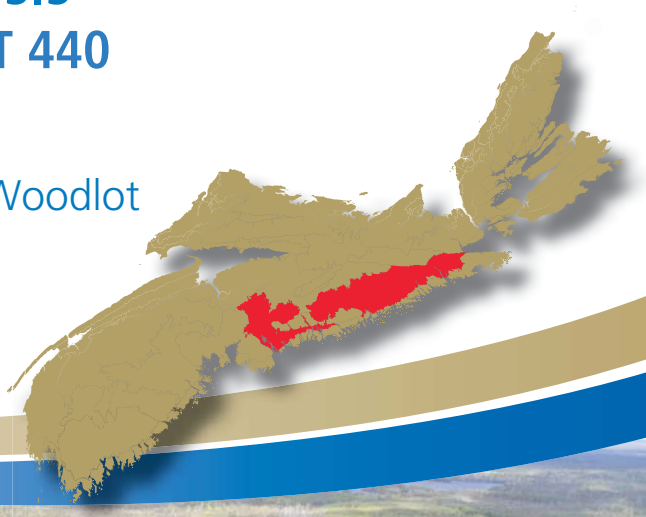
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS EASTERN INTERIOR ECODISTRICT 440

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



ELA 2015-440

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 440: Eastern Interior

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ISBN 978-1-55457-585-5

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

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

Information sources and statistics (benchmark dates) include:

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

Conventions

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

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

REPORT FOR ELA 2015-440

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A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

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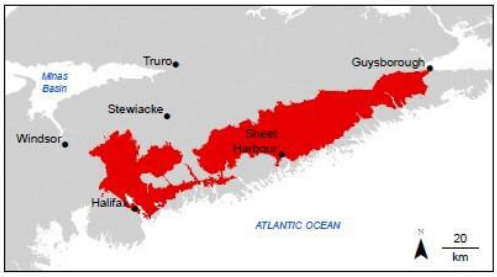


An objective of ecosystem-based management is to manage landscapes in as close to a natural state as possible. The intent of this approach is to promote biodiversity, sustain ecological processes, and support the long-term production of goods and services. Each of the province's 38 ecodistricts is an 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 Eastern Interior Ecodistrict 440. 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 Eastern Interior Ecodistrict, one of the largest in the province with an area of 457,493 hectares, includes the eastern part of mainland Nova Scotia that extends from Halifax in the west to the community of Guysborough in the east. The ecodistrict includes the inner coastal waters of some of the longer harbours to the south and extends northerly into the centre of the province.

The bedrock is highly visible in those areas where the glacial till is very thin, exposing the ridged topography. Where the till is deeper, the ridged topography is masked and thick softwood forests occur. Three distinct concentrations of drumlins can be identified roughly by the watersheds of the three rivers that flow through them: Sackville, Tangier, and Moser. Although drumlins are scattered elsewhere in the ecodistrict, these three areas represent the highest concentrations.

The forests of the ecodistrict are primarily coniferous with an overstory dominated by red and black spruce, white pine, and balsam fir with a lesser component of white spruce.

On the drumlins, tolerant hardwood forests of sugar maple, yellow birch, and beech occur. Red maple is a significant component of many hardwood forests.

Forests of black spruce, jack pine, and white pine are found where soils are shallow and bedrock exposure is significant.

Black spruce and white pine forests and sparsely forested open woodlands along the Glencross Rips on the Liscombe River, looking westerly.

The ecodistrict has several sites of ecological significance, most of which are associated with the estuaries of the larger rivers where they meet the Atlantic Ocean. This confluence of fresh and salt water provides important feeding and nesting habitat for migratory birds and as wintering areas for several species of waterfowl.

Large areas throughout the ecodistrict are shallow to bedrock and support poorly stocked forests of black spruce and pine.

These mixing areas are also the start of the upstream journey for several important anadromous fish species – those that migrate up river from the sea to spawn – including the Atlantic salmon. Private land ownership accounts for 46% of the ecodistrict area, with 45% under provincial Crown management.

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

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

Spruce Pine Hummocks is the widely dispersed matrix element on about one-quarter of the ecodistrict occurring on imperfectly drained soils on hummocky terrain. The inherent low soil fertility creates a forest of black spruce with white pine and – on better sites – red spruce. This element is frequently disturbed by windthrow and fire.

Tolerant Mixedwood Hills is a widely distributed large patch element occurring on hilly terrain. The well-drained soils support a mixed forest of Acadian species such as red spruce and yellow birch. Early successional species that follow after stand-level disturbances include red maple, white birch, and balsam fir.

Other patch elements, in order of size, are **Red and Black Spruce Hummocks**, **Tolerant Hardwood Drumlins and Hummocks**, **Spruce Hemlock Pine Hummocks and Hills**, **Wetlands**, **Spruce Pine Flats**, and **Salt Marsh.** *The ecodistrict also includes an Urban element.*

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

Forest Ecosystem Management
For Eastern Interior 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, and changes in land use and vegetation cover.

This ELA provides detailed information on the resources and descriptions of various components of the landscape for Eastern Interior Ecodistrict 440. 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 Eastern Interior 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 the Department of Natural Resources (DNR), such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011-2020
(see 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 Eastern Interior – *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

Eastern Interior is one the largest ecodistricts in the province, stretching from Pockwock Lake in the west to the community of Guysborough in the east. Total area is 4,575 square kilometres.

Lakes are numerous in the ecodistrict and fresh water makes up 5% of the area. Freshwater wetlands occupy 3% of the ecodistrict.

The area is dominated by metasedimentary rocks such as slates and quartzites with intrusions of plutonic rocks occurring at the west and east ends of the ecodistrict. There are several faults in the ecodistrict that run approximately north-south with most occurring at the west end, associated with the plutonic rocks.

Overlying the bedrock in most parts of Eastern Interior Ecodistrict are glacial deposits of ground moraine and streamlined drift along with recent sediments. Many drumlins occur throughout the ecodistrict helping shape the topography.

The composition of the forests in this ecodistrict strongly reflects the depth of the soil profile.

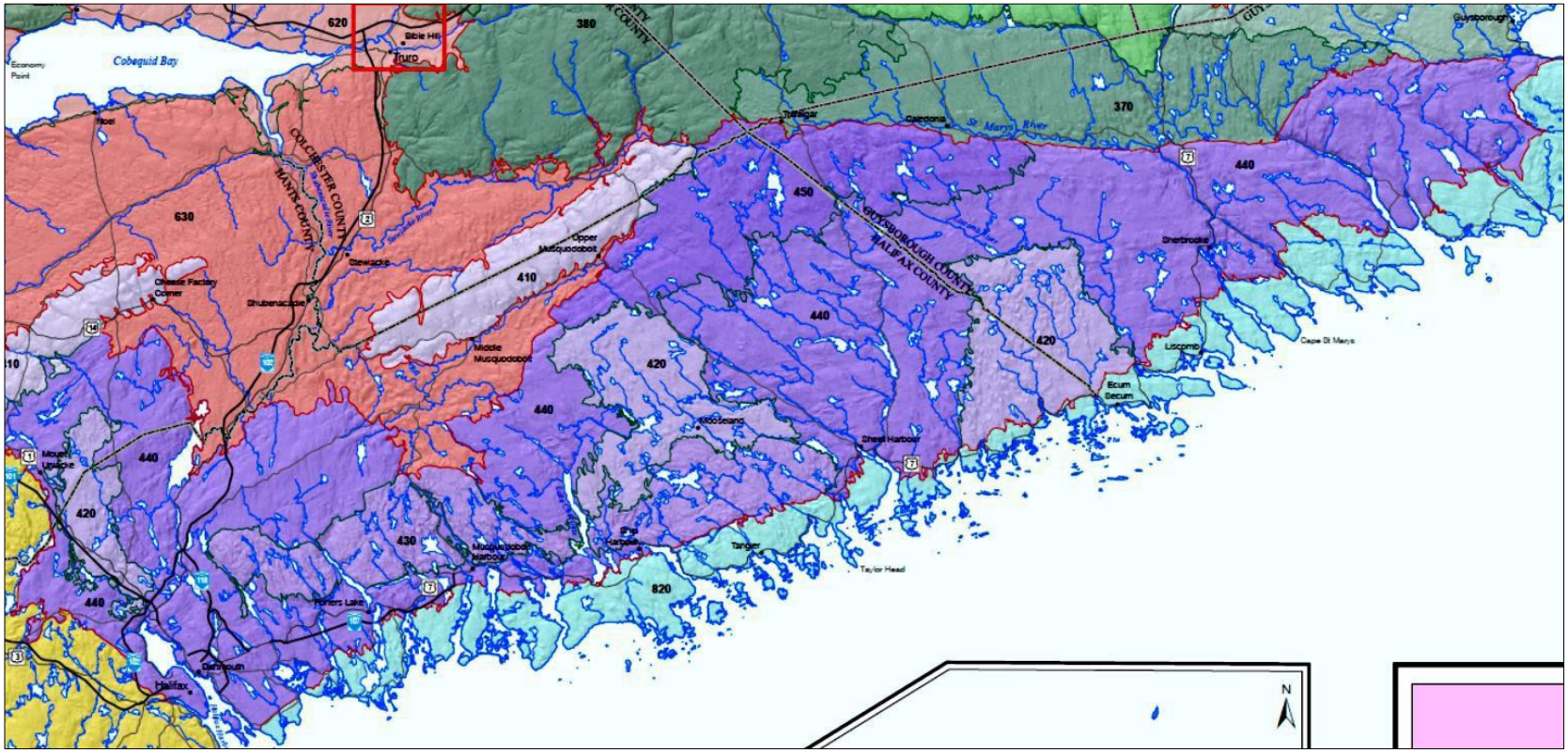
On shallow soils, repeated fires have impoverished the soils and reduced forest cover to scrub hardwoods such as red maple and white birch, with scattered white pine, jack pine, and black spruce underlain by a dense layer of heath-like vegetation.

On the deeper, well-drained soils, stands of red spruce will be found. On the crests and upper slopes of hills, drumlins, and some hummocks, stands of tolerant hardwood occur. Both beech and hemlock occur on these deeper, well-drained soils, but their presence is usually individual and seldom of a high percentage in any stand.

On the imperfectly and poorly drained soils, black spruce, tamarack, and red maple will dominate the stand composition.

Frequent stand-initiating disturbances are responsible for the majority of tree mortality. As a result, fire barrens east and northeast of Halifax are covered with grey birch, red oak, and red maple.

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



The Eastern Interior Ecodistrict 440 combines two former ecodistricts – a smaller 440 with 420 Eastern Drumlins – to form one of the largest ecodistricts in the province. (From Ecodistricts of Nova Scotia map 2007)

Land Area

Eastern Interior is primarily rural but with population intensities greater nearer to metro Halifax.

Private ownership accounts for 46% of the land base and the provincial Crown administers 45% of the ecodistrict (Table 1). Other land ownerships at 9% account for the remainder.

Table 1 – Land Area by Ownership in the Eastern Interior Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	206,354	45.1
Private	212,504	46.4
Federal	3,018	0.7
Aboriginal	494	0.1
Other (Includes inland water bodies and transportation corridors)	35,124	7.7
Total	**457,493**	**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	142,317	68.9
C2 – Multiple and Adaptive Use	46,319	22.4
C3 – Protected and Limited Use	16,980	8.3
Unclassified	738	0.4
Total	206,354	**100**

In Eastern Interior, the most common land use category is C1 (69%) followed by C2 (22%) and C3 (8%).

Within this ecodistrict, forested land accounts for 343,325 hectares, or 75% of the land base (Table 3).

Wetland is the next most common category at nearly 9%, followed by various other uses at 8%.

Urban accounts for 4%.

There is more than 10 times as much land in barrens as in agriculture.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	343,325	75
Wetland	39,258	8.6
Agriculture	889	0.2
Barrens	12,070	2.6
Urban	19,717	4.3
Road, Trail, Utility	4 087	0.9
Other	38,147	8.3
Total	**457,493**	**100**

Wetland, such as the Caribou Bog, accounts for nearly 9% of the land use in the ecodistrict.

Forests

The forest covertype of Eastern Interior comprises 59% softwood, 19% mixedwood, 15% hardwood, and 7% unclassified. This is a reflection of the predominant site condition: imperfectly drained soils of low fertility that support a softwood-dominated forest created from frequent natural disturbances such as windthrow and fire. Provincially, the softwood covertype is 50% of the forest condition.

Close to 60% of forests in Eastern Interior are softwood, followed by mixedwood and hardwood.

The forests of the Eastern Interior Ecodistrict are primarily coniferous with an overstory dominated by black spruce with a lesser component of white pine. Red spruce occupies the better-drained, more fertile softwood sites with white pine and occasionally hemlock. Balsam fir will be a component on most of these sites eventually succeeding to the longer-lived species such as red spruce.

The abundance of drumlins in the ecodistrict provides the richer sites for tolerant hardwoods such as sugar maple and yellow birch and/or mixedwood forests including red spruce and hemlock. Red maple and white birch are earlier successional species that come in after a stand-level disturbance. Shallow soils over bedrock are common and these sites support poorly stocked woodlands of jack pine, white pine, and black spruce.

Insect defoliation has not been a significant factor in forest disturbance although the spruce bark beetle can cause widespread mortality of older red spruce in many stands. Other insect outbreaks have occurred sporadically throughout the ecodistrict, including spruce budworm, tussock moth, and hemlock looper.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 4.4 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.

Most of the wood harvested in this ecodistrict is used to support the province's sawmills and two pulp and paper mills.

A large hardwood chip exporting facility is located nearby at Sheet Harbour and also harvests in this ecodistrict.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	30,414	8.8
3	33,038	9.6
4	103,866	30.3
5	118,717	34.5
6	55,080	16.0
7 or more	2,210	0.6
Total	**343,325**	**100**

*Based on growth potential for softwood species.

Water Resources

Fresh water in lakes and large rivers makes up approximately 5% of the ecodistrict.

Many of the province's major rivers originate in or near this ecodistrict, including the Liscomb,

Forests along the Moser River near Mill Lake.

West River St. Marys, West River Sheet Harbour, Moser, and Tangier. Most of these rivers have critical populations of Atlantic salmon.

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

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

Minerals, Energy and Geology

The Eastern Interior Ecodistrict extends from Pockwock Lake along the 101 Highway in the west, inland and parallel to the Atlantic Coast through to the west end of Chedabucto Bay.

The Eastern Interior bedrock geology mostly comprises metasedimentary rocks (altered by metamorphism) of the Meguma Group – formed about half a billion years ago – which covers approximately 90% of the ecodistrict.

There are numerous mineral occurrences throughout this ecodistrict including many past producers. The most abundant mineral occurrences contain gold and iron. Other occurrences include tungsten, copper, molybdenum, tin, zinc, lead, mercury, beryllium, barium, tantalum, manganese, gypsum, silica, and diatomite.

Past gold producers in this ecodistrict include: Cochrane Hill, Country Harbour, Upper Seal Harbour, Lawrencetown, Montague, Oldham, Beaver Dam, Waverley, Mount Uniacke, Killag, Renfrew, Widow Point, Lake Charlotte, Goldenville, Fifteen Mile Stream, South Uniacke, Caribou Mines, Moose River, Mooseland, Gold Lake, and Miller Lake. Lead was produced at Hirschfields, tungsten at Moose River and Lower Sackville.

Much of the area is under exploration license for gold and a new recognition of dispersed gold in the Meguma Group has sparked extensive exploration in the Touquoy Deposit and at Beaver Dam.

From an industrial minerals perspective, the area holds great potential. In the western end of the ecodistrict, near Halifax, many of the granitic plutons as well as abundant metasandstones of the Goldenville Formation are currently being quarried for local aggregate and asphalt. Slate units in the ecodistrict are also being used as a source of aggregate. Large boulders are used to construct breakwaters along waterways and coastlines.

Many glaciofluvial deposits (kames, eskers, and glacial outwash fans) occur in the ecodistrict which are excellent sources of sand and gravel. There is also significant potential for peat throughout the ecodistrict.

Gold has been produced in areas such as Moose River Gold Mines in the Eastern Interior Ecodistrict.

Overlying the bedrock in most parts of Eastern Interior Ecodistrict are glacial deposits of ground moraine and streamlined drift along with recent sediments. These contribute to the development of soils, and have been used as a source of aggregate. Many drumlins occur throughout the ecodistrict with higher concentrations in the area from Eastern Passage to Long Lake and between Lake Charlotte and Country Harbour. These drumlins help shape the topography in the area, including the three well known drumlins that make up Citadel Hill, McNabs Island, and Georges Island.

There are several hummocky ground morraine units in the ecodistrict with two large areas at the east end.

The Meguma Group comprises the metasandstones of Goldenville Formation and overlying Halifax Formation slates and argillites. These strata were metamorphosed and folded into a series of upright north to northeast and southwest plunging anticlines and synclines during the Acadian mountain building.

The Halifax Formation consists mostly of black and grey slates that locally contain abundant pyrite, pyrrhotite, and arsenopyrite. The breakdown of these sulphides when exposed at surface can lead to acid drainage problems.

The Goldenville Formation comprises varying amounts of metasandstone and metasiltstones and is host to most of the gold deposits in Nova Scotia.

The remaining 10% of the ecodistrict consists of igneous rocks and a few small patches of early Carboniferous sediments.

Early Carboniferous sedimentary rocks from the Horton Group can be found along the northeastern part of the ecodistrict associated with small outliers of Windsor marine sediments at the northwest end.

Most of the major faults in the ecodistrict run northwest to southeast with a few faults running along the northeast end of the Eastern Interior Ecodistrict.

A major concern in the ecodistrict is the presence of sulphide-rich slates in the Halifax Formation. The physical disturbance of these sulphide-bearing slates can lead to oxidation of the sulphide minerals that can possibly generate acid rock drainage, which can threaten water quality, sedimentation, integrity of building materials, and vegetation management. In addition, the oxidation of high concentrations arsenopyrite in the slate can adversely affect the quality of drinking water by liberating arsenic into the water table.

Potential geohazards, such as abandoned mine openings, potential karst areas, flood risk areas, sulphide-bearing slates, and underground coal workings, can be viewed at the following web sites:
http://gis4.natr.gov.ns.ca/website/nsgeomap/viewer.htm
http://gis4.natr.gov.ns.ca/website/mrlu83/viewer.htm
Please report any additional geohazards found on Crown lands to your nearest Natural Resources office.

Parks and Recreation / Protected Areas

A total of 29,257 hectares of provincial Crown and federal lands has been set aside under legal and policy reserves within the Eastern Interior Ecodistrict.

Four wilderness areas – Alder Ground, Boggy Lake, Liscomb River, and The Big Bog – are totally within the ecodistrict while Waverley-Salmon River Long Lake and Clattenburgh Brook are partially within this ecodistrict

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 Eastern Interior 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 Eastern Interior 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 network of wetlands, lower order streams, freshwater lakes, wet forests, and raised drumlins provide general wildlife habitat for a great diversity of forest-dependent wildlife species, such as several species of birds in the at risk group called aerial insectivores (e.g. olive-sided flycatcher, common nighthawk, eastern wood-pewee).

The Eastern Interior Ecodistrict is of particular significance to moose, which are endangered on the mainland of Nova Scotia, providing a balance of thermal cover, browse, security, and travel corridors, which can be both promoted and limited by the intensity of forestry activity that takes place in the ecodistrict.

Several deer wintering areas also occur within the ecodistrict, which are important to the long-term conservation of the white-tailed deer herd.

The wet forests of the ecodistrict provide the conditions necessary to support a diversity of lichen species and, most notably, a globally significant concentration of boreal felt lichen, an endangered species.

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

With much of the ecodistrict privately owned, effective wildlife management will to a great extent rely on active, informed stewardship by the many landowners. The DNR can assist private land stewardship by providing knowledge and information on various management strategies. Legislation such as the Wildlife Habitat and Watercourse Protection Regulations, the Endangered Species Act, and the Environment Act's Activities Designation Regulations address species and habitat concerns within the forest and wetland ecosystems.

Part 2: Linking the Landscape to the Woodlot – *How Woodland Owners Can Apply Landscape Concepts to Their Woodland*

This second part of the report provides information on how landscape concepts can be applied at the woodlot level. The starting point is an introduction to natural disturbances and succession to provide a foundation for better understanding forest ecosystems. The focus then shifts to elements that make up each ecodistrict and the forest groups and vegetation types at the stand level. This allows woodland owners to move between elements and stands to see how their woodland fits in with the larger landscape.

Forest Disturbances and Succession

Forest Disturbances

A disturbance can be described as an event, either natural or human-induced, that causes a change in the existing condition of an ecological system.

Disturbance pattern controls forest development classes (establishment, young, mature, multi-aged / old forest) and their distribution over area and time.

Due to the coastal location of Nova Scotia and its Maritime climate, the extent, intensity, and frequency of natural disturbances is difficult, for the most part, to predict. Prior to European settlement, natural disturbances were only curtailed by natural barriers such as water, climate, topography, and vegetation change. After about 400 years of activity by European settlers, the frequency, intensity, and magnitude of these natural processes has been affected.

New disturbances have been introduced as a result of human activity and include:

- clearing of forests for agriculture
- timber harvesting
- urbanization and development
- introduction of exotic animals, plants, and insects
- disease-causing agents, such as viruses or bacteria
- fire suppression in the forest
- and 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.

In areas of imperfectly drained soils with shallow rooting, species such as black spruce are susceptible to windthrow. Elsewhere, forests on dry shallow soils over bedrock and often with a thick cover of heath-like woody shrubs are prone to wild fires.

Where soils are better-drained and richer, such as on the numerous drumlins throughout the ecodistrict, hardwood forests of sugar maple, red maple, and yellow birch are less susceptible to both fire and windthrow. Insect defoliation by spruce budworm, balsam wooly adelgid, tussock moth, spruce bark beetle, and hemlock looper can occur locally.

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:

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

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.

Eastern Interior – Elements Defined

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

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

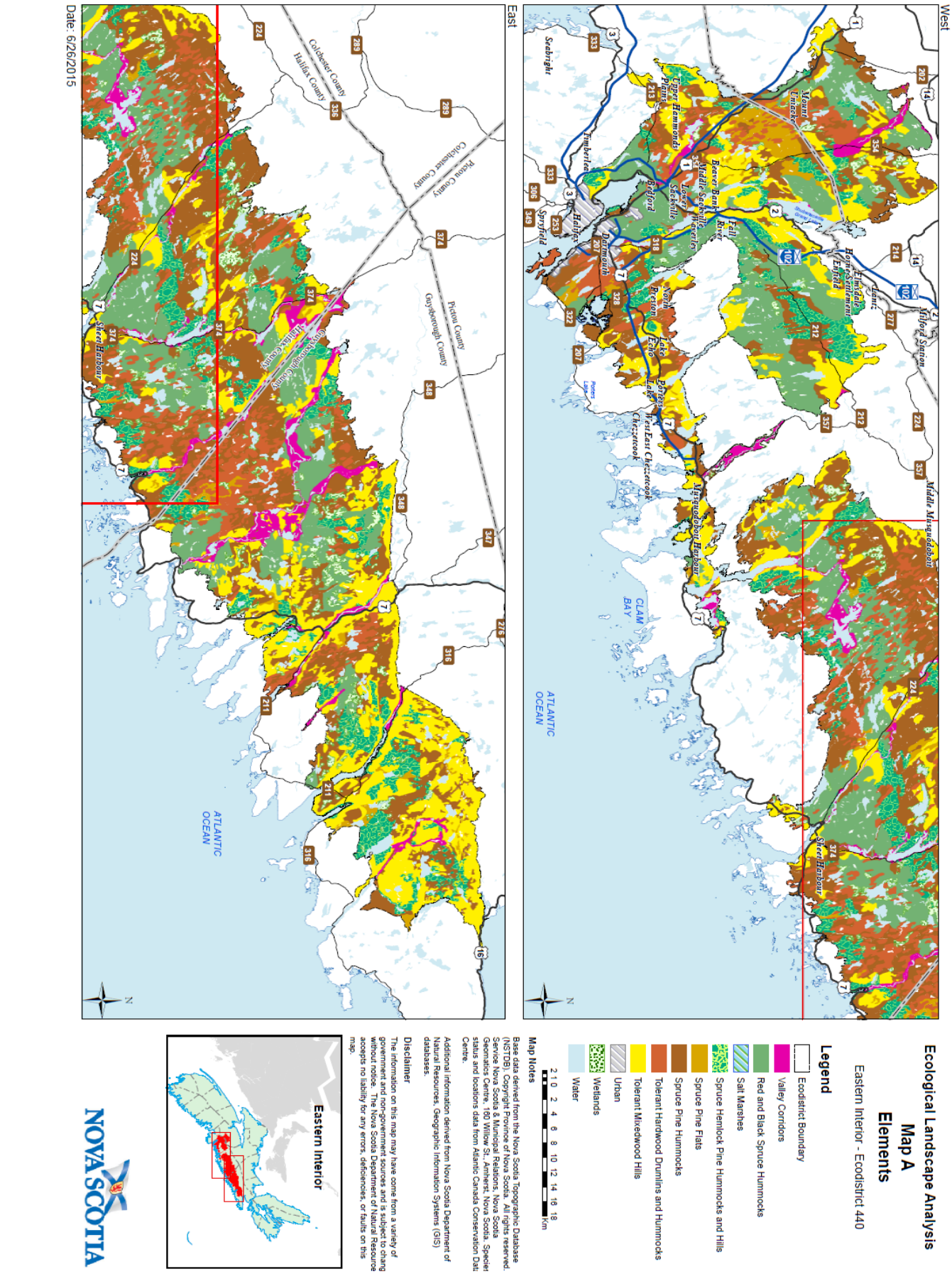
Spruce Pine Hummocks is the widely dispersed matrix element on about one-quarter of the ecodistrict occurring on imperfectly drained soils on hummocky terrain. The inherent low soil fertility creates a forest of black spruce with white pine and – on better sites – red spruce. This element is frequently disturbed by windthrow and fire.

Tolerant Mixedwood Hills is a widely distributed large patch element occurring on hilly terrain. The well-drained soils support a mixed forest of Acadian species such as red spruce and yellow birch. Early successional species that follow after stand-level disturbances include red maple, white birch, and balsam fir.

Other patch elements, in order of size, are **Red and Black Spruce Hummocks**, **Tolerant Hardwood Drumlins and Hummocks**, **Spruce Hemlock Pine Hummocks and Hills**, **Wetlands**, **Spruce Pine Flats**, and **Salt Marsh.** *The ecodistrict also includes an Urban element.*

Valley Corridors is a linear element associated with the 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.

Table 5a – Elements Within Eastern Interior Ecodistrict		
Element	**Size (Hectares)**	**Element Description**
Spruce Pine Hummocks (Matrix)	110,765 25.8%	This is matrix forest for the ecodistrict and is found on hummocky to gentle terrain. Where soils are better-drained and less coarse, red spruce can form pure stands. With progressively poorer drainage, black spruce, tamarack, and red maple dominate the forest vegetation. White pine often forms a super canopy overtopping black spruce. The dominant natural disturbances are fire and windthrow. Due to the fuel nature of pine, spruce litter, and ericaceous vegetation, fires of severe intensity can have a significant negative impact on site productivity, especially those sites with high coverage to stones and boulders or with shallow soils over bedrock. Black spruce, a shallow rooting species, is also susceptible to windthrow on moist sites. Where soils are shallow to bedrock or have been impoverished by repeated wildfires, low stocked woodlands of black spruce and white pine are more dominant.
Tolerant Mixedwood Hills (Patch)	96,932 22.6%	This largest patch element in the ecodistrict occurs on the higher elevations (75 to 125 m above sea level) with decreasing elevation closer to the Atlantic. A late successional Acadian Forest of shade tolerant species dominates most sites, with the steeper upper slopes and crests featuring a forest of sugar maple and yellow birch. As soil moisture increases on middle slopes and gentler terrain, mixedwood forests of yellow birch and red spruce become dominant and eventually stands of red spruce occupy lower and toe slope positions. Where the element includes the upper level site, soils tend to be moister and black and red spruce are prominent. Earlier successional species follow after stand-level disturbances and include red maple, white birch, and balsam fir.
Red and Black Spruce Hummocks (Patch)	81,043 18.9%	This second largest patch element occurs primarily along the northern boundary of the ecodistrict. Two dominant forest conditions can be found on this topography: where soils are shallow and therefore drier and poorer, forests are dominated by black spruce with white pine. Open woodlands with thick ericaceous woody shrub understories are also embedded within this condition and in some areas jack pine is a component of the forest. Where soils are deeper and richer, productive forests of red spruce will occur with scattered hemlock and white pine. The level and wetter terrain between ridges is usually imperfectly to poorly drained and supports a forest of black spruce, tamarack, and red maple.
Tolerant Hardwood Drumlins and Hummocks (Patch)	44,938 10.5%	These tolerant hardwood-dominated drumlins occur as small areas throughout the ecodistrict. However, there are several areas where the drumlins dominate the landscape; for example, near Sackville, Mooseland, Moser River/New Chester, and Indian Harbour. These fertile sites are underlain by well-drained medium to fine-textured soils. Forests have a prominent cover to yellow birch followed by sugar and red maples. Mixedwood forests of balsam fir, red spruce, and yellow birch become more abundant on the moister lower slopes. Natural disturbances due to insects or disease, windthrow or storm breakage creates small gaps and patches in the hardwood canopy. Stand-level disturbance is rare and forest harvesting creates conditions for early successional species such as balsam fir, white birch, and red maple although the latter can also be prominent in late successional forests.

Table 5a – Elements Within Eastern Interior		
Element	**Size (Hectares)**	**Element Description**
Spruce Hemlock Pine Hummocks and Hills (Patch)	44,642 10.4%	Most of the element occurs as large gently rolling patches with a typical Acadian forest of red spruce and white pine with hemlock found on soils with higher moisture and nutrient content which are usually associated with lower slope positions. On lower slopes and on level terrain with progressively poorer drainage black spruce, red maple, and tamarack dominate the forest vegetation. Natural disturbances tend to be infrequent and include fire, windthrow, and insects. Early successional forests include shade-intolerant hardwoods such as red maple and white birch. In areas where soils are either shallow to bedrock or coarse-textured, white pine and hybridized spruce can be more prominent in the stand composition. Where stands have avoided stand-level disturbances, old forest characteristics may develop.
Wetlands (Patch)	14,279 3.3%	The wetlands element is prominent throughout the ecodistrict, comprising freshwater bogs, fens, swamps, and poorly drained areas. The most common wetlands in the ecodistrict are large complexes associated with rivers and lakes. Others are 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. Two extensive areas of wetlands have been placed within The Big Bog and Alder Ground wilderness areas.
Spruce Pine Flats (Patch)	11,198 2.6%	This patch element occurs on imperfectly drained soils on level terrain. It forms broad linear patches along larger streams and rivers such as the Twelve Mile Stream and Ecum Secum River. Elsewhere it can form large flats associated with the headwaters of streams and rivers or as a complex of wetlands and small lakes as exemplified on the Bruce Plain. In the Sackville drumlin field, alder and woody shrubs occupy wetter soils along the streams before being replaced by forests. Typical forests include black spruce with mixtures of red maple, tamarack, and white pine. Embedded within this element are wet open woodlands.
Salt Marsh (Patch)	119 <0.1%	Along the coast are areas that are periodically flooded by the tide and mapped as salt marshes. These salt marshes can be found near the inland extreme of the Eastern Shore Ecodistrict at Cole Harbour and Chezzetcook Inlet. The salt marshes are formed from marine sediments deposited from tidal water flooding low-lying coastal areas. The deposits occur in sheltered, intertidal areas or behind spits, bars or islands and protected bays. The deposits are typically silt loams with semi-decomposed grasses and sedges.
Urban (Patch)		*An Urban element comprises parts of Halifax, Dartmouth, and Cole Harbour areas and represents 4,565 hectares.*
Valley Corridors (Corridor)	25,560 6%	Corridor systems are strong linear features linked to watercourses in the ecodistrict. Many of the province's major rivers originate in or near the Eastern Interior Ecodistrict, including the Liscomb, West River St. Marys, Sheet Harbour, Moser, and Tangier.
Total	**429,476***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Eastern Interior

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Pine Flats	OW2, SP8	13	SP4, SP6	27	SP5, **SP7**	44
Spruce Pine Hummocks	OW1, OW2, OW5, SP1, SP2, SP8	13	SP3, SP4, SP6	23	IH2, **SP5**, SP7, SP9	44
Red and Black Spruce Hummocks	IH4, IH5, IH6, MW4, MW5	11	SH5, SH6, SH8, SH9, SH10	26	MW1, MW2, MW3, SH1, SH2, **SH3, SH4**	51
Spruce Hemlock Pine Hummocks and Hills	IH4, IH5, IH6, MW4, MW5	21	SH5, SH6, SH8, SH9, SH10	30	MW1, MW2, MW3, SH1, SH2, **SH3, SH4**	32
Tolerant Hardwood Drumlins and Hummocks	IH6, OF1, OF2, OF3, OF4	23	IH7, TH7	33	TH1, TH2, TH3, **TH8**	26
Tolerant Mixedwood Hills	IH6, MW4, MW5	23	IH7, SH5, SH6, SH8, TH7	31	TH1, TH2, TH3, **TH8**	28
Salt Marsh	Grasslands of *Spartina spp.*					
Wetlands	WC1, WC2, WC3, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8					

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.

Black spruce / Lambkill / Reindeer lichen (OW2) is an early successional vegetation type found in the matrix Spruce Pine Hummocks element.

Red maple – Yellow birch / Striped maple (TH8) is a late successional vegetation type found in the Tolerant Mixedwood Hills patch element.

Yellow birch / white birch / Evergreen wood fern (TH7) is a mid-successional vegetation type found in the Tolerant Hardwood Drumlins and Hummocks element.

Red spruce – Hemlock / Wild lily-of-the-valley (SH3) is a late successional vegetation type found in the Spruce Hemlock Pine Hummocks and Hills element.

Trembling aspen / Wild raisin / Bunchberry (IH4) is an early successional vegetation type found in the Red and Black Spruce Hummocks element, but is somewhat uncommon in this ecodistrict.

Black spruce – Red maple / Bracken – Sarsaparilla (SP6) is a mid-successional vegetation type found in the Spruce Pine Flats element.

Red maple / Sensitive fern / Lady fern / Sphagnum (WD3) is a vegetation type found in the Wetlands patch element.

Landscape Composition and Objectives

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

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

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

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

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

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

Natural disturbances are frequent over much of Eastern Interior and include hurricanes, fire, insects, and disease. On sites with poor drainage and shallow soils, even-aged forests of black spruce are dominant.

On well-drained drumlins that support a mixedwood or hardwood forest of deeper rooted species such as yellow birch, sugar maple, red maple, red spruce, and hemlock, forests are less susceptible to fire and stand-level disturbances are infrequent. Over time small openings or gaps in the canopy create conditions for a younger cohort of trees to establish into the canopy and stands become uneven-aged with old growth forests possible.

Forest Composition

Forest disturbances lead to forest renewal and the development of young forest habitats with characteristic successional patterns. Management of landscapes to conserve biodiversity requires sustaining ecologically adequate representation of natural habitat diversity, among a number of other measures and planning approaches.

At a landscape planning scale, the variety of habitats can be broadly described in terms of the composition of development classes, seral stages, and covertypes.

Development Classes describe changes in structure and process as forests age and trees grow larger. For landscape management purposes, four development classes are recognized:

- forest establishment (0 to 6 m height)
- young competing forest (7 to 11 m height)
- mature forest (> 11 m height; including multi-aged and old forest)
- multi-aged / old forest (multiple layered / Old Forest Policy)

Within this simplified description there is considerable variation in the processes and structures that evolve in particular stands. When the current forest inventory is used to classify development classes, the height criterion is used. When forecasting future conditions using the Forest Model, the age criterion is preferred.

Harvesting and silviculture activities, such as planting and thinning, have been ongoing on Crown land since the 1940s.

Seral Stages describe changes in species composition of forest communities as succession progresses from domination of early seral "pioneer" species following disturbance, toward late seral communities dominated by long-lived, shade-tolerant "climax" species. Seral stage is dependent on the composition of tree species of a forest, irrespective of age. For landscape management purposes, three seral stages are recognized:

- early
- mid
- late

Early successional species are those that do well in direct sunlight and include white and grey birch, aspen, poplar, white spruce, tamarack, pin cherry, jack pine, and red pine. These species grow quickly, but are usually short-lived.

They are replaced by mid-successional species that can tolerate moderate amounts of shade, such as white ash and red oak.

Late successional species generally have a high shade tolerance and include hemlock, red spruce, sugar maple, and beech, as well as yellow birch and white pine. The species often develop slowly in shaded understories and can be long-lived and form old growth.

Covertypes descriptions further refine landscape composition by distinguishing forests of different community conditions. Management generally recognizes three forest covertypes:

- softwood (overstory cover of softwood species is 75% or more)
- hardwood (overstory cover of hardwood species is 75% or more)
- mixedwood (overstory cover of either softwood or hardwood is between 25% and 75%)

Forest Composition Objectives

Within ecodistricts, the forest composition should contain a range of conditions that sustain the inherent forest communities and dominant natural disturbance regimes. Table 6 provides target ranges for development class and seral stage composition appropriate for different disturbance regimes. These ranges have been derived from the professional judgment of DNR forest ecologists to guide composition objectives for large landscape areas.

Woodland owners can use this guidance to assess how their holdings contribute to the overall ecodistrict structure by referring to the landscape element bar charts that illustrate where deficiencies exist. For example, landowners who have a large amount of mature forest in an element where this is in short supply can recognize the contribution of their holdings to the overall health of the landscape.

Four hundred years of European settlement in the Acadian region has left insufficient natural landscape structure to confirm these ranges. Facing similar challenges, a comprehensive modeling approach was used by the Ontario Ministry of Natural Resources to support "range of variation" targets for natural disturbance regimes in the Great Lakes St. Lawrence region (see 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)

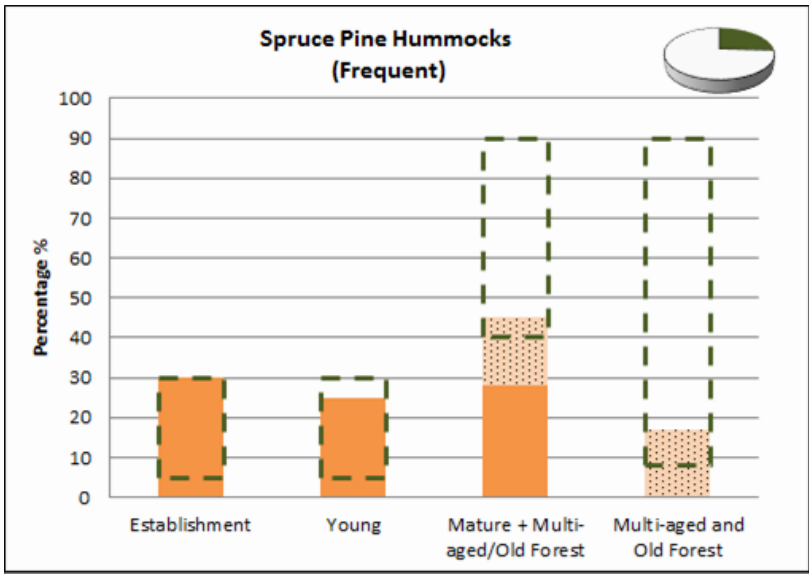
Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5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

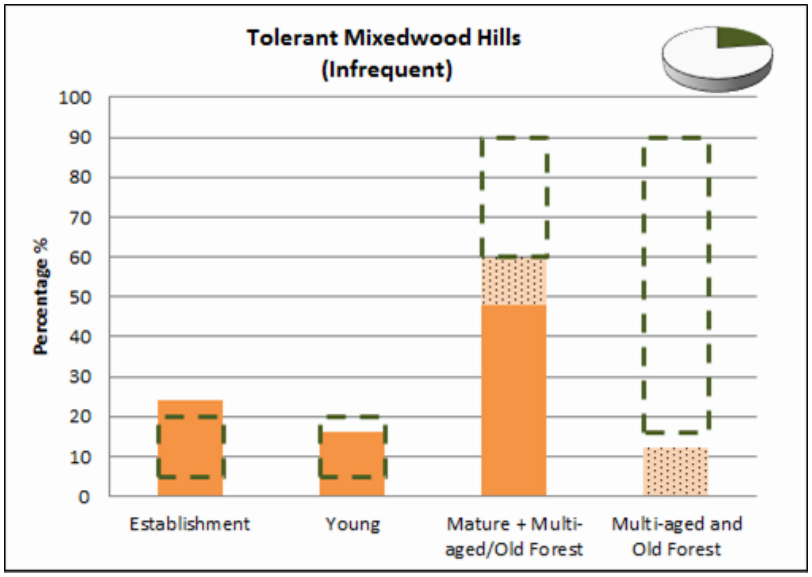
Development Class Targets by Element

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.

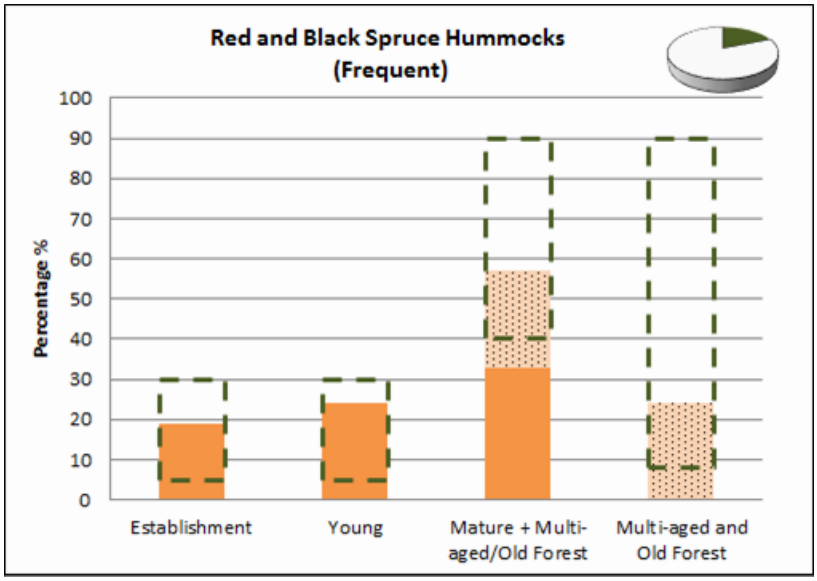
In the **Spruce Pine Hummocks** matrix element, all the development classes are within their target ranges. These forests are frequently disturbed by fire or windthrow creating conditions for the renewal of an even-aged forest. Remnant trees that survived the disturbance such as pine provide seed and contribute to stand structure diversity. Old forest conditions can be enhanced by extending the rotation age but often stand health, especially in black spruce, may limit this option.



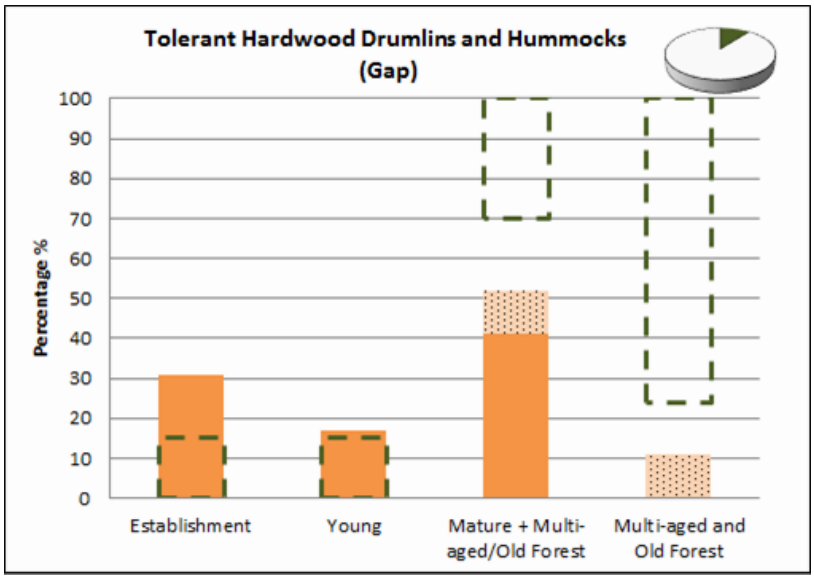
In **Tolerant Mixedwood Hills,** mature and old forest has been slightly reduced below target levels and replaced with younger establishing forests. Extended rotations and partial harvesting to favour climax species and retain large old trees will promote multi-aged forests and maintain mature conditions. Since the establishment class is above the desired condition, forestry prescriptions that increase late successional species in young forests should be used.



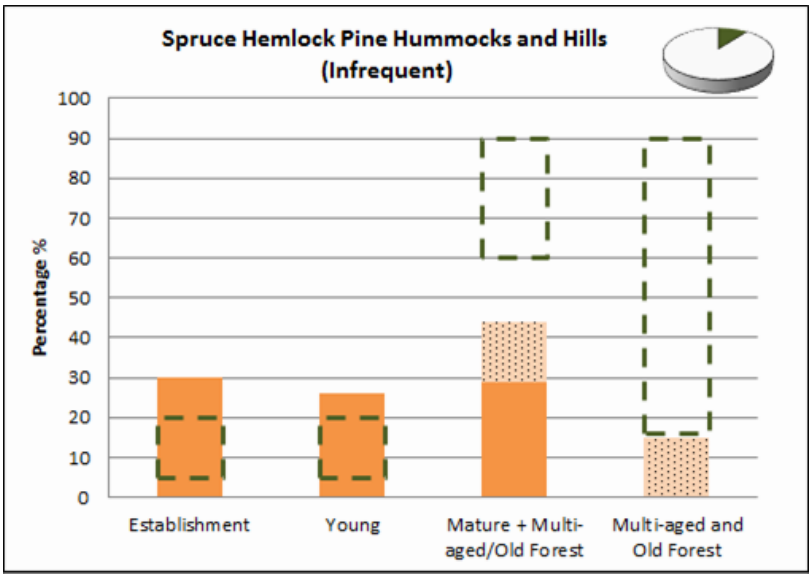
Development classes in the **Red and Black Spruce Hummocks** patch element are all within target ranges. The more fertile red spruce sites should provide opportunities to maintain and restore mature forest with extended rotations and uneven-aged practices to favour climax species. Thinning in establishment and young forests can improve species' composition and growth rates.



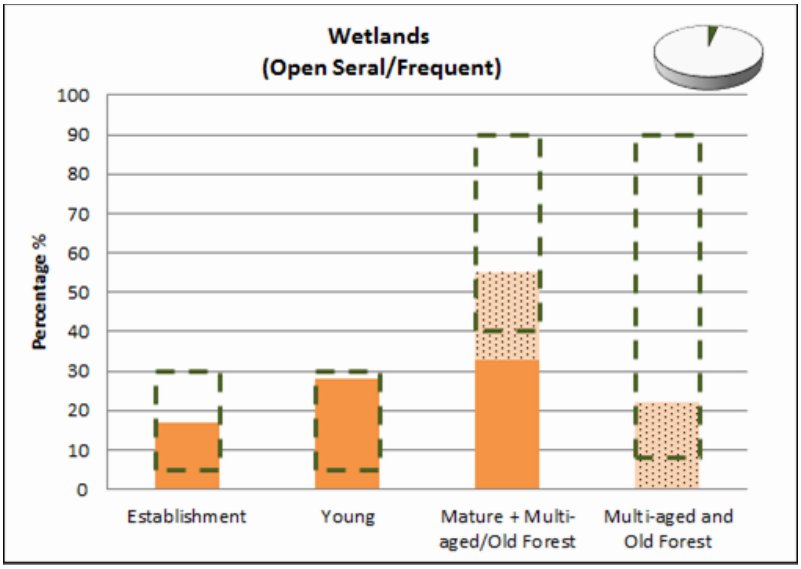
In the **Tolerant Hardwood Drumlins and Hummocks** element, the multi-aged and old forest classes are below target range. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development, particularly in tolerant hardwood stands. Favouring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



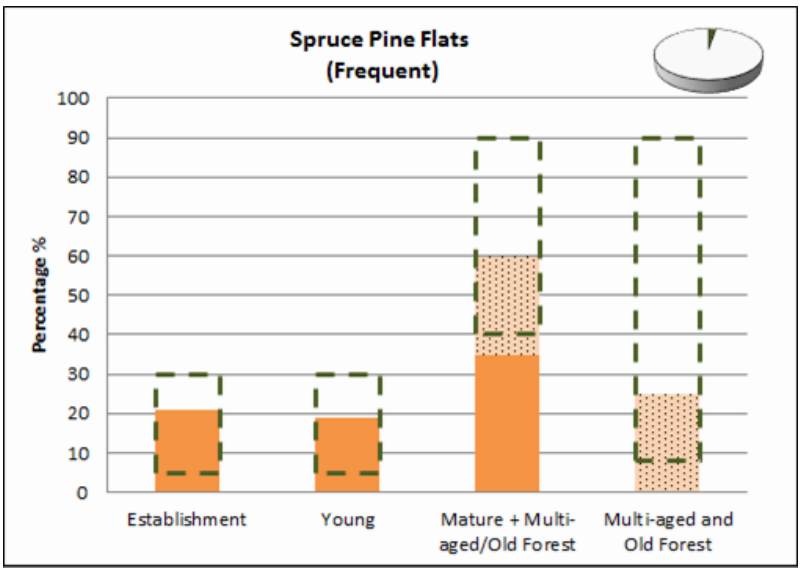
The **Spruce Hemlock Pine Hummocks and Hills** patch element is outside of all its target ranges. The excess establishment and young classes may develop mature characteristics more quickly using silviculture to increase growth and climax species composition. Mature cover can be maintained with partial harvesting and extended rotations: late seral species, large trees, and natural regeneration are most appropriate.



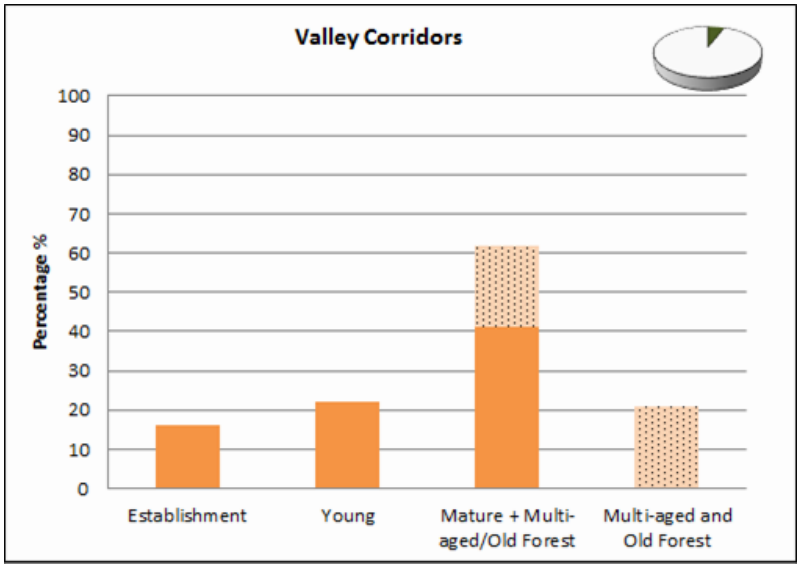
The **Wetlands** element, which has an open seral/frequent disturbance regime, is within the target ranges for all classes. This element is often variably composed of forest, interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure. Small patch harvesting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



In **Spruce Pine Flats**, all the classes are within target ranges, with fairly high levels of mature and multi-aged forests. Frequent natural disturbances in this element create stand initiation events that favour establishment of a dominant, even-aged cohort of mixed species. Disturbances typically retain abundant mature survivors – particularly pine – that provide seed trees and mature structure in developing stands.



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 growth. Mature forests include multi-aged and old growth. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old growth.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.
Natural disturbance regimes	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).