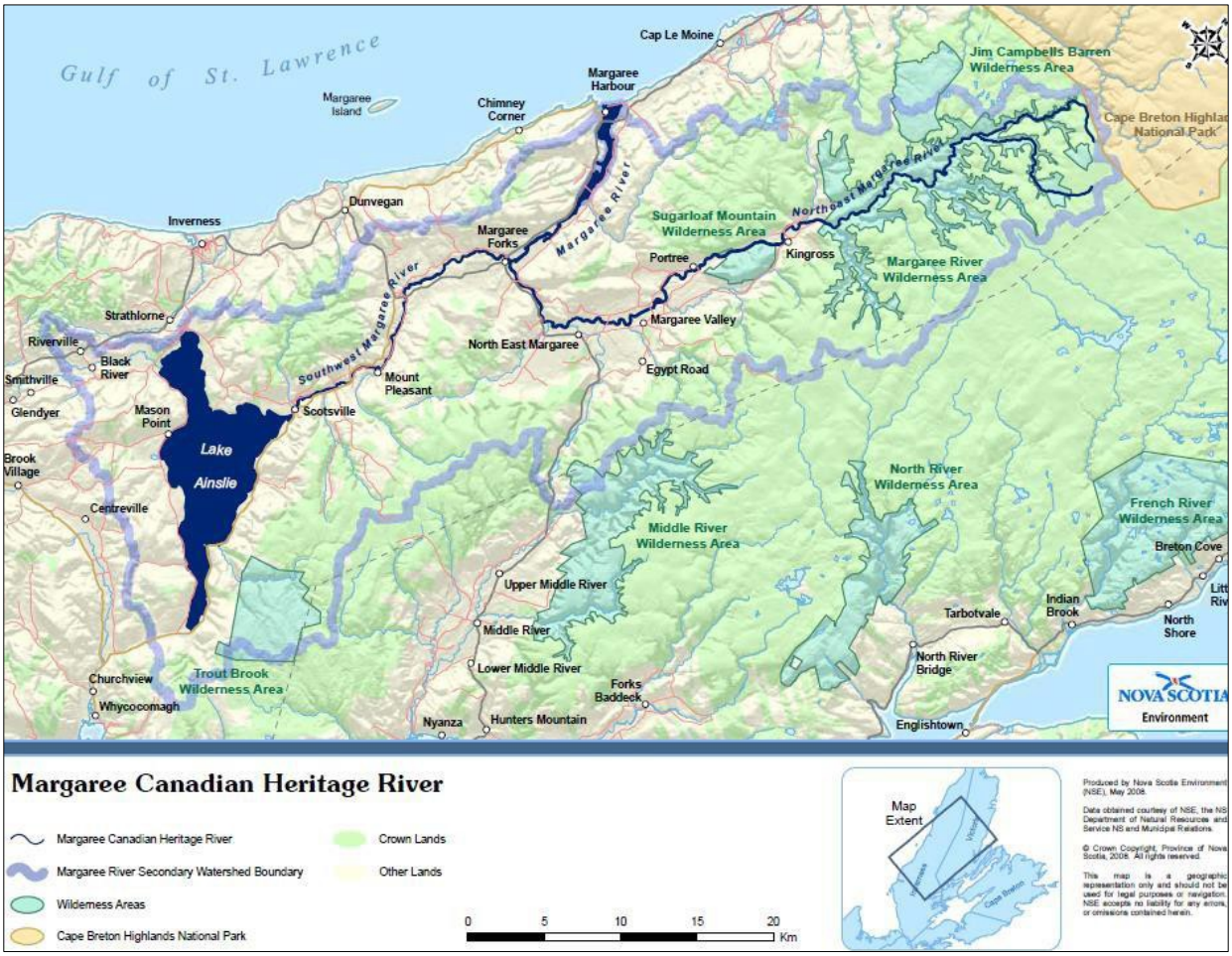
The Southwest Margaree originates at the largest natural lake in Nova Scotia – Lake Ainslie – and merges with the swifter Northeast Margaree at Margaree Forks.

Beautiful coastal beaches are part of the ecodistrict.

Both branches are renowned for their natural beauty and deep salmon pools. The icy clear waters of the upper reaches of the river system provide excellent spawning areas for Atlantic salmon and trout.

A small section of Eastern Joint Venture lands is located at Loch Ban at the northern end of Lake Ainslie. Chéticamp Island is listed as an important bird area and is noted for many colonial nesting seabirds.

There is an International Biological Preserve (IBP) located at the Black River Bog on the north end of Lake Ainslie. The bog is an alkaline bog with many rare plant species.



The Margaree Canadian Heritage River begins in Lake Ainslie and flows northeast into the Gulf of St. Lawrence.

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

Wildlife and Wildlife Habitat

Wildlife in the Inverness Lowlands 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 Inverness Lowlands 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.

Inverness Lowlands Ecodistrict 320 supports a diverse and healthy wildlife population.

White-tailed deer were once very common throughout the area but numbers have been reduced. A period of long cold winters, reduction of winter cover and the arrival of coyotes have all contributed to the decline in deer numbers and are responsible in part in keeping the recovery slower than in other parts of the province.

There are five deer wintering area that are partly within the ecodistrict and the surrounding hills which form the boundary of the ecodistrict. These deer wintering areas are found at Big Intervale, Rankinville, North Ainslie, Trout Brook and Egypt Road. The special management practice for deer wintering areas are in place to help maintain these areas of important deer cover.

Black bear numbers have increased significantly over the last decade in the ecodistrict.

Bobcat, coyote, and fox are also found throughout the ecodistrict. These mammals feed mainly on small rodents, squirrels, grouse, and snowshoe hare, which are common in the area.

Black bear numbers are on the rise in the Inverness Lowlands Ecodistrict.

Moose were an abundant and dominant animal in the region prior to the arrival of the first European settlers. By 1825, as a result of over-harvesting for commercial and subsistence purposes, the population was in serious decline. Moose appears to have disappeared from Cape Breton by the early 20th century.

In 1928 and 1929, seven mainland moose were introduced into the Highlands but this introduction was unsuccessful. In 1947 and 1948, eight moose from Alberta were released in the Cape Breton Highlands National Park. This introduction was successful and has resulted in the present population which numbers in the thousands.

Currently, moose are now common in the northern areas of the ecodistrict around Chéticamp, in the Margarees, and in the Middle River valley. There has been a licensed lottery hunt for the moose in Inverness and Victoria Counties since 1986. At present, 345 licenses are issued and the overall success rate has been around 90%. There is also a First Nations harvest that has been going on for a number of years.

Eagles and osprey are found nesting along the Margaree River, Middle River, and along the shores of Lake Ainslie, preying on the abundant fish found in these areas. Both species of birds are protected by the Wildlife Act and there are special management practices in place to protect eagle nesting sites from forest harvesting and development.

Colonies of gulls, cormorants, and kittiwakes are found nesting on the ocean side cliffs of Chéticamp Island. Piping plover, which is listed as endangered by federal and provincial governments, nest on the beach at West Mabou. In 2009, three pairs of plovers were found nesting at the site.

Salmon and trout – both speckled and rainbow – can be found in the rivers of the ecodistrict. Salmon is endangered federally and red listed in Nova Scotia.

The Margaree River system is one of the best fishing rivers in the province and one of the few in which there is still a retention fishery for salmon. This river system was designated in 1998 as one of the Canadian Heritage rivers, following a comprehensive community consultation process that culminated in publication of a community partnership strategy.

The Southwest Margaree originates in the largest natural lake in Nova Scotia, Lake Ainslie, and merges with the swifter Northeast Margaree at Margaree Forks. Both branches are renowned for their natural beauty and deep salmon pools.

Wild coffee is one of the unusual plants found on the floodplains of the Inverness Lowlands Ecodistrict.

A large run of commercially fished gaspereau is also found in the Margaree system. Rainbow trout can be found in the waters of the Middle River.

Lake Ainslie is home to a variety of fish, including trout, salmon, and white perch. Smallmouth bass have been introduced into the system and their effect has yet to be determined.

The other large freshwater lake system in the ecodistrict is Lake O'Law. This system of three lakes drains into the Margaree River through the Lake O'Law Brook and has a good population of trout. Loons have been found nesting in both of the lake systems. The Wildlife Habitat and Watercourse Regulations provide for special management zones along streams and watercourses.
Three sites in the ecodistrict are listed as sites of ecological significance in the Atlas of Nova Scotia's Nature Reserves and Sites of Ecological Significance.

A climax forest near Trout Brook is partly within the Trout Brook Wilderness Area and partly within the Trout Brook Provincial Park. An alkaline bog near the mouth of Black River and a freshwater marsh at Petit Étang are examples of wetland types that are rare in the province (Forest/Wildlife Management Inventory). These sites contain a number of rare or uncommon plants.

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.

Canada lynx, a species at risk, is generally associated with the forest habitats of the Cape Breton Highlands. Sightings in the Inverness Lowlands are generally associated with vehicle collisions, starving Lynx showing up in residential areas looking for food during periods of low hare populations, diseased animals, or trapper by-catch.

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.

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

Inverness Lowlands – 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 analysis identified and mapped seven distinctive elements in the Inverness Lowlands Ecodistrict – six patches and a corridor. A matrix is the dominant element, but in this ecodistrict there was not an obvious matrix. Inverness Lowlands is basically a valley-driven landscape with isolated areas from one end to the other. The main connection is through other ecodistricts, such as the adjoining Cape Breton Hills 310. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts.

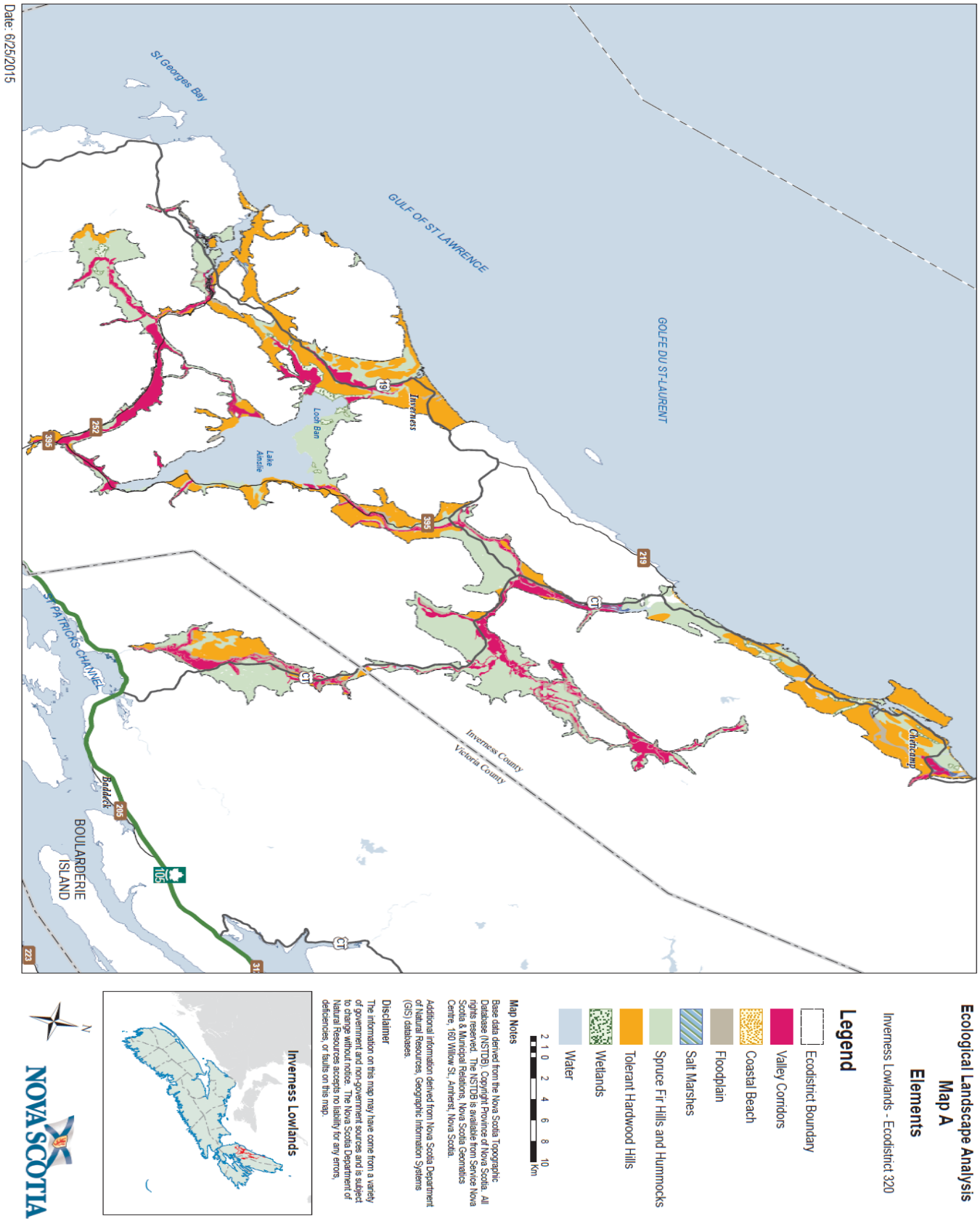
Spruce Fir Hills and Hemlocks is the largest patch element, representing 42% of the ecodistrict. The forests are dominated by black spruce, white spruce, and balsam fir.

Tolerant Hardwood Hills, representing nearly 35% of the ecodistrict, is the second largest patch element. Shade-tolerant hardwood species typical of the Acadian Forest, such as sugar maple, yellow birch, and beech, dominate.

The **Floodplain** element, representing 5% of the ecodistrict, is associated with the major rivers. Alluvial deposits occur due to flooding. The other patch elements, in order of size, are **Wetlands**, **Salt Marsh**, and **Coastal Beach**.

Valley Corridors is a linear element associated with major watercourses in the ecodistrict.

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.

Forests, communities, and coastlines are among the distinguishing features of the Inverness County Lowlands Ecodistrict.

Table 5a – Elements Within Inverness Lowlands		
Element	**Size (Hectares)**	**Element Description**
Spruce Fir Hills and Hummocks (Patch)	17,845 42.3%	This is a patch landscape element occurring on well to imperfectly drained hummocky terrain underlain by soils that range from coarse gravelly glacial fluvial outwash deposits to finer textured soils (clay loams). The forests tend to be dominated by black spruce with white spruce and balsam fir. With progressively poorer drainage, black spruce, tamarack, and red maple dominate the forest vegetation. Wetlands are embedded throughout the element. Early successional forests tend to have a higher component of aspen, tamarack, and balsam fir but overall regenerating forests from stand-level harvesting will also include red maple, white birch, grey birch, and pin cherry. The dominant natural disturbances are frequent and result in primarily even-aged forests. Natural disturbances agents include fire, windthrow, and insects (e.g. spruce budworm if forests have a high component of balsam fir or white spruce). A unique feature of this element is the karst landform that is associated with sites of fine-textured soils. Many rare and endangered plants, such as showy lady slipper, yellow lady slipper, and black ash, are found where gypsum is exposed on the surface.
Tolerant Hardwood Hills (Patch)	14,561 34.6%	The low hills and hummocks that border the rivers and watercourses support a patch forest element comprising mid to late successional shade-tolerant hardwood forests typical of the Acadian Forest. Representative species include sugar maple, beech, yellow birch, and white ash, with ironwood on the richer sites. Natural stand-level disturbances are rare and stands will usually maintain themselves through gap replacement leading to an uneven-aged climax forests and the opportunity to develop old forest characteristics. Natural disturbance agents include hurricanes, ice storms, disease, and insects. This element occurs primarily on hilly topography and slopes underlain with well-drained soils of variable textures but generally of medium to rich fertility. Seepage areas are common on the slopes and provide an important habitat for biodiversity. Under these closed canopy forests, the shrub layer consists of regenerating trees and shrubs such as fly honeysuckle and beaked hazelnut. These forests also have an abundant cover of ferns and club mosses.
Floodplain (Patch)	2,151 5.1%	The Floodplain element in this ecodistrict is associated with smooth, level terrain along the major rivers, such as the Middle, Southwest Margaree, Northeast Margaree, and Skye, as well as along larger streams. Alluvial deposits of sediment occur along these watercourses due to annual or periodic flooding. These are linear, small patch-level elements with soils that range from coarse, sandy loams to finer textured silt and clay loams that can be well to imperfectly drained. The soils are usually stone free. The climax forest for this element occurring on the better-drained alluvial soils is the shade-tolerant hardwood forest of sugar maple, white ash, and elm (although this species has been almost eliminated due to the Dutch elm disease). Small gap disturbances in this climax forest maintain a canopy that provides important functions along these watercourses. Earlier successional forests include balsam poplar, white ash, red maple, and white spruce.

Table 5a – Elements Within Inverness Lowlands		
Element	**Size (Hectares)**	**Element Description**
Wetlands (Patch)	1,056 2.5%	The Wetlands element is a patch ecosystem comprising freshwater bogs, fens, swamps, and poorly drained areas. This element may occur as a large wetland complex associated with rivers, as narrow linear communities associated with flow accumulations and small streams, as a community of hydrophytic vegetation (sedges, sphagnum moss, false holly, and winterberry) associated with level terrain where drainage is impeded, or as a depression in the landscape where water remains in excess year round. The Black River wetlands are some of the most significant wetlands on Cape Breton Island with alkaline bogs and rare and endangered plant species, such as Virginia chain fern. A similar wetland also occurs along the Hay River and both the Hay and Black rivers flow into Lake Ainslie. Smaller disjoint wetlands are often embedded within other elements, especially the Floodplain element.
Salt Marsh (Patch)	188 0.4%	Several large salt marshes have been formed as a result of periodic tide flooding, such as marshes at the estuaries of the Southwest Mabou, Mabou, Margaree, and Chéticamp rivers and at Chéticamp Harbour. These marshes are underlain by reddish brown sediments of silty clay loam texture. The soil contains semi-decomposed grass and sedges trapped in the accumulating sediment and show a layering effect due to periodic deposition of the fine material. There are no stones in this material and the salt content is relatively high. The dominant natural vegetation is saltwater cordgrass, 1 to 1.5 metres high, which occupies the wetter lower marsh.
Coastal Beach (Patch)	87 0.2%	Coastal beaches are wave-dominated deposits composed of a mixture of sand, gravel, and other sizes of sediments. The deposit of sand, gravel and larger particles such as boulders and cobbles occurs under a variety of circumstances leading to several types of beach landforms. Sand dunes are often associated with beaches and, depending on size and distance and age, support a variety of vegetation, including beach grass, bayberry, and white spruce. Sand dunes are found at West Mabou Beach. The beaches along the Gulf of St. Lawrence coast are examples of barrier beaches that have formed as a result of rising sea level and the erosion of adjacent headlands, forcing a landward retreat of the beach. The adjacent headlands anchor the extremities of the barrier beach. Good examples of this can be found at Inverness and Belle Côte beaches.
Valley Corridors (Corridor)	6,255 14.8%	The most evident linear features within this eco-district are faults and folds and associated watercourses. A total of 6,255 hectares of the most prominent of these features have been identified for this analysis. Many of the corridors have significant levels of land use which have resulted in settlements, agricultural fields, power lines, roads, and railways. These land use changes reduce the connective function of the corridor for some species, and may also increase the barrier effect of the corridors for species that must move across them.
Total	**42,143***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Inverness Lowlands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Fir Hills and Hummocks	IH4, SH8, SP8, SP10	29	SH10, SP6	33	SP4, **SP5, SP7**	27
Tolerant Hardwood Hills	IH5, IH6, IH7, MW5	14	MW4, **TH8**	39	**TH1, TH2**, TH3, TH4, TH5	38
Floodplain	OF1, OF2, OF4, OF5, FP4	27	FP3, FP6	33	**FP1**	33
Salt Marsh	Grasslands of *Spartina spp.*					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	FP3, WC1, WC2, WC6, WC7, WD1, WD2, WD3, WD5, WD6, WD7, 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.

Red maple – Yellow birch / Striped maple (TH8) is a mid-successional vegetation type found in the Tolerant Hardwood Hills element.

Black spruce / False holly / Ladies' tresses sphagnum (SP7) is a late successional vegetation type found in the Spruce Fir Hills and Hummocks element.

Balsam poplar – White spruce / Ostrich fern – Cow-parsnip (FP4) is an early successional vegetation type found in the Floodplain element.

White spruce / Bayberry (CO7) is a vegetation type found in the Coastal Beach element, where it marks the last stage of dune vegetation succession.

Black spruce / Cinnamon fern / Sphagnum (WC1) is found in the Wetlands element.

Landscape Composition and Objectives

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

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

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

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

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

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

In Inverness Lowlands, frequent and gap are the most common natural disturbance regimes.

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)

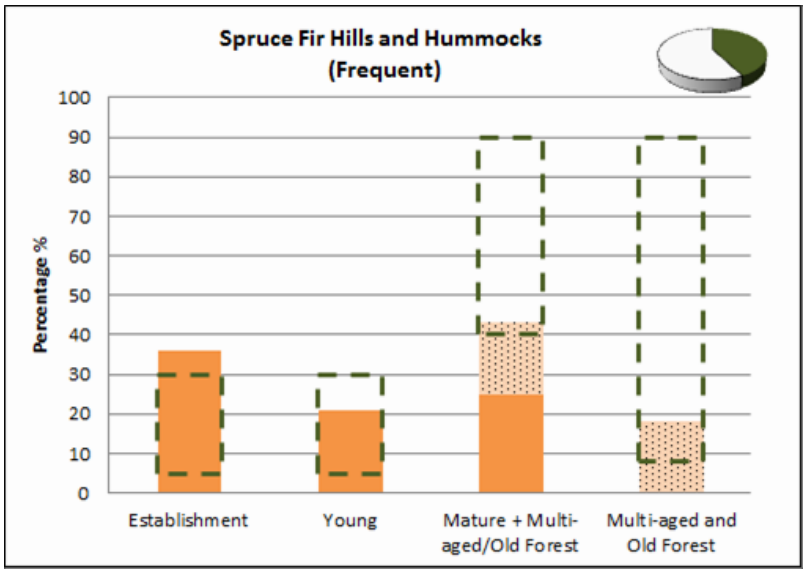
Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5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

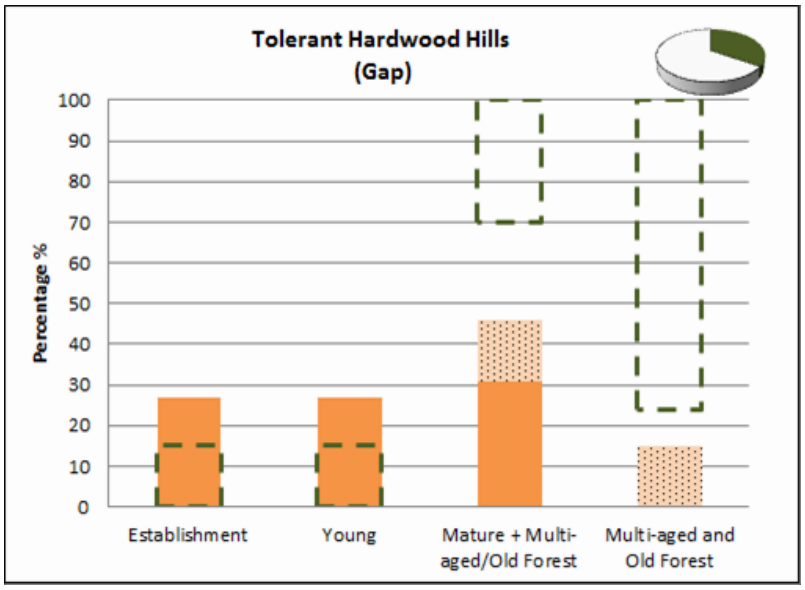
Development Class Targets by Element

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.

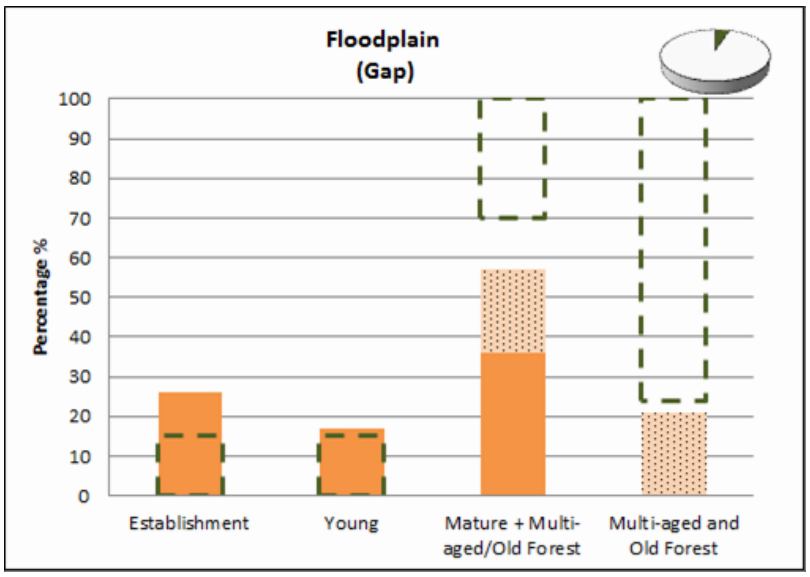
In the **Spruce Fir Hills and Hummocks** element, harvesting is pushing the area of immature forests close to the maximum desired level. Extending the rotation age of healthy spruce and fir forests can be used to maintain mature cover. Forestry practices involving partial harvests are limited due to shallow rooting of spruce and fir on the dominant moist soils of this element.



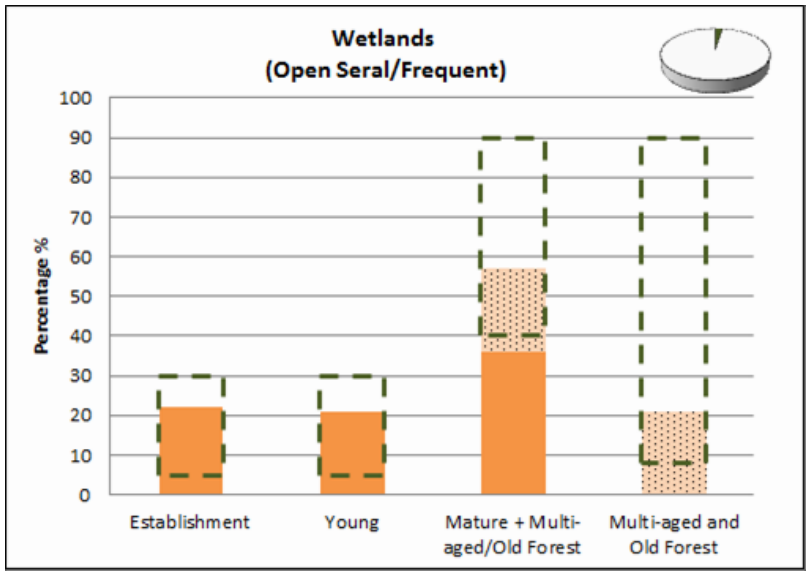
In the **Tolerant Hardwood Hills** element, the mature and the multi-aged/old forest classes are below target ranges. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development. Favouring climax species in establishment and young forests will provide future mature forest opportunities.



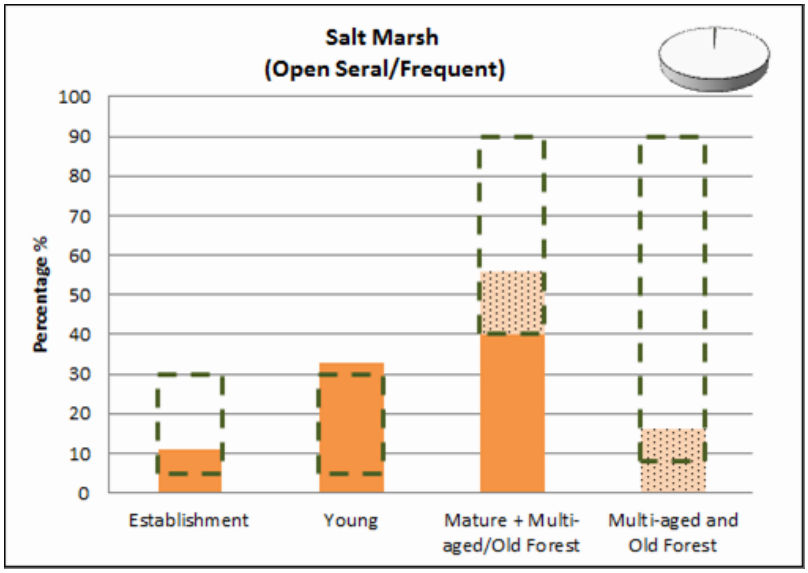
The small **Floodplain** patch element is often associated with the valley corridors and the wetlands elements and provides a habitat interface with the hydrological system. Small gap disturbances in this climax forest maintain a canopy that provides important functions along watercourses. The relatively limited distribution of this element makes its composition sensitive to local disturbances. Mature forests should be maintained.



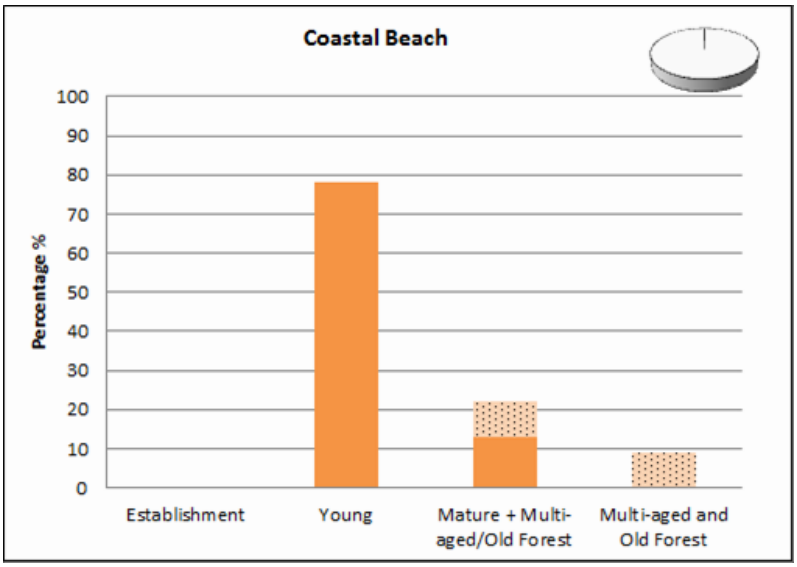
The **Wetlands** element, which has an open seral/frequent disturbance regime, is within the target ranges for all classes. This element is often variably composed of forest, interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure. Small patch harvesting following natural boundaries is appropriate.



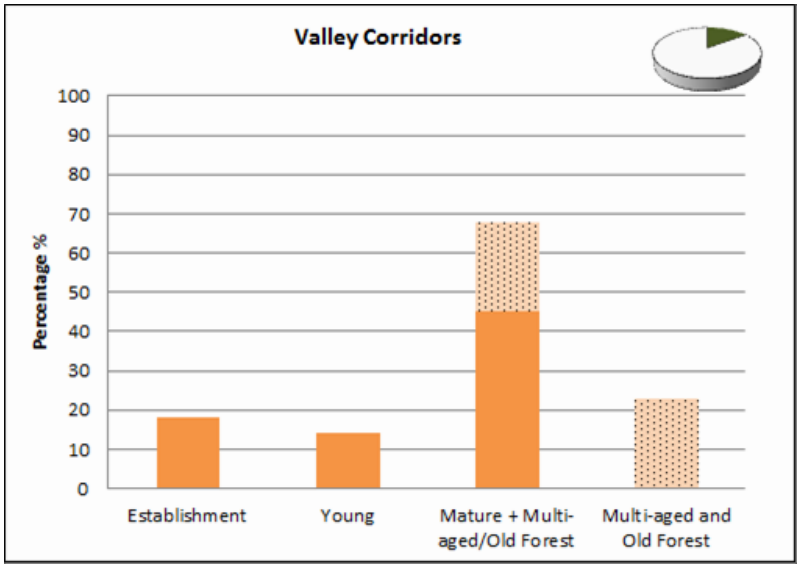
Forests in the **Salt Marsh** element are generally not associated with salt marsh ecosystems but can be included when growing on small upland incursions. These forests are prone to stand-level windthrow and site limitations to growth. Forest management options are very limited.



Forests associated with the **Coastal Beach** element are early successional, occurring on old beaches no longer influenced by coastal waters. Forest management options that maintain forest cover are preferred to protect this developing ecosystem.



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



Summary of Parts 1 and 2

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

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

Glossary A: Terms in Parts 1 and 2

Biodiversity	The diversity of plants, animals, and other living organisms, in all their forms and level of organization, including genes, species, ecosystems, and the evolutionary and functional process that link them.
Canopy	The uppermost continuous layer of branches and foliage in a stand of trees.
Climax forest community	A relatively stable and self-perpetuating forest community condition that maintains itself (more or less) until stand-level disturbance causes a return to an earlier successional stage. The final stage of natural succession for its environment.
Climax vegetation	A forest or non-forest community that represents the final stage of natural succession for its environment.
Coarse filter approach	A habitat-based approach to conserving biodiversity by maintaining a natural diversity of structures within stands, and representation of ecosystems across landscapes. The intent is to meet the habitat requirements of most native species over time. Usually combined with a fine filter approach to conserve specific rare species and ecosystems.
Composition	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).