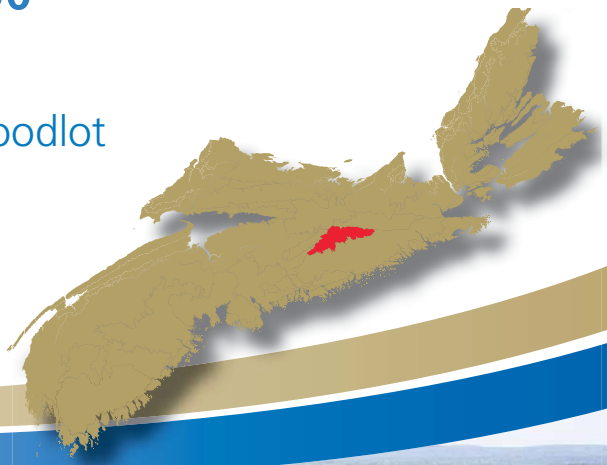
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS GOVERNOR LAKE ECODISTRICT 450

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



ELA 2015-450

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 450: Governor Lake

Prepared by the Nova Scotia Department of Natural Resources
Authors: Central DNR staff

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Governor Lake 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 2015-450

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A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

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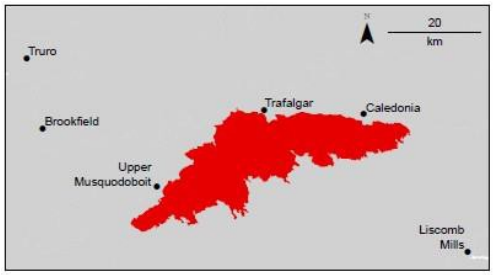


An objective of ecosystem-based management is to manage landscapes in as close to a natural state as possible. The intent of this approach is to promote biodiversity, sustain ecological processes, and support the long-term production of goods and services. Each of the province's 38 ecodistricts is an 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 Governor Lake Ecodistrict 450. 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 Governor Lake Ecodistrict, located in the centre of the eastern mainland at the junction of the Guysborough, Halifax, Colchester, and Pictou county lines, is an upland underlain by granitic bedrock. To the north, the ecodistrict drops sharply to the West River St. Marys, but on the other three sides it is less abrupt in its rise above the shales and quartzites of the Eastern Interior Ecodistrict. Governor Lake has an area of 63,300 hectares.

At its highest point, the ecodistrict is 200 metres above sea level. The ecodistrict has hot summer temperatures, cold winter temperatures, and a short frost-free period.

The ecodistrict is underlain by intruding Meguma Group granite similar to that found in the South Mountain 720 and Eastern Granite Uplands 420 ecodistricts. The granite is resistant to erosion. Some glacial activity has created drumlins and eskers, which can be found scattered throughout the ecodistrict.

Hardwood forests occur on hills and drumlins with red spruce and yellow birch on lower slopes and hummocky terrain at South Loon Lake.

Large mammals such as black bear and deer are found in the ecodistrict. Black bear are widespread and their numbers are healthy. White-tailed deer numbers increase from east to west.

Species at risk in the ecodistrict include the nationally threatened wood turtle.

Approximately 84% of the Governor Lake Ecodistrict is forested.

On the well-drained upper slopes and crests of hills and drumlins, tolerant hardwood forests are found, dominated by yellow birch and red maple and lesser amounts of sugar maple and beech. Elsewhere, softwood forests dominate, with stands of red spruce.

A portion of the Liscomb Game Sanctuary occurs in the ecodistrict providing refuge for black bear, white-tailed deer and species at risk such as the mainland moose.

Private lands account for 74% of the Governor Lake Ecodistrict, with provincial Crown lands at 20% and the remainder in other ownership.

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 six key landscape elements – one dominant matrix element, four smaller patch elements, and a corridor element– in Governor Lake.

Red and Black Spruce Hummocks is the matrix element, representing 72% of the ecodistrict area. On well-drained slopes, forests are dominated by red spruce and white pine. Other species common in the element include black spruce, balsam fir, red maple, and white birch.

Tolerant Hardwood Hills is the largest patch element, representing 18% of the ecodistrict. Yellow birch is a dominant species followed by sugar maple and red maple. Mixedwood forests of balsam fir, red spruce, and yellow birch are also found in the element on lower slopes.

The other patch elements, in order of size, are **Tolerant Hardwood Drumlins and Hummocks**, **Wetlands**, and **Spruce Pine Flats**.

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

Forest Ecosystem Management
For Governor Lake 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 Governor Lake Ecodistrict 450. 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 Governor Lake 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 Governor Lake – *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 Governor Lake Ecodistrict occupies an area of approximately 633 square kilometres, or 10% of the Eastern Ecoregion.

Softwood is the most common covertype, followed by mixedwood and hardwood.

On an annual basis, the ecodistrict receives 1,300 to 1,400 millimetres of precipitation which is similar for most of the eastern and western ecoregions.

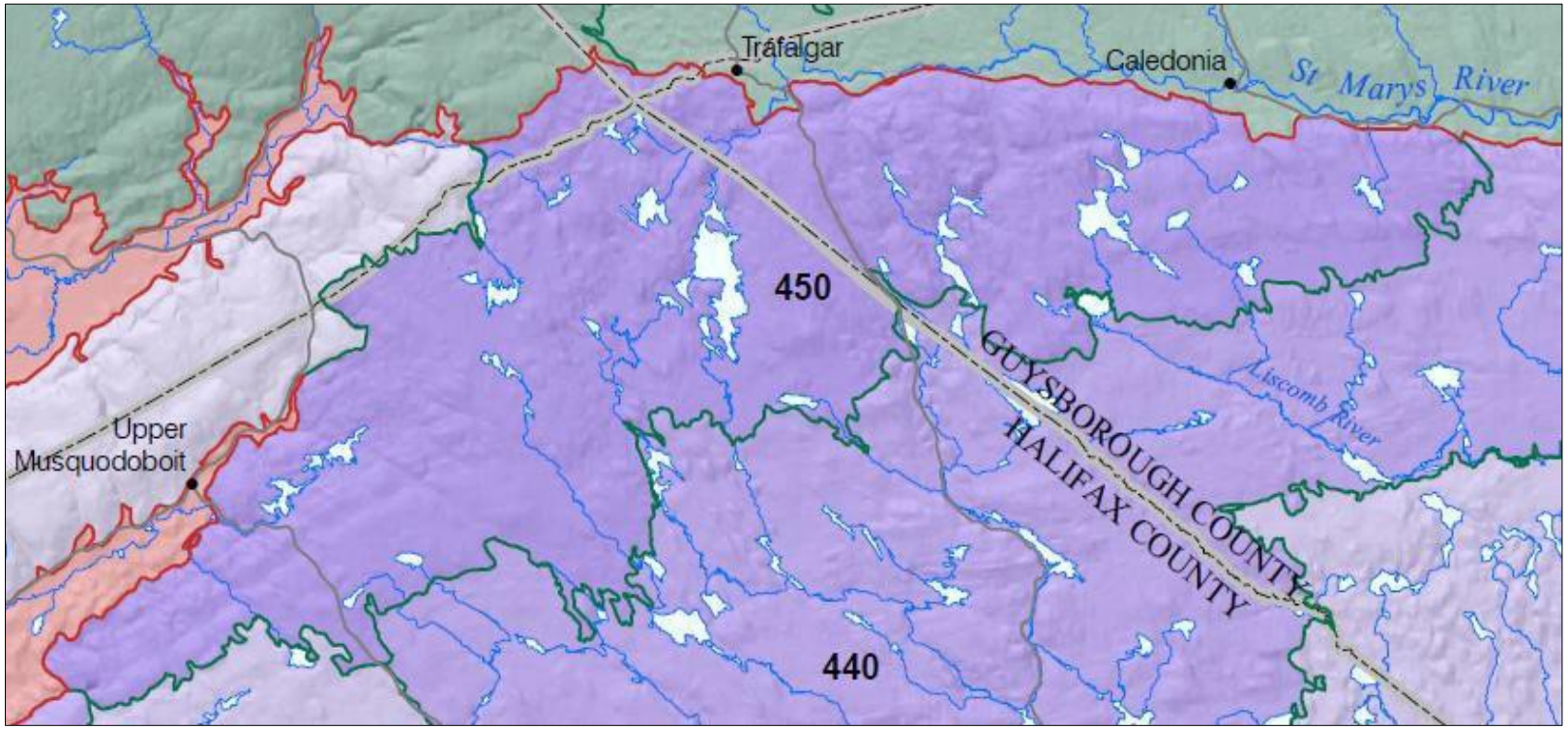
The terrain is thinly covered by coarse granitic till with many large granite boulders. Some glacial activity has created drumlins and eskers, which can be found scattered throughout the ecodistrict. The ecodistrict's geology can best be seen after a disturbance such as fire or clearcut harvesting has removed the vegetation and exposed the landscape strewn with boulders.

Approximately 2% of the ecodistrict has exposed bedrock, much of it around First, Second, and Lower Rocky lakes in the Liscomb Game Sanctuary.

Nearly 6% of the ecodistrict is covered with lakes and streams which merge to form the East River Sheet Harbour.

The soils are coarse-textured, well-drained, gravelly sandy loams. The ecodistrict is prone to wildfire due to the dryness of the soils and to windthrow due to the shallowness of the soils.

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



The Governor Lake Ecodistrict is an interior ecodistrict covering parts of Halifax, Guysborough, Colchester, and Pictou counties.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

Private land ownership accounts for 74% of the ecodistrict area, followed by Crown lands at 20% and other lands at 6% (Table 1).

Table 1 – Land Area by Ownership in the Governor Lake Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	12,837	20.3
Private	46,780	73.9
Federal	0	0
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	3,696	5.8
Total	**63,313**	**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).

The main Crown land use category in Governor Lake is C1 (62%) with the remainder of the lands in C2 (Table 2).

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	7,891	61.5
C2 – Multiple and Adaptive Use	4,938	38.5
C3 – Protected and Limited Use	0	0
Unclassified	8	<0.1
Total	**12,837**	**100**

Forests

Within the Governor Lake Ecodistrict, approximately 84% of the land is forested, with the remaining 16% dominated by wetland and other uses (Table 3).

Non-forested areas include wetlands, barrens, utility corridors, agriculture, urban, and other types such as lands in brush and alders.

Softwoods account for 71% of the classified forested area, mixedwood accounts for 17% with the remaining 12% in hardwood stands.

On the more productive sites, softwood forests primarily comprise red spruce, with lesser amounts of yellow birch hardwoods and white pine.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	53,387	84.3
Wetland	4,473	7.1
Agriculture	348	0.6
Barrens	959	1.5
Urban	124	0.2
Road, Trail, Utility	142	0.2
Other	3,880	6.1
Total	**63,313**	**100**

Wetland and barrens account for nearly 9% of the Governor Lake Ecodistrict.

Isolated pockets of white pine are found on the coarse shallow soils of ridges associated with black spruce and heather-like ericaceous vegetation. Black spruce and balsam fir can be found on poorer drained sites.

Tolerant hardwood forests of sugar maple, yellow birch, and beech can be found on well-drained upper slopes and crests of hills and drumlins. Locally, some hilltops have open stands of large diameter yellow birch which seems to indicate the loss of an earlier component, such as red spruce and/or beech.

Hardwoods are most common on the two largest patch elements, while softwoods are dominant on the matrix element.

Forestry is the dominant resource use activity on both Crown and private land.

The majority of the Crown land in the Guysborough County portion of the ecodistrict is under a license and management agreement with NewPage Corporation, formerly StoraEnso Port Hawkesbury Ltd. *The mill was purchased by a new buyer and re-opened in October 2012 as Port Hawkesbury Paper LP.*

Crown land in the Halifax County portion of the ecodistrict is under a similar arrangement with the Northern Pulp mill at Abercrombie Point, Pictou County.

As a result, these two companies effectively act as the province's forest management contractors for these Crown lands. Requests for small quantities of wood from Crown are handled through a third party request procedure that is in place with these companies.

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

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

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	2,075	3.9
3	3,487	6.5
4	10,410	19.6
5	22,768	42.6
6	13,158	24.6
7 or more	1,489	2.8
Total	**53,387**	**100**

*Based on growth potential for softwood species.

Water Resources

Freshwater lakes, rivers, and streams account for 3,630 hectares, or about 6% of the ecodistrict.

From Trafalgar eastward to just beyond Highway 7, the majority of the drainage in the ecodistrict is toward the St. Marys River. The East River St. Marys drains along the Cobequid-Chedabucto Fault, receiving a considerable portion of its flowage from the adjoining Pictou Antigonish Highlands Ecodistrict.

Freshwater lakes and rivers provide an important water resource to the Governor Lake Ecodistrict.

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 Governor Lake Ecodistrict is located in the vicinity of the junction of the Guysborough, Halifax, Colchester, and Pictou county lines.

The bedrock geology consists of metamorphosed sedimentary rocks of the Meguma Group (Goldenville and Halifax formations) that are about half a billion years old, Devonian Period intrusive rocks, and metamorphic rocks related to the Devonian intrusives.

The surficial geology of the Governor Lake Ecodistrict is generally composed of a stony glacial till 2 to 20 metres thick. Along the northeastern border and along the Upper Musquodoboit Valley border, silty till is present. Several locations along the northeastern and southwestern boundaries have areas of bedrock overlain by a thin discontinuous veneer of till.

Several small glaciofluival deposits occur between Loon Lake and Caledonia. Unconsolidated granular aggregate resources have been extracted at several locations to supply local requirements. Surficial deposits make a major contribution to soil development and may be a source of aggregate. Scattered across the ecodistrict are several small organic deposits

Several mineral occurrences (gold, antimony, lead, zinc, silver, and gypsum) are hosted within the ecodistrict.

Mineral exploration dates back to the late 1800s, and shafts and adits – horizontal entrances to an underground mine – 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 provincial AMOs database locates approximately 12 AMOs (shafts, pits, subsidence, and collapse features) in the ecodistrict.

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.

Gold deposits in this area of the province are primarily confined to the Goldenville Formation. However, minor gold mineralization also occurs locally in the Halifax Formation. Most of the Meguma-hosted gold deposits occur as native gold and associated minor sulphides (galena, sphalerite, chalcopyrite, pyrite, pyrrhotite and arsenopyrite) in deformed quartz veins and in associated wall rock slates between the metawacke beds of the Goldenville Formation.

The majority of the gold deposits lie on the steepest or overturned parts of several regionally developed anticlinal folds. Gold exploration, and sometimes production, occurred in the Lower Caledonia Gold District (straddles boundary with St. Marys River Ecodistrict) and in the Little Liscomb Lake Gold District (1893 to 1895). Mine tailings generated from the gold recovery processes and AMOs remain as indicators of past mining activity.

Several zones in the Meguma Group contain significant amounts of sulphide minerals that have the potential to generate acidic runoff when broken, exposed, and oxidized. Where possible, excavation and disturbance of acid-generating areas should be avoided.

Fossils are rare in the Meguma Group. Although the northern boundary is fault controlled, locally the ecodistrict's northern border extends north of the fault and includes small pieces of the downfaulted Horton Group rocks of the St. Marys Graben (conglomerates, sandstones, and shales).

The ecodistrict is bordered on the north by the West River St. Marys Fault. The fault separates the Meguma Group rocks of the Governor Lake Ecodistrict from the younger Horton Group strata of the St. Marys River Ecodistrict.

Several southeasterly trending faults, including the Harrigan Cove Fault and the Sheet Harbour Fault, cut across the ecodistrict. The complex structural history of the Meguma Group includes up to five stages of deformation. During the Devonian Period, pervasive deformation was superimposed on the Meguma strata, producing a series of tight northeasterly to easterly trending folds (anticlines and synclines).

Parks and Recreation / Protected Areas

There are no provincial parks or protected areas within the Governor Lake 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 Governor Lake 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 Governor Lake 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.

Governor Lake Ecodistrict 450 spans parts of four counties, with the largest areas in Halifax and Guysborough counties and smaller areas in Colchester and Pictou counties. Wildlife species present are typical of Nova Scotia second growth forests.

Large mammals such as moose, black bear, and deer are present in varying numbers.

White-tailed deer numbers increase from east to west. High deer numbers have the potential to pose concerns for farmers because of the potential for agricultural damage and to motorists who may contact deer travelling along the highway.

High numbers of white-tailed deer are reported in the Governor Lake Ecodistrict.

Black bear are widespread through the ecodistrict and their numbers are healthy.

Scattered reports of the endangered mainland moose have been reported in this ecodistrict, most often in the Liscomb Game Sanctuary which comprises a significant portion of this ecodistrict.

Species at risk in the ecodistrict include the nationally threatened wood turtle, which inhabits several of the tributary streams that feed the West Branch St. Marys River and the Musquodoboit River, rusty blackbird, chimney swift, common nighthawk, Canada warbler, and boreal and blue felt lichen.

The nationally threatened wood turtle is found in several streams in the ecodistrict.

Species classified as sensitive for this ecodistrict include northern goshawk, yellow-bellied flycatcher, triangle floater, and showy lady's slipper.

Common loons can be found in a number of the bigger lakes and nesting is known to occur in the Mill Lakes, Grassy Lakes, and Governor Lake.

Fishers, locally common to the north, are expanding their territory south and are occasionally trapped within the Governor Lake Ecodistrict.

There are no wilderness areas designated for this ecodistrict. However, approximately 1,100 hectares of old forest has been identified for protection on Crown lands in this ecodistrict. Fire is thought to be the primary natural disturbance and natural climax forest communities are dominated by black spruce, white pine, and red spruce, with lesser amounts of sugar maple, yellow birch, beech, and eastern hemlock.

Local hydrology is dominated by abundant lakes, watercourses, and wetlands which provide ample habitats for a wide range of wildlife including fur bearers, small mammals, song birds, amphibians, and reptiles.

The area is a destination for outdoor recreationalists with fishing common throughout and hunting and trapping popular outside of the Liscomb Game Sanctuary.

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

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

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

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

Forest Disturbances and Succession

Forest Disturbances

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

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

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

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

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

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

Governor Lake – 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 six distinctive elements in the Governor Lake Ecodistrict – one matrix, four 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.

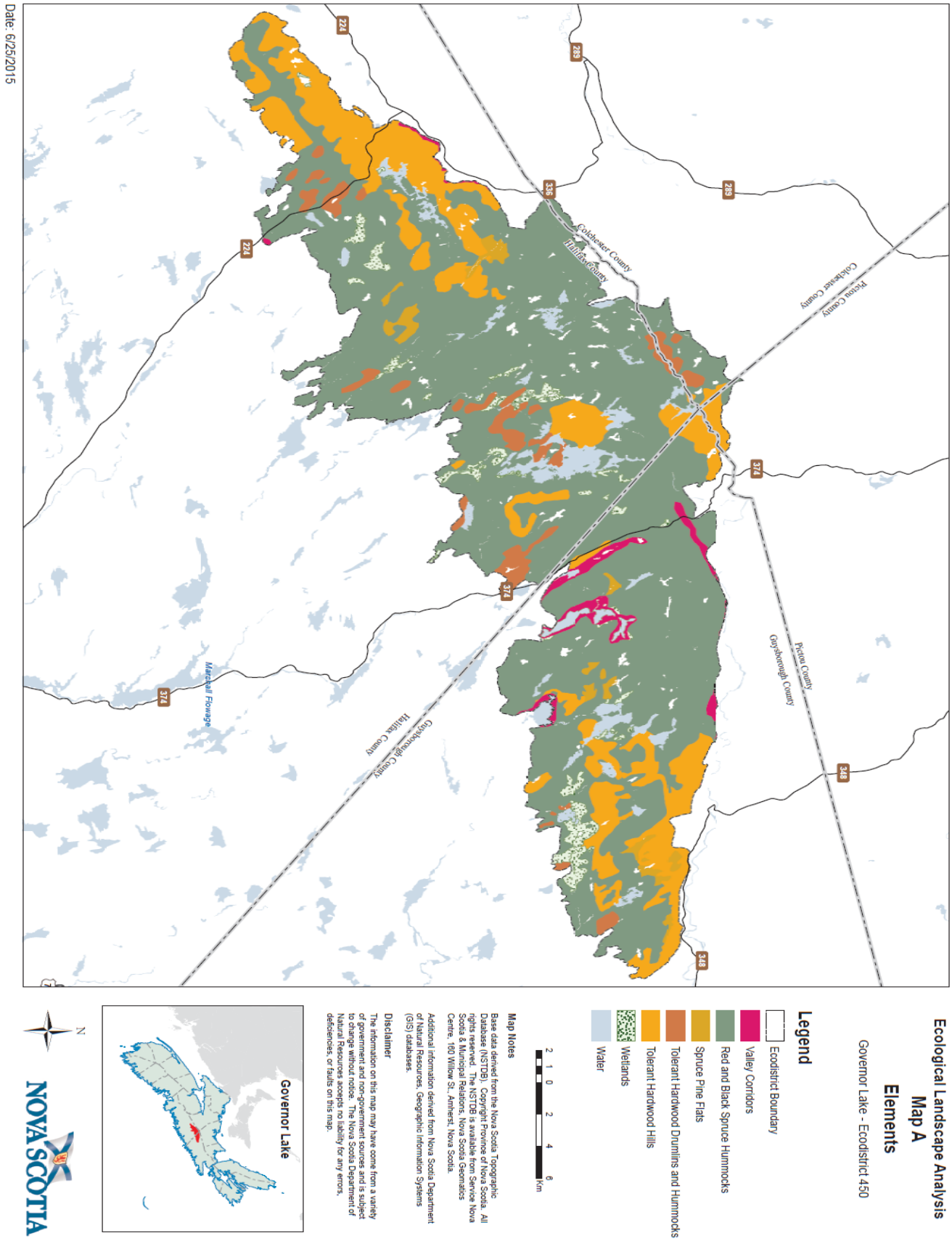
Red and Black Spruce Hummocks is the matrix element, representing 72% of the ecodistrict area. On well-drained slopes, forests are dominated by red spruce and white pine. Other species common in the element include black spruce, balsam fir, red maple, and white birch.

Tolerant Hardwood Hills is the largest patch element, representing 18% of the ecodistrict. Yellow birch is a dominant species followed by sugar maple and red maple. Mixedwood forests of balsam fir, red spruce, and yellow birch are also found in the element on lower slopes.

The other patch elements, in order of size, are **Tolerant Hardwood Drumlins and Hummocks**, **Wetlands**, and **Spruce Pine Flats**.

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.

Considerable harvesting has occurred in the Governor Lake Ecodistrict, resulting in many areas of establishment and young forests.

Table 5a – Elements Governor Lake		
Element	**Size (Hectares)**	**Element Description**
Red and Black Spruce Hummocks (Matrix)	43,160 72.3%	Red and Black Spruce Hummocks is the matrix element of the ecodistrict and occurs on well and imperfectly drained soils of coarse to medium textures. On the well to moderately well-drained slopes, forests are dominated by red spruce and white pine. The flatter terrain between hummocks is usually imperfectly to poorly drained and supports a forest of black spruce and white pine. On the wettest sites, red maple and tamarack are typical. On the sites with poor soils, especially where soils are rapidly to well-drained, very coarse, and/or shallow to bedrock, black spruce and white pine are common along with a thick understory of heath-like shrubs. Balsam fir is an early successional component of most stands. Shade-tolerant hardwoods are uncommon but small stands can be found on long slopes where soils are being enriched through seepage. Following frequent stand-level natural disturbances, such as fire and hurricane, early successional forests may include intolerant hardwoods such as red maple and white birch. Older red spruce forests are susceptible to the spruce bark beetle.
Tolerant Hardwood Hills (Patch)	10,776 18.1%	These hardwood-dominated hills are scattered throughout the ecodistrict, usually surrounded by hummocky terrain with red and black spruce forests. The sites are fertile and underlain by well-drained medium to fine-textured soils. Yellow birch is a dominant species followed by sugar and red maples. Balsam fir, red spruce, and yellow birch are more abundant on the moister lower slopes. Natural disturbances due to insects or disease, windthrow, or storm breakage create small gaps and patches in the canopy. As such, these tolerant hardwood forests can be uneven-aged and stands can develop old forest characteristics. Open stands of large-diameter old yellow birch often dominate the hilltops. 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.
Tolerant Hardwood Drumlins and Hummocks (Patch)	2,199 3.7%	These hardwood-dominated drumlins occur as small areas concentrated to the south and east of Governor Lake. The sites are fertile underlain by well-drained medium to fine-textured soils. Forests have a prominent cover to yellow birch followed by sugar and red maples. Balsam fir, red spruce, and yellow birch are more abundant on the moister lower slopes. Natural disturbances due to insects or disease, windthrow, or storm breakage create small gaps and patches in the canopy. As such, these tolerant hardwood forests can be uneven-aged and stands can develop old forest characteristics. 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 Governor Lake		
Element	**Size (Hectares)**	**Element Description**
Wetlands (Patch)	1,587 2.7%	The wetlands element is a patch ecosystem comprising freshwater bogs, fens, swamps, and poorly drained areas. The most common wetlands in the ecodistrict are large wetland 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, alders, false holly, and winterberry) on level terrain where drainage is impeded or as a depression in the landscape where water remains in excess year round. Smaller disjoint wetlands are often embedded within other elements, especially the Spruce Pine Flats element. Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple. For the most part, sites are underlain by poorly drained mineral soils derived from glacial tills or organic soils derived from peat (sphagnum mosses) or sedges. This element plays a critical role in water collection, filtering, and groundwater recharge.
Spruce Pine Flats (Patch)	938 1.6%	This small patch element occurs on level and sometimes hummocky terrain and is dominated by wet forests of black spruce and open wetlands. The element occurs on imperfectly to poorly drained coarse to medium-textured soils associated with small streams and wetland complexes. Forests of black spruce and tamarack are typical with the wetter sites dominated by red maple. Shrubs such as alders, false holly, and winterberry are common. This element is frequently disturbed by windthrow, fire, and/or natural senescence which limit the potential for old growth forest development. Earlier successional forests will be of similar species composition to later stages.
Valley Corridors (Corridor)	1,023 1.7%	The most evident linear features within this ecodistrict are watercourses, with six of the most prominent being identified for this analysis. These corridors are considered to be made up of numerous different small areas bounding these watercourses. The current forest cover within these corridors contains a fairly well-balanced distribution of development and seral stages, and is dominated by softwood covertypes. All three disturbance regimes are thought to influence the natural development of these corridor areas.
Total	**59,683***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Governor Lake						
Element	**Seral Stage**					
	Early	**%***	**Middle**	**%**	**Late**	**%**
Spruce Pine Flats	OW2, SH9, SP6	18	SP4, SP7	30	**SP5**	40
Red and Black Spruce Hummocks	IH6, MW4, MW5, SH8, SH9	19	SH5, SH6, SP4	24	MW1, MW2, MW3, SH1, SH2, **SH3,** SH4, SP5	37
Tolerant Hardwood Drumlins and Hummocks	IH6	16	IH7, TH7	21	TH1, TH2, **TH8**	29
Tolerant Hardwood Hills	IH6	23	IH7, TH7	30	TH1, TH2, **TH8**	28
Wetlands	WC1, WC2, 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.

Red Spruce – Balsam fir / Schreber's moss (SH5) is a mid-successional vegetation type found in the Red and Black Spruce Hummocks matrix element.

White birch – Red Maple / Sarsaparilla – Bracken (IH6) is an early successional vegetation type found in the Tolerant Hardwood Hills patch element.

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

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

Black spruce / Lambkill / Bracken (SP5) is a late successional vegetation type found in the Spruce Pine Flats 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.

In the Governor Lake Ecodistrict, the most common natural disturbance regimes are frequent and gap and agents include windthrow, fire, and insects or disease.

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 (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)

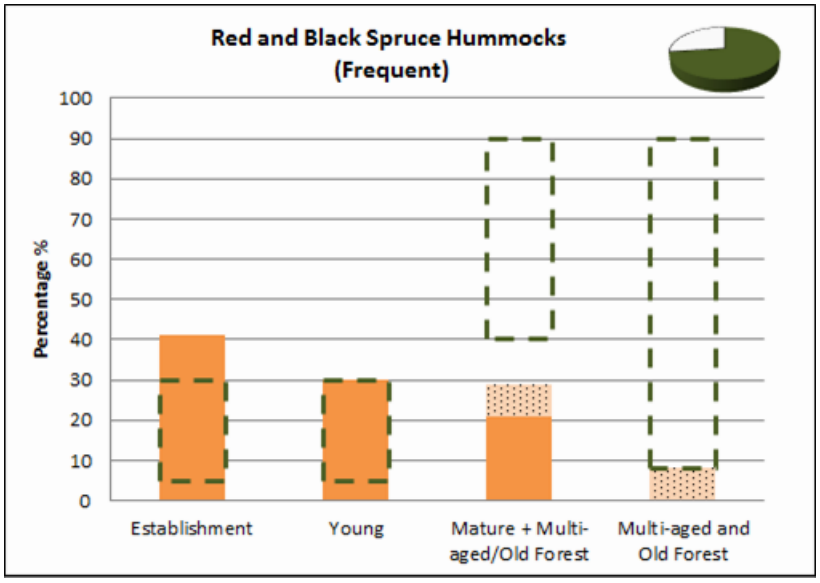
Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5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

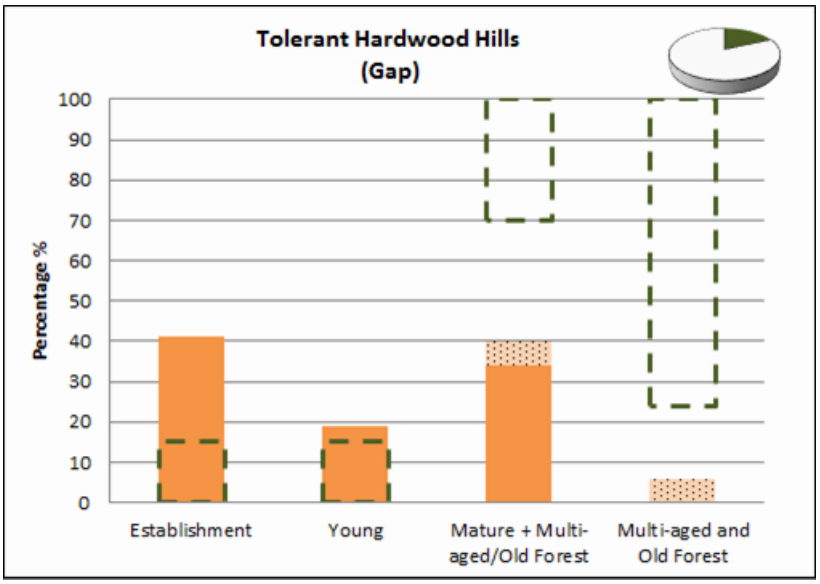
Development Class Targets by Element

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.

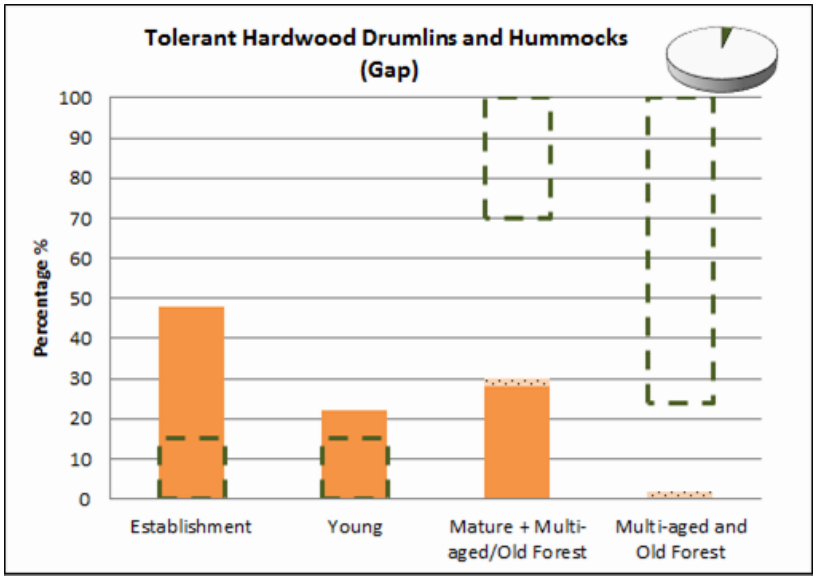
Development classes in **Red and Black Spruce Hummocks** for mature and old forest are significantly below target levels. The red spruce component of this element can provide opportunities to maintain and restore mature forest features by using extended rotations and uneven-aged practices to favour climax species. Thinning can be used to enhance late successional species composition and increase growth rates.



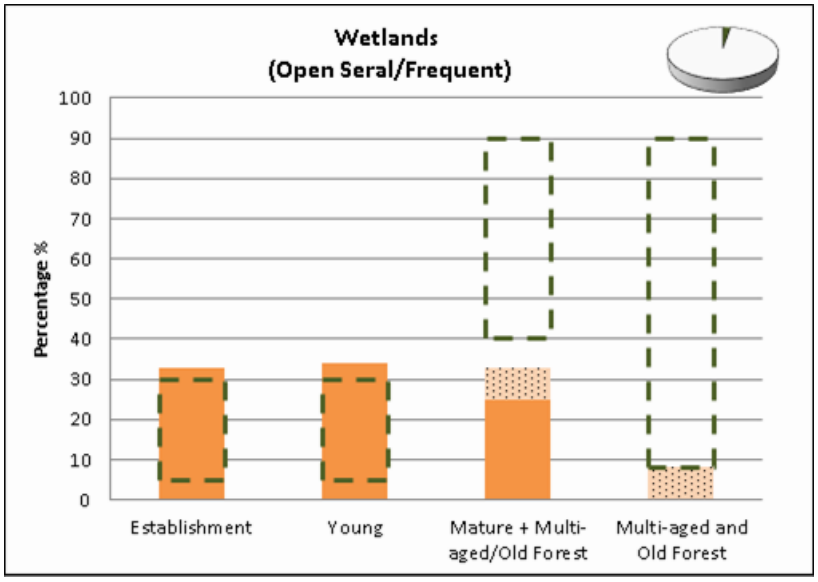
In the **Tolerant Hardwood Hills** element, the multi-aged and old forest classes are below their target ranges. The establishment class is more than double its target. Partial harvests that are consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development. Favouring climax hardwood species during silviculture in establishment and young forests will provide future mature forest opportunities.



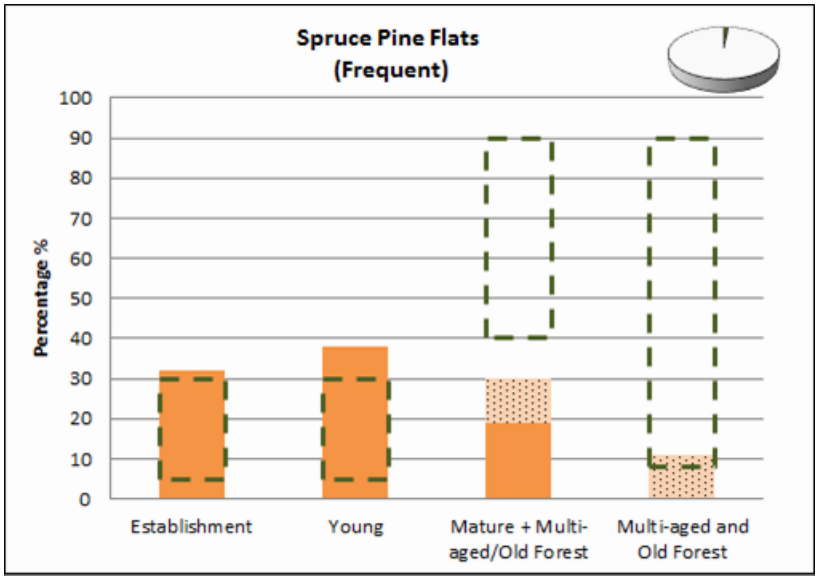
In the **Tolerant Hardwood Drumlins and Hummocks** element, mature and old forest classes are significantly below target levels. With three times as much establishment class as desired, forestry prescriptions that increase late successional species in young forests should be used to speed up return to older forest composition and conditions.



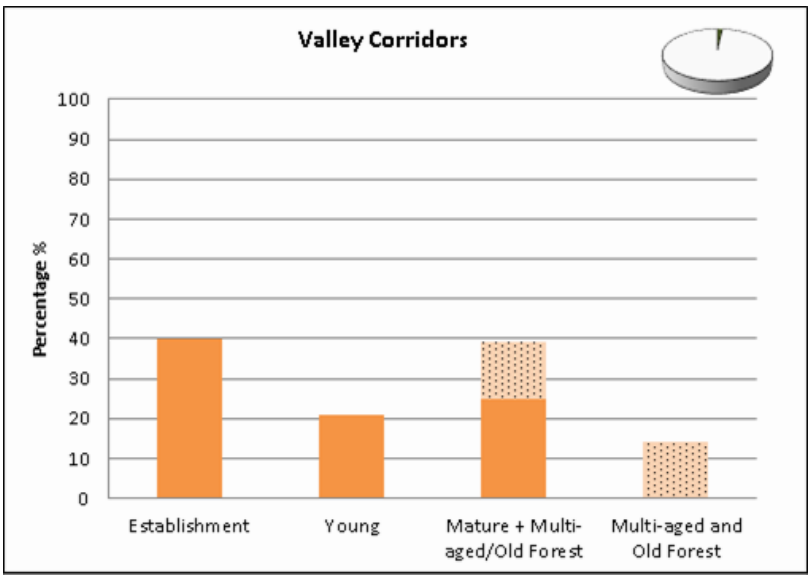
The **Wetlands** element is variably composed of forest, interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure. The relatively high amount of establishment and young may reflect height growth limitations on poor sites, as well as past harvesting.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



In the small **Spruce Pine Flats** patch element, there is an over-abundance of young forest. On productive sites, pre-commercial thinning may hasten diameter growth and help restore this aspect of mature forests. Due to the shallow rooting of trees on moist to wet soils, mature stands are vulnerable to blowdown, particularly if thinned. Potential for old growth is low except where white pine is dominant.



The **Valley Corridors** element includes parts of several elements and does not have a specific disturbance regime or composition target. Small patch disturbances will support development of establishment and young forest habitats.



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 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).