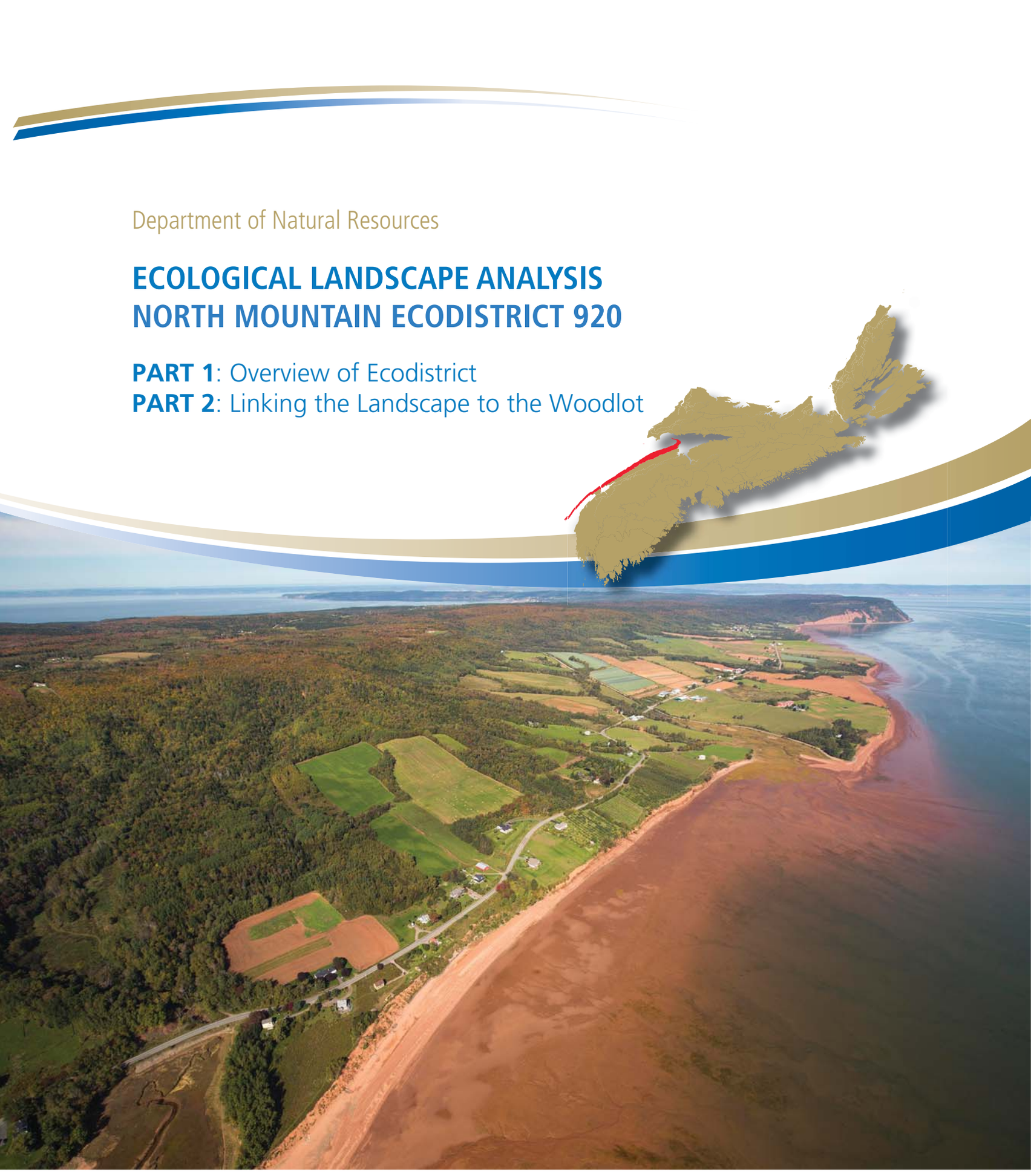
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS NORTH MOUNTAIN ECODISTRICT 920

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



ELA 2015-920

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 920: North Mountain

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

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (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.

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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 North Mountain Ecodistrict 920. 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 North Mountain Ecodistrict is a narrow ridge parallel to the southern shoreline of the Bay of Fundy – known for the highest tides in the world – stretching 200 kilometres from Cape Split to Brier Island. The maximum elevation of North Mountain, made of volcanic rock, is 240 metres.

At the southwestern end, the ecodistrict gradually narrows from Digby Neck to Long Island and finally Brier Island.

North Mountain is the northern boundary of the Annapolis Valley Ecodistrict 610 and serves to shelter the valley from the cooler climate along the Bay of Fundy. The south-facing slope of the North Mountain can be steep in places, with escarpment-like features at several locations. Small steep-sided valleys, locally known as vaults, dissect the slope.

On the Bay of Fundy side, the slopes are longer and more gradual, but usually end with vertical cliffs at the coastline, such as in Cape Split, Margaretsville, and Keatings Sand Beach.

The North Mountain provides stunning panoramic views of the Annapolis Valley at look offs along its southern escarpment. Cape Split and the more than 800-hectare Blomidon Provincial Park have striking landscapes with hiking trails and beautiful scenery.

A mix of forest, fields and abandoned farmland blanket the North Mountain, which gently slopes towards the Bay of Fundy. Small steep-sided valleys, locally known as vaults, dissect the slope.

North Mountain is a ridge of basalt. The majority of the soils have developed from dark brown or dark yellowish brown sandy loam till derived almost entirely from the underlying volcanic rock. Although the soil is stony, extensive areas on the north slopes are suitable for agriculture and can be used for growing vegetables and forage.

Approximately 81% of the ecodistrict is forested. On well-drained sites along the Fundy Shore, white spruce is the dominant tree species with black spruce on the wetter sites. Inland, red spruce will begin to occur on the lower and middle slopes of the North Mountain while sugar maple and yellow birch are found on the upper slopes and crests.

The total area of North Mountain Ecodistrict is nearly 99,000 hectares, including water. Private land ownership accounts for 96% of the area.

The North Mountain is almost entirely underlain by 200 million year old basalt from the Jurassic period and is easily visible in the cliffs along the Bay of Fundy near Morden.

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 combination patch and corridor element – in North Mountain.

Tolerant Hardwood Hills is the matrix element, representing nearly 73% of the ecodistrict. This element naturally supports a hardwood forest of shade-tolerant species, such as sugar maple, yellow birch, and beech.

Tolerant Mixedwood Hummocks, representing nearly 8% of the ecodistrict, is the largest patch element. Shade loving mixedwoods of red spruce, hemlock, yellow birch, and sugar maple are the climax forest. The remaining three patch elements, in order of size, are, **Red and Black Spruce Flats Red Spruce Hummocks**, and **Wetlands**.

Tolerant Mixedwood Slopes is a combination patch and corridor element found on steep slopes and on the escarpment overlooking the Annapolis Valley.

Forest Ecosystem Management
For North Mountain Ecodistrict

The primary ecological goals of ecosystem-based management are to maintain and conserve ecosystem biodiversity, productivity, and resilience. Integration of economic, ecological, and social values within a single planning process provides opportunities for creative solutions to meet the challenges of sustainable resource management. By maintaining their integrity, ecosystems can better adapt to environmental stressors such as extended cycles of climate change, atmospheric pollution, changes in land use and vegetation cover.

This ELA provides detailed information on the resources and descriptions of various components of the landscape for North Mountain Ecodistrict 920. 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 North Mountain Ecodistrict was up to 2008. These baseline measurements can be used to assess trends through comparison with present and future inventories.

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

Finally, the relationship between inherent structure and existing conditions is used to guide future direction. The ELA is part of an ecosystem approach that will expand to encompass other initiatives of the Department of Natural Resources (DNR), such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011 - 2020 (http://novascotia.ca/natr/strategy/pdf/Strategy_Strategy.pdf).

The intention is to describe important ecological characteristics to consider during resource planning – the ELA is not a plan in itself.

Part 1: An Overview of North Mountain – *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 North Mountain Ecodistrict – part of the Fundy Shore Ecoregion – is a narrow ridge, nearly 99,000 hectares in size, varying in width from a maximum of nine kilometres to a minimum of one kilometres.

The ecodistrict stretches for about 200 kilometres from Cape Blomidon to Brier Island. At the southwestern end, the ecodistrict is a series of divided landforms going from Digby Neck to Long Island to Brier Island. A maximum elevation of about 240 metres is attained.

The basalts that are the foundation of the ecodistrict are layered in approximately 17 lava flows with a total estimated thickness of 300 metres and the flows dipping toward the Bay of Fundy. The lava flows extend underneath the thick ocean floor sediments in the Bay of Fundy and once covered much of western Nova Scotia and into the New England states, but have been eroded by glaciation.

The dominant soils are mostly silt loams and well- drained. Although the soil is stony, extensive areas on the north slopes are suitable for agriculture. There is a large area of sandy clay loam between Arlington West and Moshers Corner.

The total freshwater area is 373 hectares, or 0.4% of the ecodistrict.

The south-facing slope of the North Mountain can be steep in places. Small steep-sided valleys, locally known as vaults, dissect the slope.

The climax forest over much of the ecodistrict is shade-tolerant softwoods, tolerant hardwoods, or tolerant mixedwoods. Red spruce could be expected to occur at mid-slope positions about half a kilometre inland from the Bay of Fundy coast. Tolerant mixedwoods and hardwoods are found on upper slopes and crests.

Some of the less accessible sites near Blomidon and Cape Split and in the vaults suggest that the climax forest consisted of a mixed shade tolerant hardwood and softwood association. The vaults on the Fundy side support a varied forest with tolerant hardwoods, red spruce, and a few white pine on the upper slopes. Shaded and lower slopes of the vaults are red and black spruce and a few hemlocks.

One of Nova Scotia's rarest native trees, eastern white cedar, grows in a few locations, in streamside alluvial deposits, near the southwestern end of the mountain.

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

North Mountain Ecodistrict 920 extends from Cape Split in the northeast to Brier Island in the southwest.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

The majority of the land is held in private ownership at 96% (Table 1). Crown land blocks, making up nearly 2% of the area, are scattered throughout the ecodistrict. The largest Crown land blocks are located at Cape Split and Blomidon. A large federal land block, owned by the Department of National Defense, can be found at Granville Ferry.

Table 1 – Land Area by Ownership in the Valley Slope Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	1,573	1.7
Private	95,229	96.3
Federal	1,034	1
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	1,035	1
Total	**98,871**	**100**

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

The ecodistrict is rural in character with a number of small settlements, including Hampton and Sandy Cove. The small coastal communities along the Bay of Fundy are usually involved in the fisheries. A number of farms are also present.

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	177	11.3
C2 – Multiple and Adaptive Use	89	5.7
C3 – Protected and Limited Use	998	63.4
Unclassified	309	19.6
Total	**1,573**	**100**

Crown land designations are C1 (11%), C2 (6%), and C3 (63%). The remaining 20% is unclassified.

The ecodistrict comes in contact with tidal water through the Bay of Fundy, St. Marys Bay and a section of the Minas Basin. Land below the mean high water mark is provincial Crown land.

Permits are required from DNR for activities that take place on this land. These activities include wharf construction, bank stabilization, and installation of saltwater intake and outflow pipes.

Since there is little Crown land in this ecodistrict, DNR has been acquiring a number of small and medium-sized blocks of land in the past few years. More land is expected to be acquired as it becomes available.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	80,083	81
Wetland	1,620	1.6
Agriculture	8,678	8.8
Barrens	293	0.3
Urban	2,341	2.4
Road, Trail, Utility	666	0.7
Other	5,189	5.2
Total	**98,870**	**100**

Forests

Within the North Mountain Ecodistrict, forested land represents 81% of the total 98,870 hectares (Table 3). Other major land uses, in order of size, are agriculture (9%), other (5%), urban (2%), and wetland (2%).

Mixedwoods are the most common forest community type, often comprising red maple, white birch, and spruce species. White spruce, most often located on abandoned farmland, is the next most common forest community type, followed by the intolerant hardwood community. There is also a good representation of tolerant hardwoods.

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

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	1,884	2.3
3	4,037	5
4	11,374	14.2
5	38,455	48
6	22,197	27.7
7 or more	2,135	2.7
Total	**80,082**	**100**

*Based on growth potential for softwood species.

Forested land accounts for 81% of the ecodistrict, followed by agricultural land at 9%.

Water Resources

Because of its topography and location, most of the water in the ecodistrict drains directly into the Bay of Fundy or St. Marys Bay. The ecodistrict is characterized by numerous small streams with few lakes. A cluster of small lakes occurs south of Hampton.

Water supply areas for Margaretsville, Middleton, Bridgetown, and Digby are located within the 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 for the entire province.

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

Small lakes, such as this dammed lake that is part of Middleton's water supply, are an important water resource in the ecodistrict.

Minerals, Energy and Geology

North Mountain is a linear ecodistrict that trends northeast-southwest and encompasses what is locally referred to as the North Mountain. The North Mountain extends from the outer islands on Digby Neck in the west to the escarpment of Cape Split in the east.

The southern edge of the ecodistrict is steep-sided with an elevation of up to 240 metres at the eastern end and slopes to nearly sea level in the west.

The northern edge of the ecodistrict is at the intersection with the Bay of Fundy and the southern edge is at the intersection with the Annapolis Valley floor.

Bedrock in this ecodistrict is 98% basalt and about 200 million years old.

Coastal exposed bedrock can be found in various parts of the North Mountain Ecodistrict.

The remaining 2% comprises the Blomidon and Scots Bay formations, ranging in age from 195 to 225 million years old.

The Blomidon Formation outcrops in small isolated sections along the southern margin of the ecodistrict and comprises red shales, claystone, and siltstone.

The Scots Bay Formation is a small isolated section on the North Mountain and on the south shore of Scots Bay. The bedrock in the Scots Bay Formation consists of fluvial to lacustrine red and green calcareous siltstone, silicified limestone, thick bedded chert, agate, stromatolitic limestone, and brown layered chert. Scots Bay is frequented by rock collectors and local artists who use the rocks to make jewelry.

North Mountain basalts host a variety of semi-precious rocks and minerals and rock collectors come from all over the world to collect unique mineral specimens. Among those collected are zeolites, jasper, calcite, agate, and amethyst. Other minerals that are found in the basalts are celadonite, magnetite, hematite, goethite, apophyllite, native copper, and quartz.

A unique aspect about mineral collection along the Bay of Fundy is the shape of the bay, wide at one end, reaching a narrow point at the other, creating the highest tides in the world at 12 to 15 metres on average. These tides create a weathering effect on the basalts of the North Mountain, exposing new areas for mineral collection twice daily.

There are two adits – horizontal entrances to underground mines or erosional cliff faces due to freezing and thawing – one in Margaretsville and one in Freeport, both on the Bay of Fundy shore, which produced native copper. Clay was produced from a small shaft in the Slokum Brook area and iron was produced in Centreville on Digby Neck.

There are several known copper and iron mineral occurrences in the western half of the ecodistrict. These past production and exploration areas are current exploration targets for prospectors and exploration companies.

There are a few isolated peat bogs, located on the western end of the ecodistrict.

The basalt at the base of the North Mountain is a thick flow (40 to 140 m) and has a columnar structure which is typically hexagonal in shape and forms long vertical columns during the cooling and contracting process in lava. The balancing rock on Brier Island is an example of a fractured piece of columnar basalt. This flow unit is fairly uniform and does not have the mineralization which is observed in the middle flow units.

Several faults are located on Digby Neck. They are a series of parallel and oblique short faults that offset the basalt ridge of North Mountain along its length. These occur in Digby Gut, on Digby Neck at Gullivers Cove and between Long and Brier islands and are interpreted to be inactive.
Most of these faults are associated with offsets in the trend of North Mountain. Later erosion appears to have removed considerable basalt from these offsets and has resulted in the location of coves and/or flooded deep marine passages between the islands on Digby Neck.

Exploration activity within the ecodistrict is generally low with the majority of activity centred on exploration for zeolite mineral development. There are four known abandoned mine openings within 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.

Exposed coastal bedrock separates the waters of the Bay of Fundy from residences, farmland, and forests in the North Mountain Ecodistrict.

Parks and Recreation / Protected Areas

The North Mountain Ecodistrict contains several day-use provincial parks and two camping parks where visitors can enjoy their natural environment and the views. Due to its elevation, spectacular views of the Annapolis Valley and the Bay of Fundy are values assigned to this ecodistrict.

Parks, recreation, and protected area properties are described in the following categories:

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

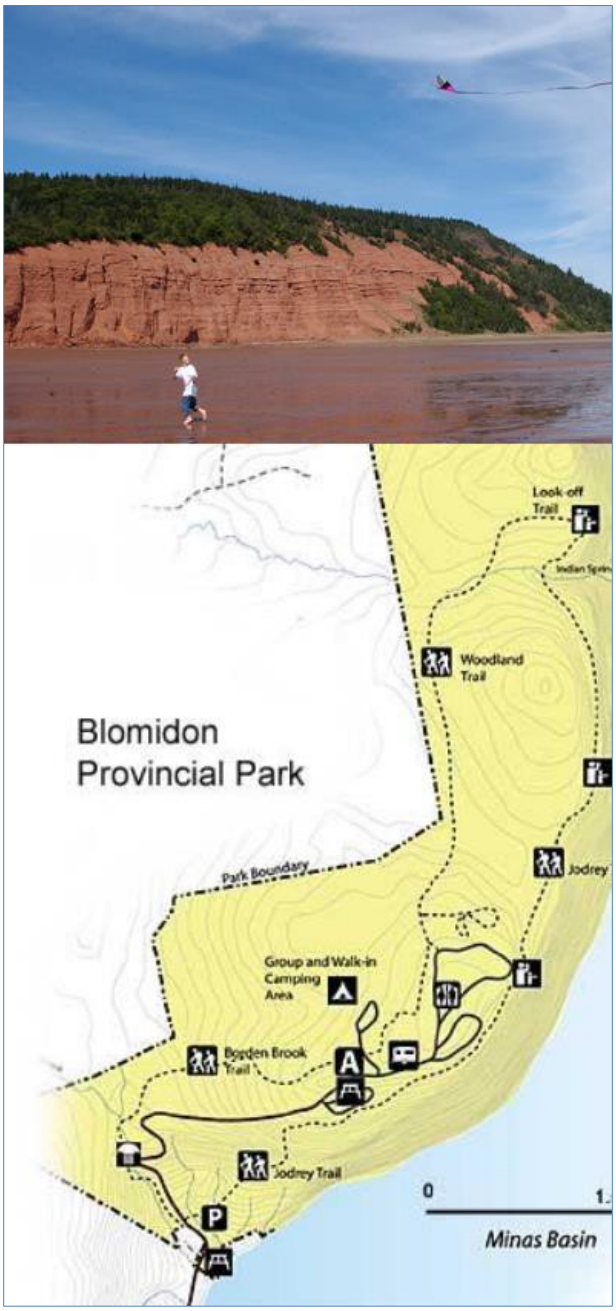
Included are:

Annapolis Basin Look Off Provincial Park	1.6 hectares
Blomidon Provincial Park	835.2 hectares
Central Grove Provincial Park	12.6 hectares
Lake Midway Provincial Park	1.7 hectares
Valleyview Provincial Park	57.1 hectares

Category B consists of other properties with protection value or with a level of commitment to protect. This category includes non-designated but operational parks, non-designated nature reserves, and properties with some legal obligation or ministerial commitment to protection.

Included are:

Baxters Harbour	0.1 hectares
Blomidon	15.7 hectares
Blomidon Look Off	0.1 hectares
Cape Split	289.1 hectares
Cottage Cove	0.5 hectares
Scots Bay North	0.3 hectares
Scots Bay South	9.6 hectares



Blomidon Provincial Park is well known for its high cliffs, high tides, spectacular views, and walking trails.

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 North Mountain 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 North Mountain 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 silvicultural systems.

Wetlands and Aquatic Habitat

In addition to providing important wildlife habitat, wetlands perform vital environmental functions, such as flood and erosion control, groundwater recharge, and water filtration. Wetlands data are contained in DNR's GIS wetland layer, collected primarily through aerial photography interpretation. Wetlands of 0.2 hectares or more in size that are visible on aerial photos are included.

Along the length of the North Mountain Ecodistrict, streams carry water either northwest to the Bay of Fundy or down steeper slopes southeast toward the floor of the Annapolis Valley. At the southwestern end of the ecodistrict, streams also drain into the Annapolis Basin and St. Marys Bay. Compared to other ecodistricts in western Nova Scotia, North Mountain has relatively few lakes and wetlands.

Bogs are the most abundant wetland type in the ecodistrict at 56% of wetland area, while fens and shrub swamps are less common (17% and 13%, respectively). Unlike fens and shrub swamps, bogs receive their water primarily from rainfall so they are not closely associated with watercourses in the ecodistrict, except where streams carry draining water away. Other wetland types are uncommon in the ecodistrict, each making up 5% or less of total wetland area.

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

The management of fish resources in Nova Scotia is shared between the federal Department of Fisheries and Oceans and the Nova Scotia Department of Fisheries and Aquaculture. While the

Nova Scotia Department of Natural Resources does not have direct responsibilities related to fish, there is some overlap with regard to the management of aquatic habitat of fish and other wildlife.

Terrestrial Habitat

Forested wildlife habitat in the North Mountain Ecodistrict has a high proportion of young intolerant hardwood and mixedwood species. A range of predictable wildlife species, associated with various forest stand compositions mixed with agricultural land, are expected to occur in these habitats.

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

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

Much of the forest in the North Mountain Ecodistrict is currently in the early development stages, so food availability for deer is relatively high in young stands of intolerant hardwood and mixedwood, especially in regenerating woods that have recently been harvested. Throughout much of the North Mountain, stands of mature softwood are widely scattered and, at times, lacking in some areas, so the degree of canopy closure needed for adequate winter cover may be limiting in some cases. In the southwestern part of the ecodistrict, particularly on Digby Neck, there is more continuity of mature softwood stands, but agricultural land is less common.

While there is a potential for good white-tailed deer habitat in this ecodistrict, actual deer numbers and distribution are dependent on the arrangement of required habitat components. Some deer may need to move around seasonally and could even be moving between this ecodistrict and the Annapolis Valley.

Ideal habitat for snowshoe hare has low dense ground cover, shrubs, and regenerating hardwoods, and is near open areas that provide access to succulent green plants in summer. The best forest habitats that can potentially support large populations of snowshoe hare are early successional hardwood and mixedwood stands.

Snowshoe hare usually do well in young forests.

In the North Mountain Ecodistrict, snowshoe hare do well in the young intolerant hardwood and mixedwood stands, especially where these are near forest openings and agricultural lands.

The abundance of snowshoe hare and deer in the North Mountain Ecodistrict can be limited by the apparent absence of wooded swamps, with their rich soils and understory of shrubs and other food plants. Like deer, snowshoe hare occur throughout the ecodistrict, but abundance depends on the

arrangement of suitable habitat features. Their distribution and abundance will in turn influence that of their predators, mainly bobcats and coyotes.

Birds of prey (raptors) are high trophic level feeders which occupy large territories and are far less abundant than their prey species; because they are relatively few in number, raptor species are of concern from a conservation standpoint. Identifying existing or suspected nest site locations is one important aspect of raptor conservation. Information on nest locations is accumulated opportunistically, and because of their transitory nature, this data requires regular updating.


Red-tailed hawks are among the raptors found in the North Mountain Ecodistrict.

Raptor habitat requirements vary, but most need large mature trees for nesting. Because the red-tailed hawk is a species that hunts a variety of prey in areas of mixed open and wooded habitat, North Mountain offers excellent conditions if there are suitable nest trees near feeding areas.

Given the amount of deciduous and mixed forest in the ecodistrict, broad-winged hawks would also be expected to nest here. Goshawks are more specific in their nesting requirements, and are less common because of their preference for old mature forests where they need large areas of continuous forested land to hunt birds on the wing. Goshawks require large old growth trees (usually hardwoods) for nesting. There are reports of goshawks nesting in this ecodistrict.

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
- 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 landscape 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 disturbance agents in the ecodistrict are primarily associated with hurricanes. Stands of fire origin are uncommon.

Insect defoliation has not been a significant factor in forest disturbance. Yellow birch dieback of the 1940s has been a significant agent in the North Mountain forest.

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

North Mountain – 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 North Mountain Ecodistrict – one matrix, four patches, and a combination patch and 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.

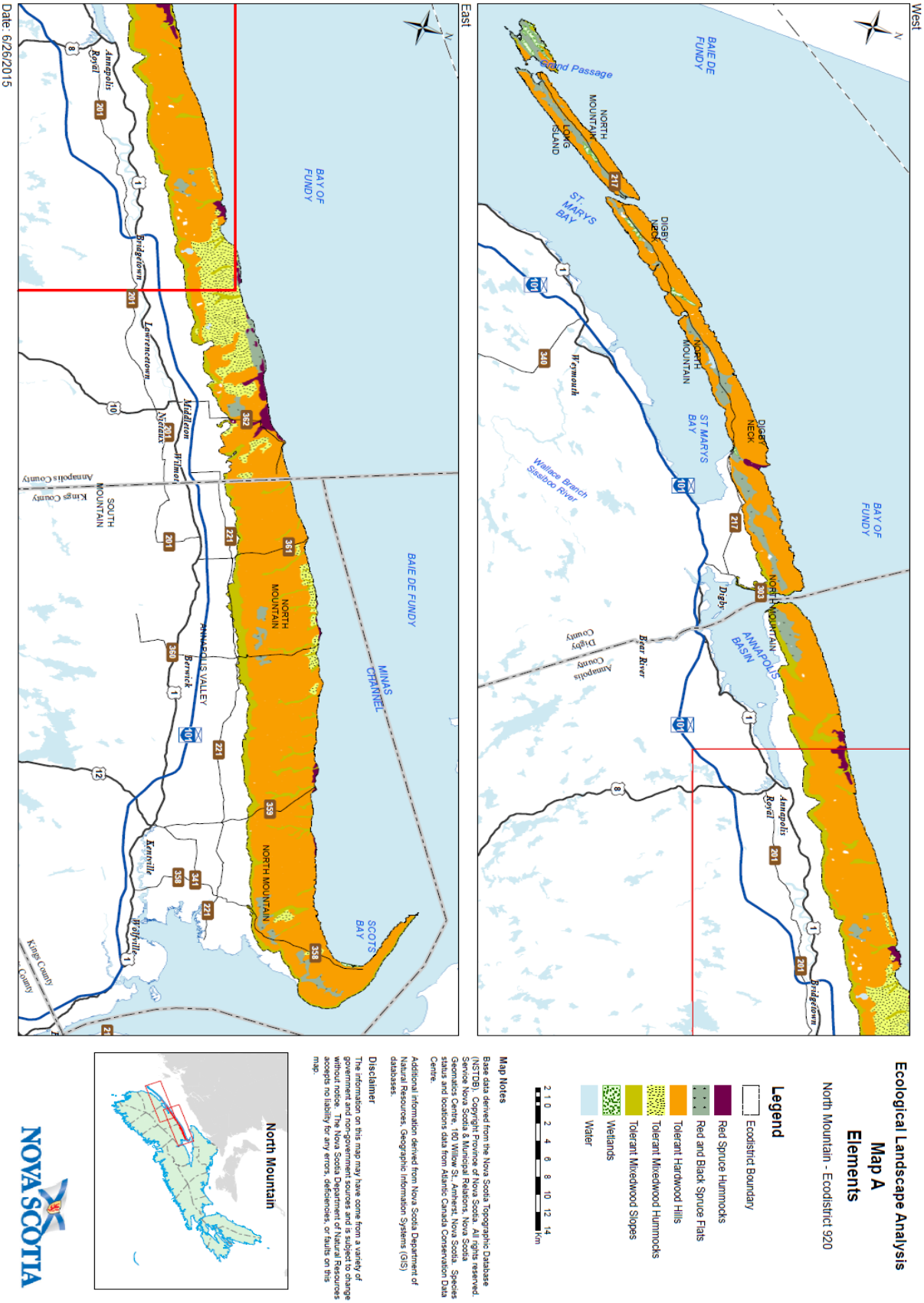
Tolerant Hardwood Hills is the matrix element, representing nearly 73% of the ecodistrict. This element naturally supports a hardwood forest of shade-tolerant species, such as sugar maple, yellow birch, and beech.

Tolerant Mixedwood Hummocks, representing nearly 8% of the ecodistrict, is the largest patch element. Shade loving mixedwoods of red spruce, hemlock, yellow birch, and sugar maple are the climax forest. The remaining three patch elements, in order of size, are **Red and Black Spruce Flats**, **Red Spruce Hummocks**, and **Wetlands**.

Tolerant Mixedwood Slopes is a combination patch and corridor element found on steep slopes and on the escarpment overlooking the Annapolis Valley.

Steep slopes of the North Mountain Ecodistrict affect the types of trees that grow there.

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 North Mountain		
Element	**Size (Hectares)**	**Element Description**
Tolerant Hardwood Hills (Matrix)	71,579 72.7%	Tolerant Hardwood Hills is a matrix-level element in this ecodistrict occurs on the well-drained medium-textured soils derived from basalt till. These productive soils, primarily on the hummocky terrain of the north-facing slopes of the North Mountain, yield forest stands comprising shade-tolerant hardwood species such as sugar maple, yellow birch, beech, ironwood, and white ash. However, Digby Neck, with similar soils on hillier terrain, is exposed to the Bay of Fundy and supports a coniferous coastal-like forest of balsam fir, white spruce, and black spruce. But w here the slopes are sheltered and/or south-facing the tolerant hardwoods return. When this element occurs on crests and upper slope positions, and where soils may be coarse-textured, shallow to bedrock, and subsequently drier, beech may be more dominant (scattered white pine is also possible). As soil moisture progressively increases toward middle and lower slope positions, or where the slope terraces, yellow birch, and white ash become more common in mixedwoods with red spruce.
Tolerant Mixedwood Hummocks (Patch)	7,517 7.6%	Tolerant Mixedwood Hummocks is a patch element associated with fine-textured well- to moderately well-drained soils on gently hummocky relief. This element can at times have a similar late successional forest as would be found on the Red and Black Spruce Flats element. These productive soils with clay content occur primarily between Port George and Hampton and are scattered elsewhere on the North Mountain. Regardless of slope position, late successional forests generally comprise shade-tolerant hardwood species such as sugar maple, yellow birch, hemlock, and red spruce. Earlier successional stages will have forests comprised of red maple, white birch, balsam fir, and aspens. With progressively poorer drainage on the level terrain between hummocks, red map le, white ash, and balsam fir dominate the forest vegetation. Natural disturbances are infrequent but stands may not be given enough time between disturbances to develop uneven-aged forests similar to those that would occur on the better-drained soils in this ecodistrict. This element has been extensively converted to other land uses such as agriculture. Areas of abandoned farmland revert to forests of white spruce.
Red and Black Spruce Flats (Patch)	6,773 6.9%	This element occurs on the moist rich soils of the North Mountain producing a tolerant softwood forest dominated by red spruce. Yellow birch and red maple can be significant components creating mixedwood communities. Lesser vegetation in this element can be diverse with uncommon species such as Canada yew, cedar, and several herbs indicative of richer soils. This element is similar to the patch-level Tolerant Mixedwood Hummocks on the better-drained sites but supports a higher percentage of pure softwood forests. Tolerant hardwood species are unusual although they may be found on the deeper better-drained soils. Balsam fir and red maple follow infrequent stand-level natural disturbances such as windthrow. With progressively poorer drainage on the level terrain, w et forests of balsam fir, black spruce, tamarack, red maple, white ash, and alders dominate the forest vegetation.

Table 5a – Elements Within North Mountain		
Element	**Size (Hectares)**	**Element Description**
Red Spruce Hummocks (Patch)	1,560 1.6%	Red Spruce Hummocks is a small patch element occurring along the coastline of the Bay of Fundy. It occurs on well-drained coarse-textured soils over wave-washed stratified gravel derived mainly from basaltic material. Forests are dominated by red spruce but mixedwoods with red spruce, yellow birch, red maple, and white spruce are prominent on the landscape. On headland sites where exposure to the Bay is severe, forests take on a coastal appearance and include white spruce and balsam fir. Away from this exposure, the red spruce forest may resemble the coastal re d spruce forest common onCape Chignecto in the Parrsboro Shore Ecodistrict. Following infrequent stand-level natural disturbances, such as windthrow, early successional forests may include shade-intolerant hardwoods, such as red maple, white birch, and aspen.
Wetlands (Patch)	533 0.5%	The wetlands element comprises bogs, fens, swamps, and poorly drained areas. This element may occur as a large wetland complex associated with streams and lakes; as narrow linear communities associated with flow accumulations and small streams; as a community of hydrophytic vegetation associated with level terrain where drainage is impeded; or as a depression in the landscape where water remains in excess year round. The North Mountain Ecodistrict has 0.5% of the area in wetlands and most of the larger wetlands occur on Digby Neck. Smaller disjoint wetlands are often embedded within other elements, especially Red and Black Spruce Flats, and where level terrain occurs on the gentle slopes. For the most part, sites are underlain by poorly drained mineral soils or organic soils derived from peat (sphagnum mosses) or sedges.
Tolerant Mixedwood Slopes (Patch/Corridor)	10,539 10.7%	Tolerant Mixedwood Slopes occurs as one of two linear, patch-level elements in this ecodistrict. Along the streams that originate at the apex of the North Mountain are tolerant mixedwood forests comprising primarily hemlock, red spruce, and yellow birch, with scattered sugar maple, beech, and white pine. However, depending on slope and soil conditions, forests of pure softwood species may prevail. For example, very steep upper slopes and lower slopes are usually favourable to hemlock. Soils are mostly well-drained, of variable textures, but could be drier and rapidly drained where shallow to bedrock. At the toe slope position, soils are often moister and richer and other species such as white ash and ironwood may occur along with understory plants indicative of moist-rich conditions. The other linear, patch-level element is the steep slopes of the Annapolis Valley-facing escarpment along the North Mountain. Soils are usually shallow over bedrock and/or loose sediments creating excessivelywell-drained conditions. Occasionally talus deposits occur where soils are poorly developed and also excessively drained. However, if moisture is available, the inherent fertility of the underlying basalt bedrock creates opportunities for ironwood, white ash, and rich-site loving plants.
Total	**98,501***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in North Mountain

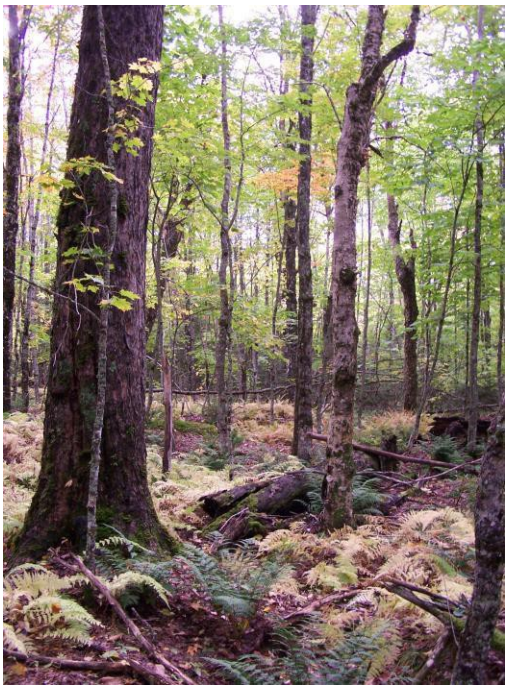
Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Red and Black Spruce Flats	IH4, IH6, MW4, MW5	46	MW2, SH8, SH9	22	**SH6, SP7**	19
Red Spruce Hummocks	IH4, IH6, MW4, MW5	79	MW2, SH7, SH8	12	**SH5**, SH6	3
Tolerant Mixedwood Hummocks	OF1, IH4, IH6	76	MW2, MW4, MW5, SH5, SH6, SH8	11	TH1, TH2, TH5, **MW1,** MW3	3
Tolerant Hardwood Hills	IH4, IH6, OF1	48	IH7, TH7, TH8	25	**TH1, TH2,** TH3, TH4, TH5, (**CO3**)	18
Tolerant Mixedwood Slopes	IH4, IH6	31	MW2, MW4, MW5, SH5, SH8	29	**MW1,** MW3, SH3	35
Wetlands	WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8, SP7					

View forest groups and vegetation types at
http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by DNR are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (KA), Mixedw ood (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 / Mountain ash / Foxberry (CO3) is a late successional vegetation type found in the Tolerant Hardwood Hills matrix element.



Sugar maple / Hay-scented fern (TH1) is a late successional vegetation type found in the Tolerant Mixedwood Hummocks patch element.

Trembling aspen / Wild raisin / Bunchberry (IH4) is an early successional vegetation type found in the Red and Black Spruce Flats patch element.

Balsam fir / Wood fern / Schreber's moss (SH8) is a mid-successional vegetation type found in the Red Spruce Hummocks patch element.

Red spruce – Balsam fir / Cinnamon fern / Sphagnum (WC5) is one of two wet red spruce forests in Nova Scotia found in the Wetlands patch element.

Hemlock – Yellow birch / Evergreen wood fern (MW 3) is a late successional vegetation type found in the Tolerant Mixedw ood Slopes element.

Landscape Composition and Objectives

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

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

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

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

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

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

The two most prominent natural disturbance regimes in the North Mountain Ecodistrict are gap and infrequent.

The gap disturbance regime is a feature of a tolerant mixedwood or hardwood climax covertype. This regime favours the development of an uneven-aged structure, shade-tolerant species, and formation of old growth conditions. Mortality is commonly by animal or insect predation, disease, lightning, blowdown, or old age where individual trees or small groups of trees across the landscape succumb to mortality. Regeneration occurs under openings (gaps) where mortality has occurred.

Tolerant species regenerate in the openings. As gaps in the canopy enlarge, regeneration is released into the canopy and shares growing space with the surviving old growth trees. Major stand-initiating events are very uncommon under this regime.

The infrequent natural disturbance regime occurs when the interval between stand-initiating disturbance events is longer than the longevity of the climax species. This disturbance regime is

associated with tolerant softwood covertypes (red spruce, white pine, and hemlock). Agents of disturbance are often hurricane, fire, and insects. If the interval between major disturbances is long enough, the area may take on old growth characteristics with multiple canopy layers.

Forest Composition

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

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

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

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

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

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

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

- early
- mid
- late

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

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

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

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

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

Forest Composition Objectives

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

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

Four hundred years of European settlement in the Acadian region has left insufficient natural landscape structure to confirm these ranges. Facing similar challenges, a comprehensive modeling approach was used by the Ontario Ministry of Natural Resources to support "range of variation" targets for natural disturbance regimes in the Great Lakes St. Lawrence region (http://www.ontario.ca/document/forest-management-great-lakes-and-st-lawrence-landscapes).

A full description of definitions and mapping of Nova Scotia's disturbance regimes is contained in the report "Mapping Nova Scotia's Natural Disturbance Regimes" available from the DNR website (http://novascotia.ca/natr/library/forestry/reports/NDRreport3.pdf).

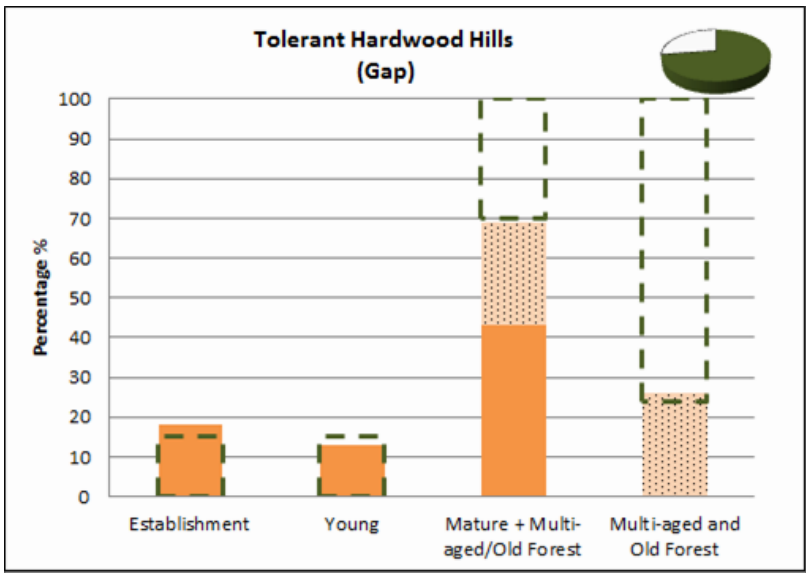
Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)				
Natural Disturbance Regime	**Development Class**			
	Forest Establishment	**Young Competing Forest**	**Mature Forest (including multi-aged and old forest)**	**Multi-aged and Old Forest**
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5 - 20%	>60% most in mid and late seral stages	>16%
Gap Replacement	0 - 15%	0 - 15%	>70% most in late seral stage	>24%

Table 6 indicates that for frequent stand- initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively even balance of early, mid, and late successional stands. At least 8% of the mature forest should be in the multi-aged and old forest class. The targets for the other disturbance regimes are shown in Table 6. Forest planning should strive to maintain composition within these targets and identify corrective and mitigating measures when outside these ranges.

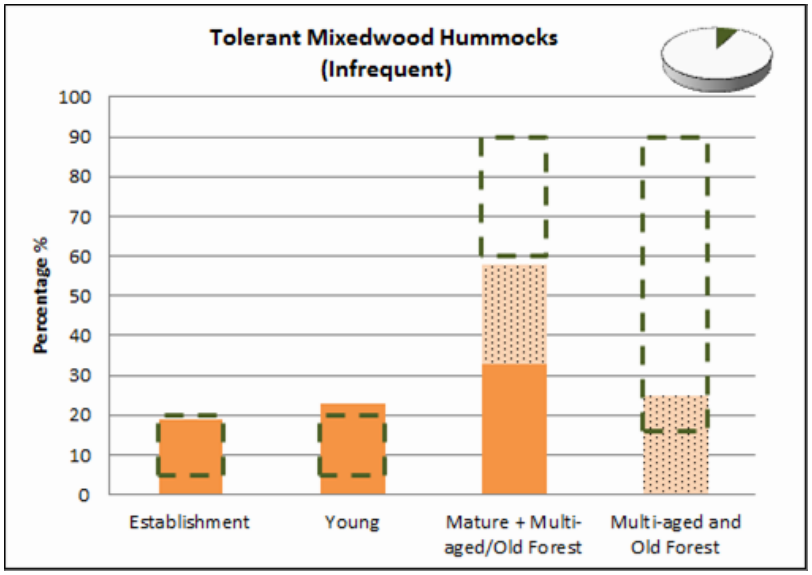
Development Class Targets by Element

The series of charts that follow combine data on development classes for each element with desired or target percentages, based on the type of natural disturbance regime. The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage of each development class at the time the original data was gathered. The dotted area in the mature class shows the amount of multi-aged and old forest area included. The coloured portion of the small pie chart in the corner of the graphic shows the relative size of the element within the ecodistrict.

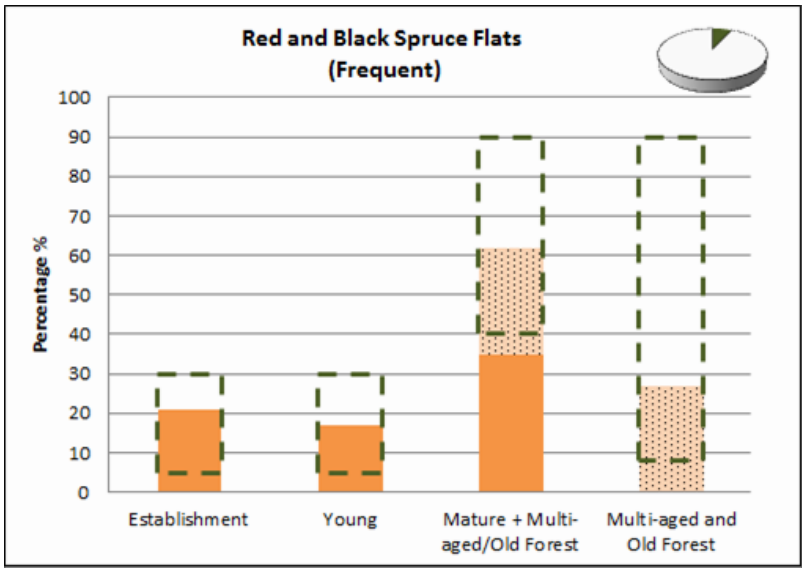
In **Tolerant Hardwood Hills,** composition is dominated by mature and multi-aged forests, which is appropriate for this element. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development, particularly in tolerant hardwood stands. Moist fertile slopes associated with this element will support nutrient-demanding species such as white ash.



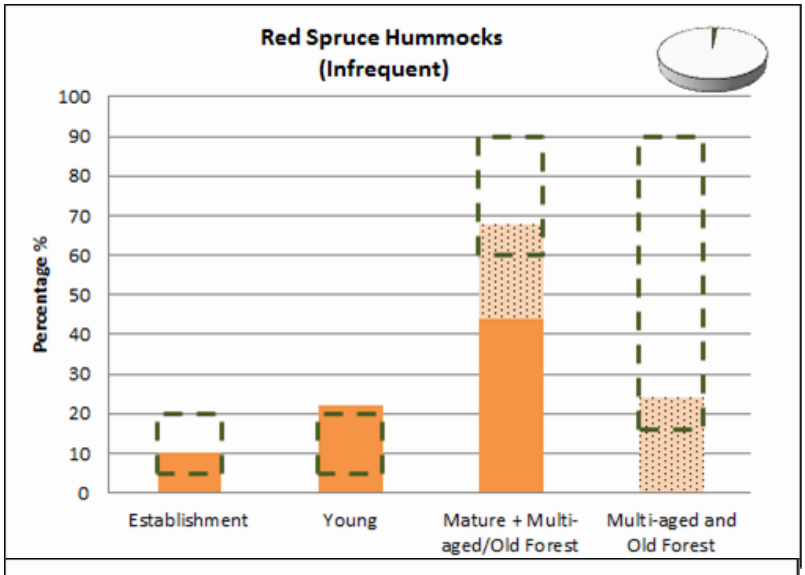
The **Tolerant Mixedwood Hummocks** element has a good balance of development classes, all within or close to the suggested ranges. Mature forests with a good representation of climax species should be encouraged to support connectivity functions. Extended rotations, natural regeneration, promotion of late seral species, and uneven-aged practices are most appropriate for infrequent natural disturbances.



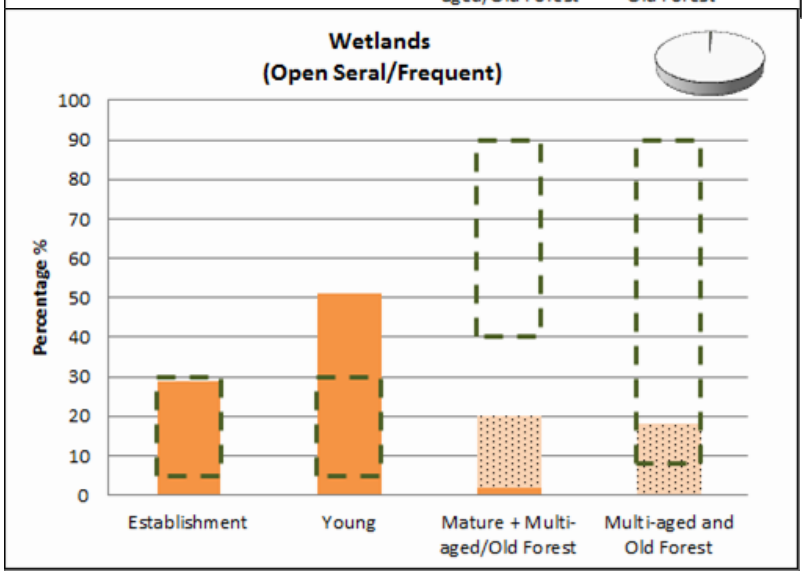
In **Red and Black Spruce Flats** there is a good balance of development classes. This element occurs on moist soils which increases the risk for windthrow if stands are partially harvested. Practices which enhance natural regeneration are preferred. Stand maturity is critical in terms of producing adequate seed for regeneration and should be considered when scheduling harvests. Even-aged forests are common.



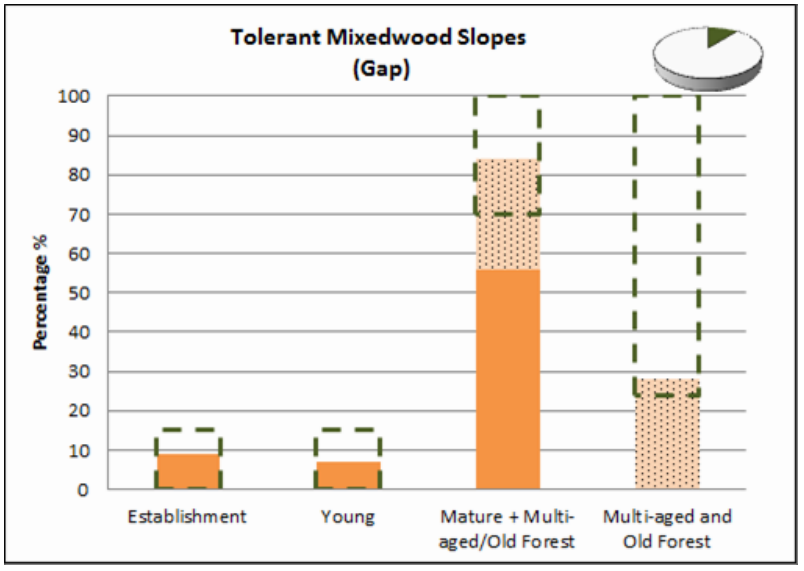
Composition of the **Red Spruce Hummocks** patch element has a slightly excessive young stage but otherwise is within targets. Pre-commercial thinning in the young and establishment stages will provide opportunities to restore climax species and increase diameter growth rates to hasten mature forest development. Mature stands can be maintained with extended rotations and uneven-aged management in sheltered sites.



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 classes may reflect height growth limitations in poor sites, as well as past harvesting. Some thinning opportunities may exist, as well as potential for small patch harvesting following natural boundaries.



In **Tolerant Mixedwood Slopes**, mature and multi-aged conditions dominate more than 80% of the forest, consistent with the desired composition for gap disturbance ecosystems. This condition enhances slope stability and provides mature habitat continuity. The small area of establishment and young forest will provide some diversity.



Summary of Parts 1 and 2

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

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

Glossary A: Terms in Parts 1 and 2

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

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

Ecosystem	A functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non- living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, pond, field, forest, or the earth's biosphere – but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, such as a forest ecosystem, old-growth ecosystem, or range ecosystem. Can also refer to units mapped in the DNR Ecological Land Classification system.
Element	A landscape ecosystem containing characteristic site conditions that support similar potential vegetation and successional processes. Elements were mapped by combining ecosections with similar climax vegetation and natural disturbance interpretations. Depending on their role in the ecosystem, elements may be described as matrix, patch or corridor.
Endangered species	A wildlife species facing imminent extirpation or extinction. A species listed as endangered under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal Species at Risk Act).
Even-aged	A forest, stand, or vegetation type in which relatively small age differences exist between individual trees. Typically results from stand- initiating disturbance.
Extinct species	A species that no longer exists. A species declared extinct under federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Extirpated species	A species that no longer exists in the wild in Nova Scotia but exists in the wild outside the province. A species declared extirpated under federal or Nova Scotia endangered species legislation (Nova Scotia Species at Risk Act or federal SARA).
Forest management	The practical application of scientific, economic, and social principles to the administration and working of a forest for specified objectives. Particularly, that branch of forestry concerned with the overall administrative, economic, legal, and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection, and forest regulation.
Frequent stand initiating	Disturbances usually occur more frequently than the average lifespan of the dominant species and are of sufficient intensity to destroy most of the existing trees, promoting a new forest within relatively short periods of time.

Gap replacement	An absence of stand-initiating disturbances supports the development of a dominant overstory that is sustained through dynamic processes of canopy gap formation, understory development, and overstory recruitment. Gap formation ranges from individual tree mortality to periodic gap formation events that are rarely of a stand- initiating intensity.
Habitat	The place where an organism lives and/or the conditions of that environment including the soil, vegetation, water, and food.
Impact assessment	A study of the potential future effects of resource development on other resources and on social, economic, and/or environmental conditions.
Infrequent stand initiating	The time between stand-initiating disturbances is usually longer than the average longevity of dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests.
Inherent conditions	Refers to the natural condition of ecosystems based on their enduring physical features. This is the potential condition expected in the absence of human influence.
Integrated Resource Management (IRM)	A decision-making process whereby all resources are identified, assessed, and compared before land use or resource management decisions are made. The decisions themselves, whether to approve a plan or carry out an action on the ground, may be either multiple or single use in a given area. The application of integrated resource management results in a regional mosaic of land uses and resource priorities which reflect the optimal allocation and scheduling of resource uses.
Land capability (LC)	LC values represent the maximum potential stand productivity (m^3/ha/yr) under natural conditions.
Landform	A landscape unit that denotes origin and shape, such as a floodplain, river terrace, or drumlin.
Landscape	An expanse of natural area, comprising landforms, land cover, habitats, and natural and human-made features that, taken together, form a composite. May range in scale from a few hectares to large tracts of many square kilometres in extent.
Matrix	A widespread vegetation forest community which dominates the landscape and forms the background in which other smaller scale communities (patches) occur. The most connected or continuous vegetation type within the landscape, typically the dominant element. (Matrix is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)

Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old forest. Mature forests include multi-aged and old forest. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes, and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old forest.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.
Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand- initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand- initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand- initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.
Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi- layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.

Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)
Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain, or standing water body.
Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms that are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened, and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as "species of special concern." A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).