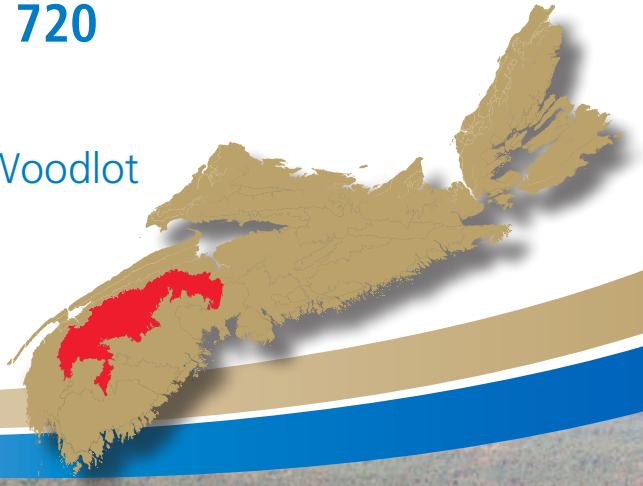
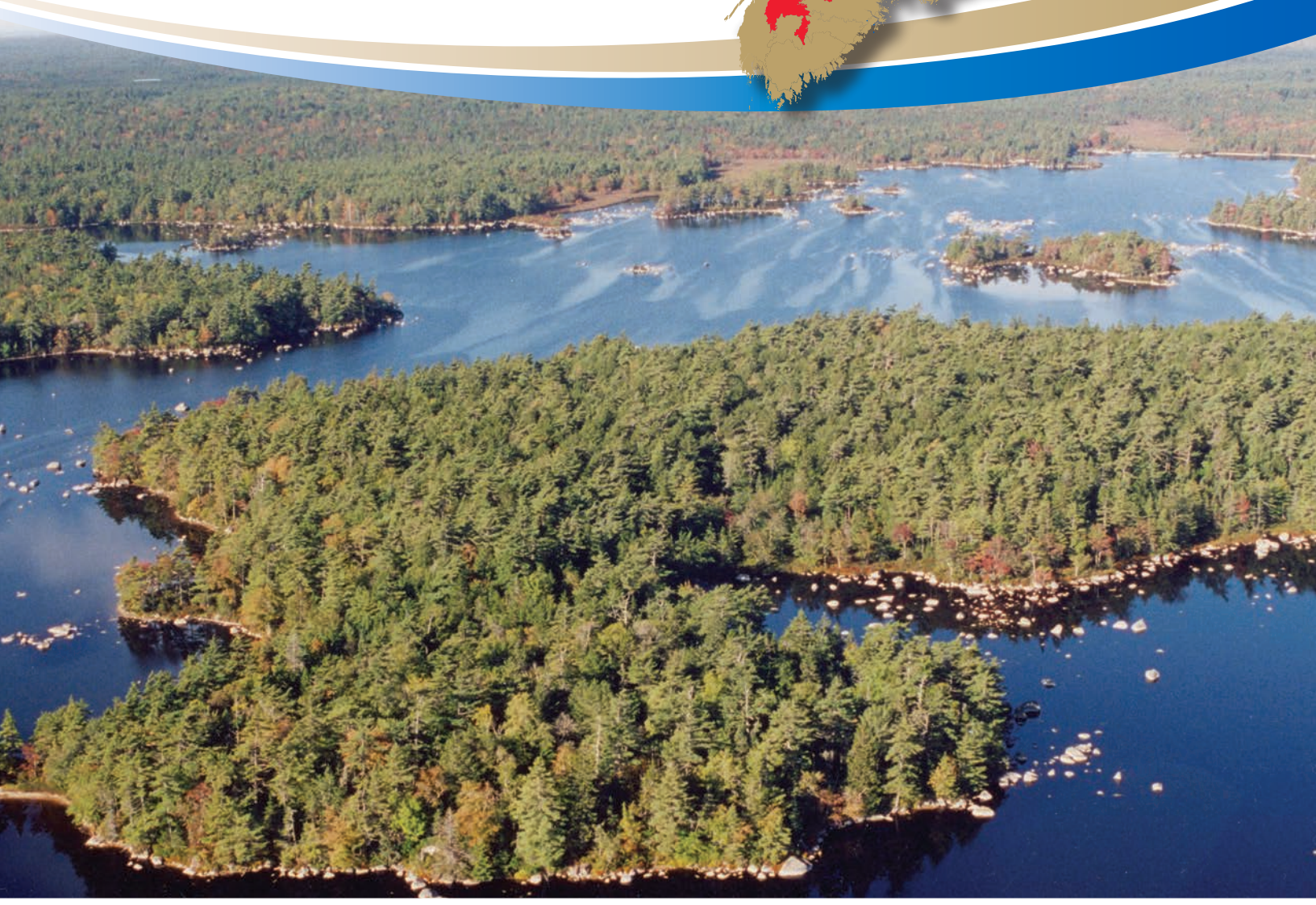
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS SOUTH MOUNTAIN ECODISTRICT 720

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





ELA 2015-720

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 720: South Mountain

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

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (2002) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting & silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads & 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 2015-720

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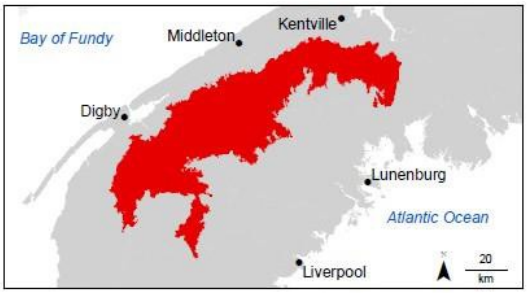


Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 720: **South Mountain**

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

This Ecological Landscape Analysis (ELA) provides detailed information on the forest and timber resources of the various landscape components of South Mountain Ecodistrict 720. 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.

South Mountain is one of the largest ecodistricts in the province, sprawling across nine counties, from Hants in the northeast to Yarmouth in the southwest, with an area of more than 455,000 hectares. The foundation for South Mountain, part of the Western Ecoregion, is a fairly homogenous land mass underlain by granite.

The ecodistrict extends from the headwaters of the Sissiboo River to Panuke Lake and includes some of the province's longest rivers, such as the Medway, Mersey, LaHave, Jordan, and Roseway. Larger lakes include Panuke, Paradise, Fisher, Aylesford, Fourth, Fifth, Mulgrave and Gaspereau. Some of these lakes have been developed for hydro power.

The climate features warm, early springs and warm, dry summers. Combined with coarse, shallow soils, this can create periods in the growing season where a lack of moisture is a problem. Winters are moderately mild, although if snow is going to accumulate in western Nova Scotia, it is most likely to do so in this ecodistrict due to the higher elevation.

The Acadian Forest is well represented, particularly with softwood species such as eastern hemlock, red spruce, and white pine, mainly occurring on sites with soils that are well-drained and of a sandy loam texture. Scattered throughout the ecodistrict, on the richer sites, will be hardwood climax forests of sugar maple, yellow birch, and beech, particularly on drumlins and the upper slopes of long hills.

Wetlands in the forms of bogs and streams or riverside fens can be found throughout the ecodistrict.

Abandoned farmland on drumlins tends to reforest with white pine.

Fire has played a dominant role in shaping the forests of this ecodistrict and fire species such as white pine, red pine, white birch and red oak are extensive. Continued efforts on fire suppression may allow later successional species of the Acadian Forest to become more common.

The ecodistrict provides habitat for several species of plants belonging to a group known as Atlantic Coastal Plain Flora. These rare plants became established in southwestern Nova Scotia as a result of a land bridge between the province and Massachusetts 10,000 to 14,000 years ago. Sea level was likely about 110 metres lower than today.

Raptors that nest in South Mountain include bald eagles, ospreys, and hawks.

Endangered mainland moose occur in this ecodistrict, primarily as part of the remnant population of mainland moose found in the Tobeatic Wilderness Area. The southern flying squirrel has also been found in the ecodisrict.

Both northern and southern flying squirrels occur in the older forests of this ecodistrict. (*Kiyono Katsumata photo*)

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 profile identified and mapped nine key landscape elements – one dominant matrix element, seven smaller patch elements, and a corridor element – in South Mountain.

Red and Black Spruce Hummocks is the matrix element, covering more than 60% of the ecodistrict. The climax forest is dominated by late successional shade-tolerant softwoods, such as red spruce and eastern hemlock, along with white pine.

The largest patch element is **Spruce Hemlock Pine Hummocks and Hills.** This element supports a climax forest of red spruce, eastern hemlock and white pine on the slightly moister sites, with white pine, red oak and red pine on the drier hilltops.

Other patch elements, in order of size, are **Spruce Pine Flats, Tolerant Mixedwood Drumlins, Wetlands, Tolerant Mixedwood Hummocks, Tolerant Hardwood Hills,** and **Spruce Pine Hummocks**.

Valley Corridors is a linear corridor element found mainly along some of the ecodistrict's major waterways. Corridors are extremely important for biodiversity and ecosystem functioning.

Forest Ecosystem Management

For South 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, 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 South Mountain Ecodistrict 720. Resources and their components include the natural elements that make up the landscape and may affect functions like connectivity – how a landscape enables or impedes movement of resources, such as water and animals – as well as conditions of forest composition, road density, and land use intensity.

Only brief summaries are presented for other land values, including minerals, energy and geology, water resources, parks and protected areas, wildlife and wildlife habitat. These summaries are included in the document to present the range of land values that must be balanced during the design stage of the land management process and are not intended to be exhaustive treatments of the respective land values. Where possible, the reader will be referred to additional sources for detailed information.

Application

The data in this ELA does not represent current inventory, but instead provides baseline conditions for the time when the report was researched, which in the case of the South 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 South 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

South Mountain is the largest of eight ecodistricts in the Western Ecoregion, covering about 455,000 hectares, including water. This sprawling ecodistrict covers parts of nine counties and borders many other ecodistricts, including Clare 730, Western Barrens 770, Rossignol 750, LaHave Drumlins 740, St. Margarets Bay 780, Rawdon / Wittenburg Hills 410, Central Lowlands 630, and Valley Slope 710.

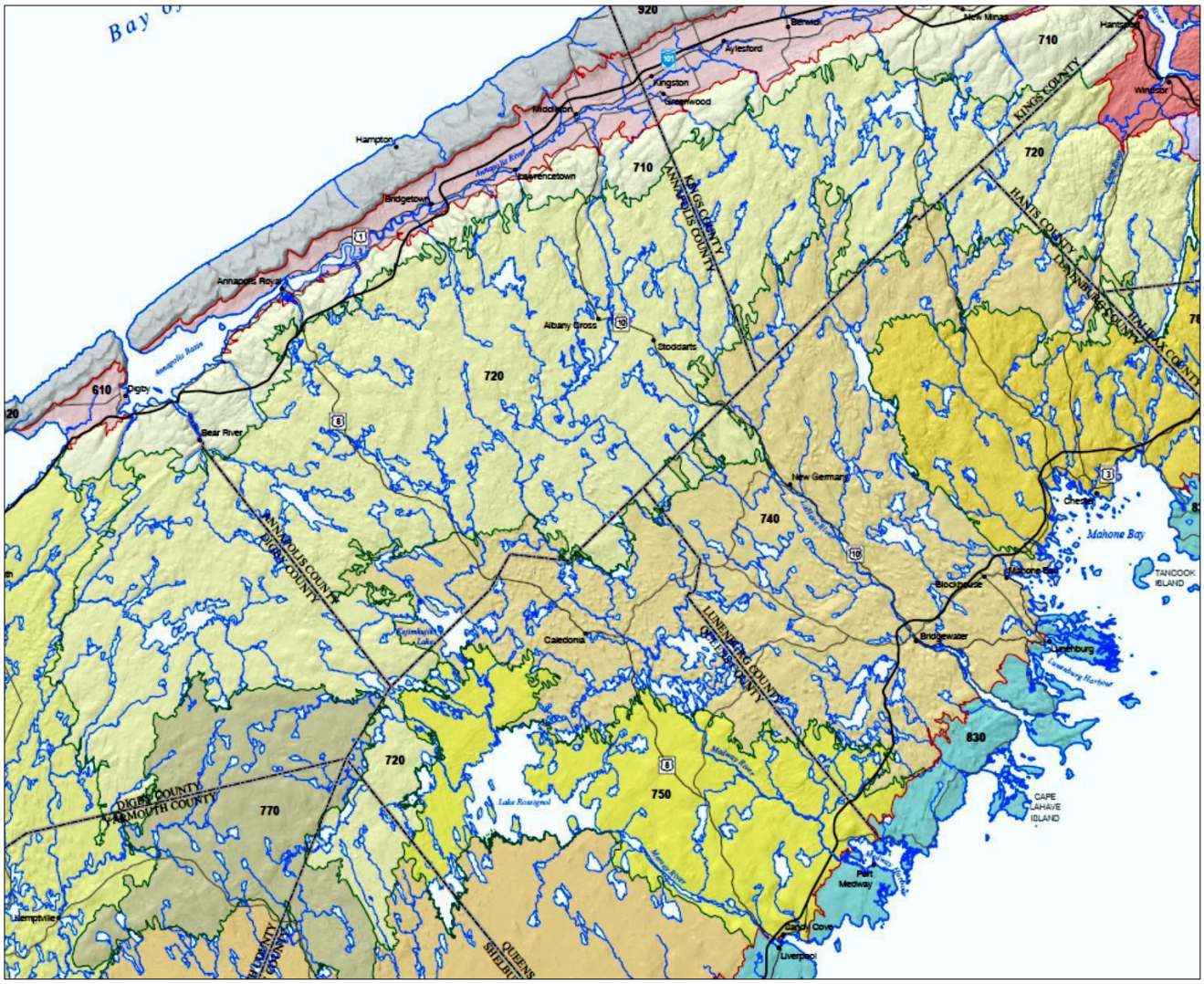
South Mountain is a fairly uniform land mass characterized by granite bedrock. Topography is often low, rounded hills or slight ridges which rise only a small distance above the general landscape. Broad, shallow depressions are also common. The occasional higher hill also occurs.

About 7.5% of the ecodistrict is water. Headwaters of some of the longer river systems can be found here, including the Sissiboo, Medway, Mersey, LaHave, Jordan and Roseway. Wetlands in the forms of bogs and streams or riverside fens can be found and are more common in western portions of the ecodistrict.

In western Nova Scotia, the highest elevations of 200 to 250 metres above sea level are found within the ecodistrict in an area stretching from Paradise Lake to Gaspereau Lake.

Soils have developed from granite till and are often well-drained, coarse sandy loams. Soils are generally shallow, stony and dry. The landscape is dotted with large, granite boulders which can restrict forest operations and travel. Stocking of trees is also impacted. In some cases, granite outcrops or bare ledges are prominent. Drumlins are scattered throughout the ecodistrict but are a common occurrence in the vicinity of Fisher Lake, Annapolis County.

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



The South Mountain Ecodistrict 720, shown in the ash brown, is one of the largest in the province, stretching from Yarmouth County in the west to Hants County in the east. (From Ecodistricts of Nova Scotia map 2007)

Land Area

South Mountain is one of eight ecodistricts within the Western Ecoregion.

The South Mountain Ecodistrict is predominately rural with the majority of the land held in private ownership. *This has changed, as shown by italicized information in Table 1.*

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

Ownership	Area** (hectares)	Percent of Total Area
Provincial Crown land	127,577	28
Federal land	14,034	3.1
Aboriginal land	1,002	0.2
Private	278,177	61.1
Other (Includes inland water bodies and transportation corridors)	34,379	7.6
Total	**455,169**	**100**

*Note: Figures may vary slightly from table to table because of rounding, averaging, and overlapping of categories and other factors. ***Major changes in land ownership occurred in 2013, reflecting the province's purchase of former Bowater Mersey Paper Company Limited lands. Provincial Crown land increased to 243,066 hectares, representing 53% of total area. Private and other lands decreased to 212,558 hectares, representing 47% of total area.*

Crown land is concentrated around the Cloud Lake Wilderness Area in the central part of the ecodistrict and in the western end of the ecodistrict as part of the Tobeatic Wilderness Area. Scattered inholdings of Crown land occur outside these areas.

Aboriginal lands are located at Bear River on the western boundary, New Ross on the ecodistrict's southern boundary and on its eastern boundary at St. Croix. Federally owned land includes a portion of Kejimkujik National Park.

IRM Classification for Crown Lands

The Integrated Resource Management (IRM) classification for Crown lands was developed through a public consultation process of 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	48,228	37.8
C2 – Multiple and Adaptive Use	34,671	27.2
C3 – Protected and Limited Use	44,433	34.8
Unclassified	245	0.2
Total	**127,577**	**100**

Much of the former CN Rail Line that ran from Nictaux to Bridgewater is located in the ecodistrict. The long-term plan for this land is trail development and the line is under a management agreement with the South Shore Annapolis Valley Recreational Trail Association.

There are a number of campsite leases on Crown land throughout South Mountain. No new campsite issues are being leased.

Forests

Within the South Mountain Ecodistrict there are 455,170 hectares of land (Table 3). Approximately 85% (387,671 ha) is forested.

The current forest contains 188,260 hectares of softwood covertype (stands with more than 75% softwood). This accounts for a little less than half of the forested area. Tolerant softwoods (red spruce, white pine, hemlock) occur on well-drained, loamy sites. Imperfectly drained sites are dominated by black spruce, with black spruce and larch on the wettest sites. White pine and red pine with black spruce are present on shallow, rapidly drained coarse-textured soils.

Table 3 – Area Distribution by Land Category for All Owners		
Category	**Hectares**	**Percent**
Forested	387,827	85.2
Wetland	27,184	6
Agriculture	655	0.1
Barrens	1,654	0.4
Urban	1,311	0.3
Road, Trail, Utility	776	0.2
Other	35,763	7.9
Total	**455,170**	**100**

Mixedwood covertype (120,968 ha, or 31% of the forested area) is often shade-tolerant softwoods along with intolerant hardwoods, usually red maple. At times, more tolerant hardwoods such as sugar maple, yellow birch, beech, and red oak occur with the softwoods.

The hardwood covertype (>75% hardwood composition) is largely shade-intolerant species (red maple, white birch).

Fall in South Mountain produces a wonderful array of colours from the many hardwoods in the ecodistrict.

Tolerant hardwoods sometimes occur on drumlins and upper slopes of hills. Oak is often present on sites with a history of fire.

Table 4 illustrates the land capability in the ecodistrict for forestry. Much of the land base has good potential for growing trees, with 303,479 hectares having a site capability of 5 or greater.

The average Land Capability(LC) of forested land in this ecodistrict is estimated to be 5 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	9,289	2.4
3	27,638	7.1
4	52,435	13.5
5	175,725	45.4
6	112,492	29
7 or more	10,248	2.6
Total	**387,827**	**100**

*Based on growth rating for softwood species.

Water Resources

About 7.5% of the ecodistrict is water. Headwaters of some of the longer river systems can be found here, including the Sissiboo, Medway, Mersey, LaHave, Jordan, and Roseway. The Bear River, Nictaux River, and several of the streams that feed into the Annapolis River have their headwaters here as well. Wetlands in the forms of bogs and streams or riverside fens can be found and are more common in western portions of the ecodistrict. Large granite boulders can be seen around and within the shallow lakes of the district.

Most of the major rivers have a series of dams on them that are controlled by Nova Scotia Power. NS Power may own the submerged land or have flowage rights for the land that was flooded when the dams were installed.

Some of the larger lakes include Panuke, Paradise, Fisher, Aylesford, Fourth, Fifth, Mulgrave, and Gaspereau. Some of these lakes have flowage areas as they have been developed for hydro power.

Past glacial history has helped form a landscape of numerous small streams with irregular drainage patterns. Water supply areas for Cornwallis, Lawrencetown and Kentville are all within the ecodistrict's northern boundary.

Lakes along the Medway River are among the water resources in the South Mountain Ecodistrict.

Minerals, Energy and Geology

This ecodistrict encompasses the geological formation known as the South Mountain Batholith. The batholith consists of granitic rocks that are Late Devonian in age (360 to 380 million years ago, and abbreviated as Ma) and account for 95% of the ecodistrict. A few small outliers of carboniferous rocks from the Windsor Group (Early Carboniferous, 340 to 330 Ma) and a few small sections of Meguma Group (Cambrian to Ordovician in age, 540 to 480 Ma) occur along the margins of this ecodistrict and account for the remaining 5% of the ecodistrict.

The Meguma Group is divided into the Goldenville Formation and overlying Halifax Formation. The Goldenville Formation comprises varying amounts of metasandstone and metasiltstone and is where the many gold occurrences and deposits are found in Nova Scotia. The Halifax Formation comprises black to grey to rust-brown slate with thin beds and lenses of minor black metasiltstone. The Windsor Group rocks are made up of marine sediments and are an important source rock for salt, limestone, gypsum and to a lesser extent, base metals such as lead and zinc.

The South Mountain Batholith is the largest granitoid batholith in the Appalachian orogeny (the process of mountain making), spanning an area of approximately 7,300 square kilometres. The unique mineralization associated with the granitic plutons of the South Mountain Batholith and the contact margins of the Meguma Group and Windsor Group are excellent targets for future exploration and potential development. Mineralization associated with the batholith consists of

polymetallic mineral deposits with tin, tungsten, uranium, molybdenum, arsenic, fluorite, copper, and zinc associations.

Current exploration activity within the ecodistrict is modest with the majority of activity centered on early stage exploration. Past exploration in this ecodistrict was extensive and at one time, a large percentage of the ecodistrict was held under mineral exploration licenses for uranium, tin, manganese, and rare earth metals.

In the New Ross area, 1,258 tons of manganese was produced from 1912 until 1921 and 4,200 tons of tin was produced in 1907. These past production and exploration areas are current exploration targets for prospectors and exploration companies.

There are a few abandoned mine openings associated with the past mining activities in the New Ross area. The mine openings are located on both Crown and private lands and caution should be used when walking or working in this area.

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.

The surficial geology in this ecodistrict is dominated by a thin stony till cover and bedrock is very close and often exposed at surface. The soils in this area reflect the fact that the parent material is derived from the granite bedrock. They are typically shallow and acidic. There are numerous peat resources but are generally thin and not suitable for peat production. Some glacial outwash deposits are found along the northern side of the South Mountain and are sources of aggregate and rock that is used extensively in the construction industry.

Parks and Recreation / Protected Areas

The South Mountain Ecodistrict provides opportunities for a wide range of outdoor activities for people living within the ecodistrict and for visitors from more populated areas, such as the Annapolis Valley and the South Shore. South Mountain's rural, natural environment adds to the outdoor recreational experiences found here, from hunting and fishing, boating to four-wheeling or snowmobiling.

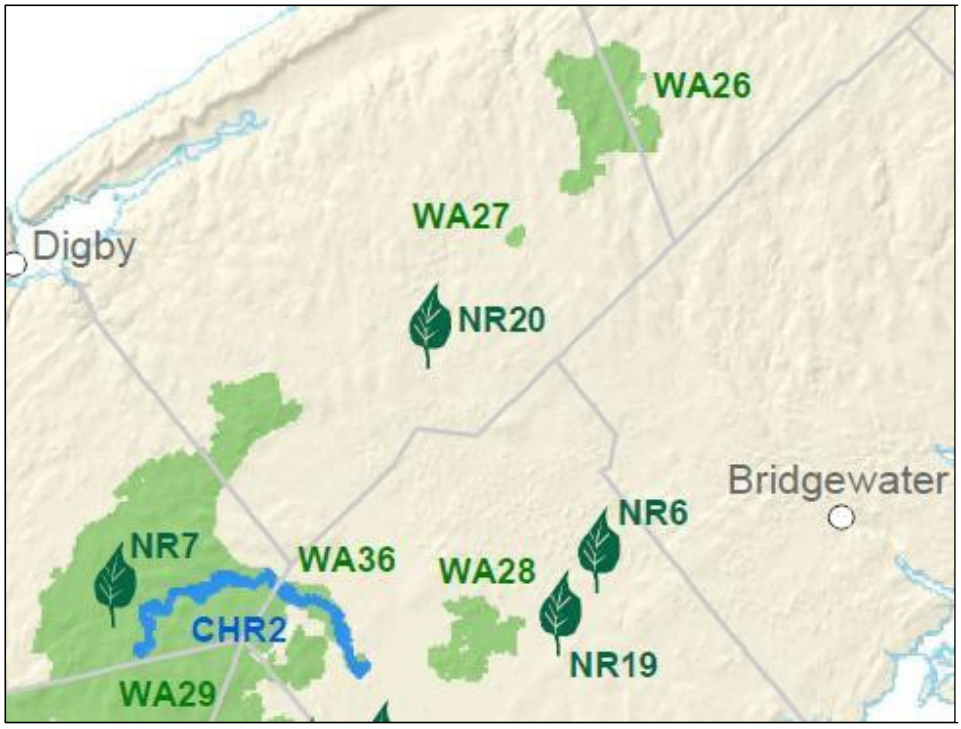
There are also several lakes with cottages along the shores, with some people now using these as permanent residences. There are also several provincial parks and other provincially owned properties located in this ecodistrict that contribute to its recreational values.

These are best described in the following categories:

Category “A” – Existing designated parks, protected areas, and nature reserves. This category includes all properties designated under the Parks Act, Wilderness Areas Protection Act, and Special Places Protection Act.

Sites include:	Hectares
Falls Lake Provincial Park	6
Lake George Provincial Park	4
Cloud Lake Wilderness Area (WA26)	10,013
McGill Lake Wilderness Area (WA27)	178
Tobeatic Wilderness Area (WA29)	33,647*

*Note: This figure represents 34.4% of the Tobeatic Wilderness Area that is located within South Mountain Ecodistrict.



Part of Nova Scotia’s Protected Areas Program map, prepared by the province’s Environment Department, shows three of the wilderness areas in the South Mountain Ecodistrict: Cloud Lake (WA26), McGill Lake (WA27) and Tobeatic (WA29). The map also shows nature reserves (NR) and other protected areas.

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

Sites include:	Hectares
Gaspereau Lake	97
Upper Clements Wildlife Park	22

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

Sites include:	Hectares
Abandoned railway corridor	39

It also should be noted that about 41%, representing 14,027 hectares, of the Kejimkujik National Park and National Historic Society of Canada falls within the South Mountain Ecodistrict.

Abundant wetlands and inland islands are a characteristic feature of this ecodistrict.

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

Wildlife and Wildlife Habitat

Wildlife in the South 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 South 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 silviculture systems.

Wetlands and Aquatic Habitat and Wildlife

The South Mountain ecodistrict predominantly consists of rolling hills with shallow, coarse and well-drained granitic soils. Within depressions and low lying areas are a considerable number of lakes, watercourses, and wetlands.

In addition to providing important wildlife habitat, wetlands perform vital environmental functions such as flood and erosion control, groundwater recharge, and water filtration. All

wetlands in this ecodistrict were considered to be a significant component of the landscape, because in southwest Nova Scotia wetlands are abundant and may provide habitat for rare species. These include several species of plants belonging to a group known as Atlantic Coastal Plain Flora. These rare plants became established in southwestern Nova Scotia as a result of a land bridge between the province and Massachusetts 10,000 to 14,000 years ago.

Freshwater wetlands in the South Mountain ecodistrict are of several types: bog, deep marsh, fen, lakeshore wetland, meadow, seasonally flooded flats, shallow marsh, shrub swamp, and wooded swamp. Wetlands make up about 6% of the ecodistrict's area.

A few individual wetlands in this ecosection are significant in size and deserve special mention. One site is a bog (peatland) at the edge of Gaspereau Lake in Kings County, the largest wetland in the ecodistrict. The second largest is a bog at Cherrytree Meadow, west of Dean Chapter Lake in Hants County.

In addition to wetlands, the major 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, where terrestrial vegetation meets a watercourse or wetland, is one of the most productive habitat zones on the planet and it promotes a rich diversity of wildlife species.

Typical South Mountain lakes would include common species of fish such as yellow perch, brown bullheads, white suckers, and golden shiners. In the spring when waters are high, brook trout are often present, retreating to cooler sites when lower water levels result in rising lake water temperatures. Smallmouth bass, a voracious predator illegally introduced as a sportfishing species, occurs in a number of lakes in the ecodistrict. The presence of smallmouth bass dramatically influences what other fish species exist there, which in turn affects the ecology of the greater animal community. Fish availability is a limiting factor for populations of fish predators like otters, common loons, and osprey.

Several South Mountain river systems are noteworthy for seasonal runs of anadromous fish, which move between fresh and salt water. Unfortunately, soils in this ecodistrict tend to have a low capacity for buffering acid precipitation, and acid rain is believed to be the major cause of salmon and trout declines in the rivers of southwestern Nova Scotia. Though the population of Atlantic salmon in this ecodistrict continues to trend downwards, small runs persist in a few rivers.

Terrestrial Habitat and Wildlife

Wildlife habitat in the forest of South Mountain ecodistrict can be generally described as predominantly mid-succession hardwood and mixedwood, and late succession softwood.

An extensive number of wildlife species, associated with the various stand compositions, would be expected to occur in these habitats. Rarities in South Mountain forest habitat are moose and American marten.

There is a high level of public concern regarding population levels and habitat for white-tailed deer and snowshoe hare, two common but high profile game species, in the South Mountain Ecodistrict. Deer prefer a mix of habitat types, as needs change seasonally. South Mountain generally provides suitable habitat but lacks the land richness and mix of habitat types seen in other ecodistricts. Good habitat for snowshoe hare has low dense ground cover, shrubs and regenerating hardwoods, and is near open areas that provide access to green plants in summer.

Endangered mainland moose occur in this ecodistrict, primarily at the southwestern end. These moose would be part of the remnant population of mainland moose centred on the Tobeatic Wilderness Area.

The southern flying squirrel has also been found in the ecodisrict.

Raptor nests are another important feature of South Mountain's terrestrial wildlife habitat. Information on nest locations is collected opportunistically, and because nest locations can be transitory from year to year, this data does not remain accurate and should be updated regularly. Bald eagles nest in the ecodistrict mostly in the northeastern end, in Hants and Kings Counties, likely due to the availability of food. Eagle nests are uncommon throughout the remainder.

Another prominent bird of prey in the ecodistrict is the osprey, which nests near water where fish, its main prey, are available. Osprey nests are more numerous, and are more evenly distributed, than those of bald eagles.

Riparian zones that border rivers and streams and a mix of hardwood and softwood forests provide important habit to animals and plants.

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

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 Activities Designation Regulations address species and habitat concerns within the forest and wetland ecosystems.

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

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

Forest Disturbances and Succession

Forest Disturbances

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

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

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

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

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

Understanding how ecosystems respond to disturbances is critical to understanding how they function and how they can be managed. This will assist woodland owners and forest managers in:

i. assessing the potential for old forest stands and development class distributions
ii. determining appropriate patch sizes and species composition to emulate natural structures and processes
iii. prescribing the appropriate rotation age and development class structure across a forested landscape

iv. projecting future changes to the forest due to climate change and human disturbances
v. maintaining and conserving biodiversity

Natural disturbances are agents that abruptly change existing conditions and initiate secondary succession to create new ecological communities.

By adapting forest management practices to create the structures and processes that emulate natural disturbances, woodland owners and forest managers can help shape forest landscapes.

One approach that closely mimics nature is to allow ecosystems to naturally develop without active management. This approach is particularly effective on lands with long-lived tree species, such as red spruce, white pine, hemlock, sugar maple, yellow birch, and beech. One of the roles of protected areas is to allow this to occur and also provide a model to compare with managed forests.

Natural disturbance agents in the South Mountain Ecodistrict are primarily associated with hurricanes and fire.

A study has shown that the last three major disturbances, which would include fire and hurricanes, occurred 250, 500 and 700 years ago. These disturbances would result in infrequent disturbance regime leading to older, shade-tolerant climax forests.

Pollen and sediment studies in the area also support a history of fires. More recently, acid rain and the associated pollutants have been suspected of negatively affecting soil chemistry. The already highly acidic soils derived from granite parent material are particularly sensitive to acid precipitation. Significant negative impacts are showing up in the waterways and on some soil types in the Western Ecoregion and will have long term effects on species' composition.

The impact of global warming will also alter ecosystems in western Nova Scotia. Changes can be expected in water availability, along with an increase in the frequency of natural disturbances such as fires caused by lightning and the blowdown of large forested tracts by hurricanes. A warmer climate will affect tree species' composition with boreal species likely to suffer most.

Significant insect and disease impacts on the forest have been due to introduced species. The balsam wooly adelgid has reduced the balsam fir in most of the ecodistrict to an understory species. The beech bark canker, introduced in the 1890s, has also reduced the beech to an understory species although small scattered stands of disease-free beech can be found.

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

Fire has played a dominant role in shaping forest succession in this ecodistrict. Fire species such as white pine, red pine, white birch and red oak are extensive throughout the ecodistrict. Where soils are shallow to bedrock, very coarse or stony, and well to rapidly drained, sites are sensitive to fire. These sites are also inherently poor and will naturally support a forest of black spruce and white pine.

Most of these sites will develop a dense understory layer of ericaceous (heath-like) vegetation such as huckleberry, rhodora, and lambkill that restrict certain types of softwood regeneration creating sparse stands of white pine and black spruce mixed with red maple, white birch, red oak, aspen, and red pine. This forest type also occurs where soils have been impoverished by repeated fires. Continued efforts on fire suppression may allow later successional species of the Acadian Forest to become more common.

It is interesting to note that the intervales along the large rivers of this ecodistrict are not prone to producing rich nutrient soil conditions. Rich sites are more likely associated with swales along small, slow flowing streams and seeps on lower slopes.

South 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.

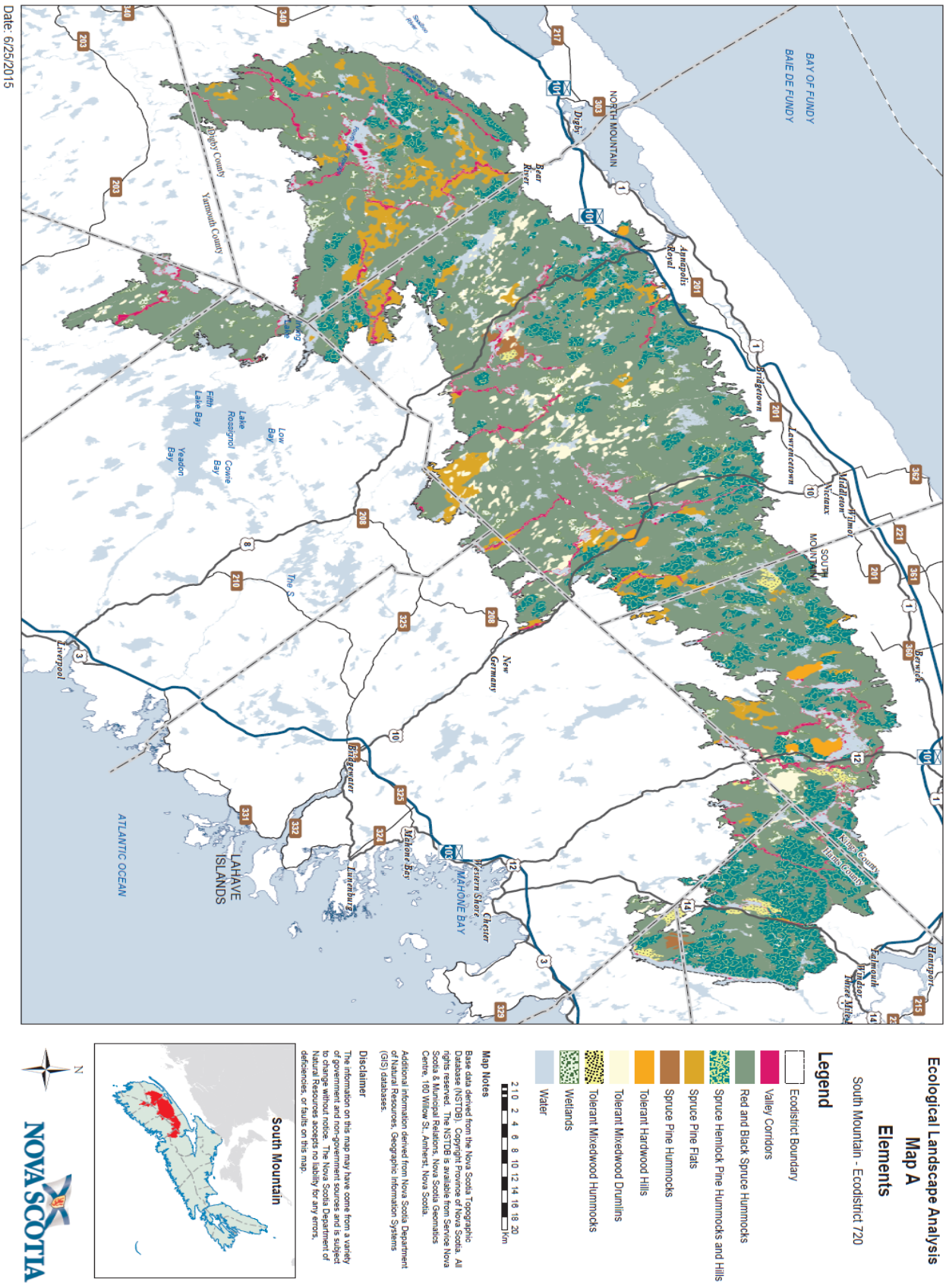
A landscape profile identified and mapped nine distinctive landscape elements in the South Mountain Ecodistrict – one matrix, seven patches, and a corridor (Table 5a). A matrix is the dominant community type. Patches are smaller yet still distinctive community types. Corridors are natural linear communities,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

Red and Black Spruce Hummocks is the matrix element comprising 63% of the ecodistrict. This element is dominated by red and black spruce, white pine, and hemlock.

Spruce Hemlock Pine Hummocks and Hills is the largest patch element in the ecodistrict, which has a mainly shade-tolerant softwood climax forest. **Spruce Pine Flats** has a climax forest of black spruce. **Tolerant Mixedwood Drumlins** includes some species that do well in at least partial sun, such as red maple and white birch. The **Wetlands** element plays an important role in providing wildlife habitat for species such as moose, turtles, snakes, and rare plants. **Tolerant Mixedwood Hummocks** and **Tolerant Hardwood Hills** are two of the smaller patches in the ecodistrict. **Spruce Pine Hummocks** is found mainly in two parts of the ecodistrict – near Fisher Lake and Bear Lake.

Valley Corridors is a linear corridor element found along some of the major waterways. Many species use the water and land habitat. See Table 5a for more detailed descriptions and Map A for element locations.

Map of Elements in Ecodistrict



Forest Stands Within Elements

Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)*** (http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp) is helpful in identifying forest plant communities. Viewed online or available in print through DNR, woodland owners can learn about the characteristics of a particular forest community. Refer to Table 5a for descriptions of elements and Table 5b for forest vegetation types that are likely to be found within elements.

Table 5a - Elements Within South Mountain		
Landscape Element	**Size (Hectares)**	**Element Description**
Red and Black Spruce Hummocks (Matrix)	275,724 63%	This is the matrix-level element comprising almost 61% of the ecodistrict. It occurs on well and imperfectly drained coarse-textured soils derived from granite till. Forests on the zonal site condition are dominated by red spruce, white pine, and hemlock, although the latter is usually resigned to slopes along streams and rivers where soils are slightly more moist and richer (i.e. well-drained sandy loams). The flatter terrain between hummocks is usually imperfectly drained and supports a forest of black spruce and white pine which may have frequent stand level disturbances caused by windthrow on these wetter soils which restrict rooting. Following infrequent stand-level natural disturbances such as fire and hurricane, early successional forests may include shade intolerant hardwoods such as red maple, white birch, and aspen with red oak on some of the driest sites.
Spruce Hemlock Pine Hummocks and Hills (Patch)	77,303 17.7%	This is a patch-level element occurring on hilly terrain with well to rapidly drained soils of coarse texture derived from granite tills. Most of the element occurs as large patches throughout the ecodistrict. The zonal condition supports a forest of red spruce and white pine with hemlock on the soils with higher moisture and nutrient content which are usually associated with lower slope positions. Drier and less fertile soils, often coarser in nature, support a forest dominated by white pine and in a mixedwood situation red oak and red maple. Often soils are shallow to bedrock, or have been impoverished by repeated wildfires, producing poorly stocked stands of black spruce, red oak, red pine, and white pine.
Spruce Pine Flats (Patch)	22,495 5.1%	This patch-level element occurs primarily on imperfectly drained soils of coarse texture on flat terrain most often associated with lakes and watercourses. Wetlands are embedded within this element. Forests of slow growing black spruce are typical but on the better drained soils red / black spruce, spruce / fir, and balsam fir all with white pine potential are common. As soil drainage gets progressively poorer, wet forests of red maple, tamarack, alder, false holly, winterberry, and other woody shrubs are common. Red maple fens along the major streams and rivers are noteworthy.
Tolerant Mixedwood Drumlins (Patch)	13,465 3.1%	This element occurs as small isolated drumlin fields at five major locations in this ecodistrict. Drumlin landforms that comprise unsorted glacial tills yield soils of variable textures that are typically Well-drained. These productive soils yield forest stands of both shade-tolerant hardwood and softwood species which may occur as pure and/or mixedwood covertypes. The hardwood covertype is more prevalent in this ecodistrict and dominates most of the slope positions. With progressively poorer drainage on the level terrain between drumlins, black spruce, tamarack, and red maple dominate the forest vegetation.

Table 5a - Elements Within South Mountain		
Landscape Element	**Size (Hectares)**	**Element Description**
Wetlands (Patch)	13,289 3%	The wetlands element comprises bogs, fens, swamps, and poorly drained areas. It may occur as a large wetland complex associated with rivers and lakes, as narrow linear communities associated with flow accumulations and small streams, or as a community of plants that have adapted to wet conditions. This element is associated with level terrain where drainage is impeded or as a depression in the landscape where water remains in excess year round. Wetlands are generally treeless or sparsely forested woodlands. For the most part, sites are underlain by poorly drained mineral soils or organic soils derived from peat (sphagnum mosses) or sedges. This element plays a critical role in water collection, filtering, and ground water recharge.
Tolerant Mixedwood Hummocks (Patch)	3,108 0.7%	Tolerant Mixedwood Hummocks are a small patch-level element associated with coarse-textured well-drained soils from granite till on gently hummocky relief. Tolerant hardwood species are unusual although they may be found on the deeper better drained soils with a finer texture. The zonal forest is red spruce and white pine with black spruce and hybrid spruce occurring where soils are drier and less fertile.
Tolerant Hardwood Hills (Patch)	2,189 0.5%	Tolerant Hardwood Hills are a small patch-level element in this ecodistrict and occurs primarily on scattered hills of the South Mountain. The soils of this element are somewhat unique to the granite-dominated tills of the ecodistrict as they are derived from a till containing varying amounts of granite, quartzite, and basalt. This mixture creates well-drained sandy loams of a higher fertility and thus a forest dominated by shade-tolerant hardwoods such as sugar maple, yellow birch, and beech.
Spruce Pine Hummocks (Patch)	1,276 0.3%	The Spruce-Pine Hummocks element occurs on imperfectly drained coarse-textured soil derived from granite till. The low inherent low soil fertility leads to a forest of black spruce and pine and a significant understory of woody ericaceous (heath-like) shrubs. This is a patch-level element on the South Mountain and occurs on low hills and ridges. Black spruce, white pine, and red maple are predominant on all sites but white pine may occur as pure forests on the drier sites. With progressively poorer drainage, black spruce, tamarack, and red maple dominate the forest vegetation. White pine often forms a super canopy overtopping red maple and black spruce. The dominant natural disturbance is fire due to the fuel provided by pine and spruce litter and the ericaceous vegetation associated with this element.
Valley Corridors (Corridor)	28,504 6.5%	Valley Corridors are corridors found along portions of some of the major hydrological systems in the ecodistrict (Sissiboo, Mersey, Medway, Bear, Nictaux, LaHave, Gaspereau, Gold, and Avon rivers). These corridors around waterways are extremely important for biodiversity and ecosystem function as many species use both aquatic and terrestrial habitat. These corridors pass through forested communities which are mostly mature or multi-aged late seral softwood (red and black spruce with some pine, fir and hemlock).
Total	**437,353***	*Total doesn't include water features, such as lakes, rivers and streams.

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

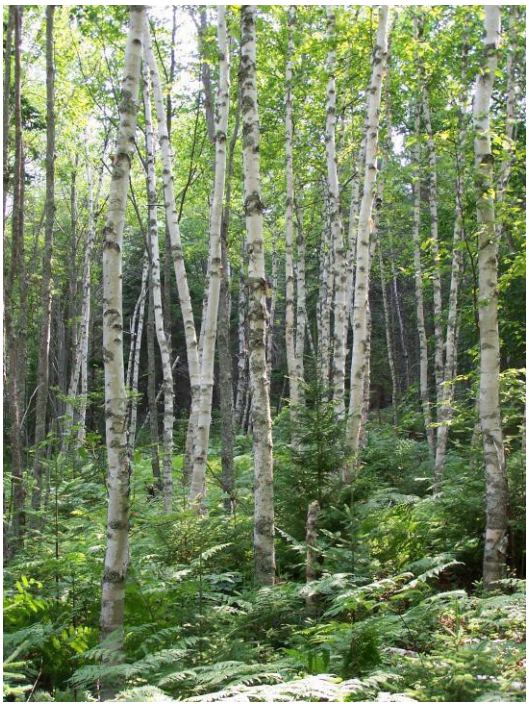
Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Pine Flats		7		29	**SP7**	56
Spruce Pine Hummocks	IH1, SP2, SP8	2	IH2, IH6, SP3, SP4, SP6, SH9	25	**SP5, SP7,** SP9	71
Red and Black Spruce Hummocks	IH3, IH4, IH5, IH6, MW4, MW5, SP8	9	MW2, SH5, SH6, SH9, SP6	39	**SH1, SH2, SH3, SH4, SP5, SP7**	43
Spruce Hemlock Pine Hummocks and Hills	IH3, IH4, IH5, IH6, MW4, MW5	15	SH5, SH6, MW2	50	**SH1, SH2, SH3, SH4,** MW1, MW3	26
Tolerant Hardwood Hills[2]	IH3, IH5, IH6, OF3	24	IH7, TH8	34	**TH1, TH2,** TH3, **TH5, TH6**	28
Tolerant Mixedwood Drumlins	OF1, OF2, OF3, OF4, IH3, IH5	14	IH6, IH7, MW2, MW4, SH5, SH6	40	TH1, TH2, TH5, **MW1, MW3,** SH1, SH2, SH3, SH4	38
Tolerant Mixedwood Hummocks	OF1, OF2, OF3, OF4, IH3, IH4, IH5	11	IH6, IH7, MW2, MW4, MW5, SH5, SH6	50	TH1, TH2, TH5, **MW1, MW3,** SH1, SH2, SH3, SH4	26
Wetlands	CE1, FP3, WC1, WC2, WC4, WC5, WC6, WC7, WC8, WD1, WD2, WD3, WD4, 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), 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).
[2] Red oak can be a component of this element.
*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.

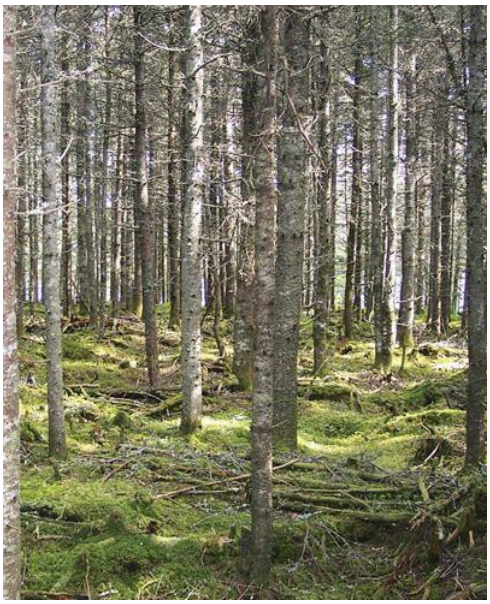
Photos Illustrating Vegetation Types in Elements

The following photos show some of the vegetation types expected to be found within their respective elements.

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



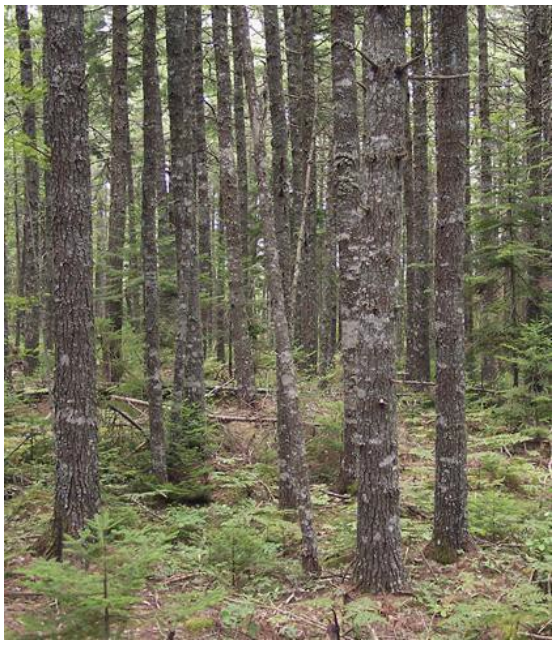
White birch –Red maple / Sarsaparilla-Bracken (IH5) is an early successional vegetation type found within the red and Black Spruce Hummocks matrix element.



Balsam fir – White spruce / Evergreen wood fern – Wood aster (OF4) is an early successional vegetation type that grows on abandoned farmland within the Tolerant Mixedwood Drumlins patch element.

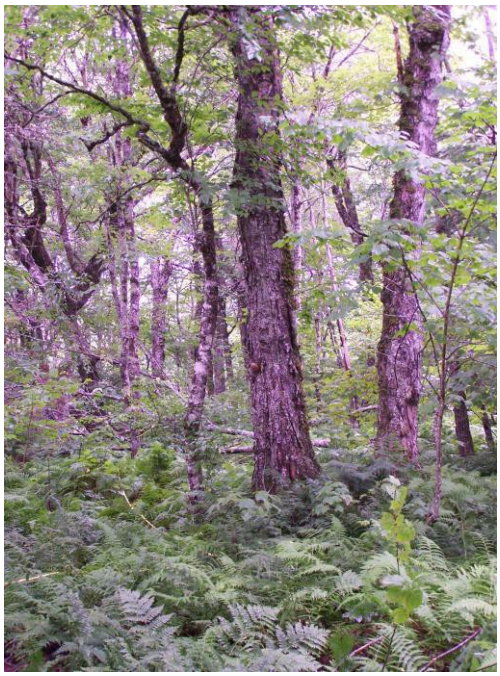
Black spruce / False holly / Ladies' tresses sphagnum (SP7) is a late successional vegetation type within the Spruce-Pine Flats patch element.

Black spruce / Lambkill – Labrador tea / Sphagnum (WC2) is a mid-successional vegetation type found in the Wetlands element.



White pine / Blueberry / Bracken (SP4) is a mid-successional vegetation type within the Spruce Pine Hummocks patch element.

Red spruce – Yellow birch / Evergreen wood fern (MW1) is a late successional vegetation type found in the Tolerant Mixedwood Hummocks patch element.



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

The two most prominent natural disturbance regimes in South Mountain are the frequent and infrequent regimes. Spruce Pine Flats is a good example of an element influenced by the frequent regime. Red and Black Spruce Hummocks is an example of an element influenced by the infrequent regime.

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%

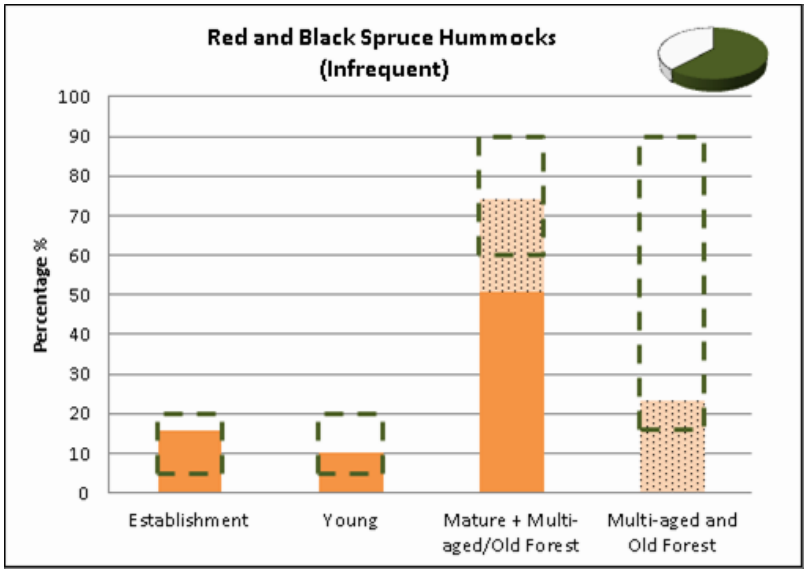
Table 6 indicates that for frequent stand-initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively 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.

Natural disturbances result in different forest development classes in the South Mountain Ecodistrict.

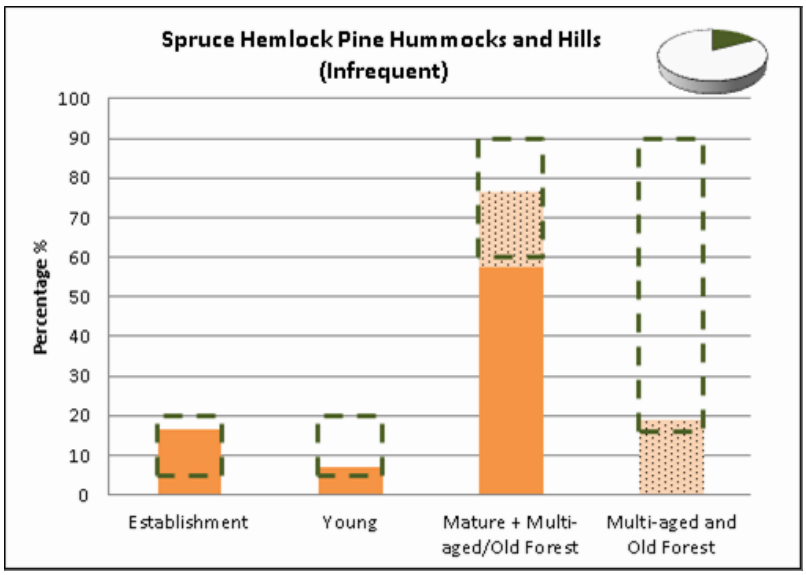
Development Class Targets by Element

A 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.

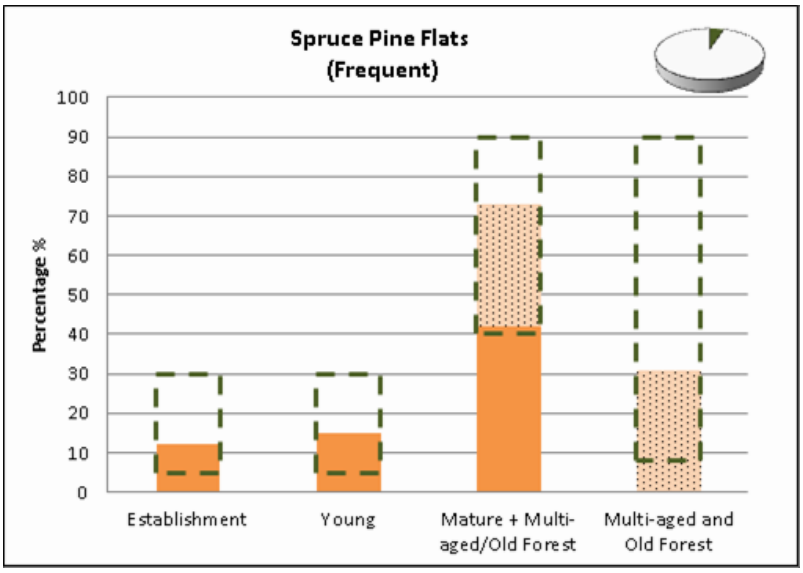
Development classes in the **Red and Black Spruce Hummocks** matrix element are all within target ranges. This will support habitat diversity and continuity of mature forest, as well as provide management flexibility. Extended rotations, natural regeneration, late seral species, and uneven-aged practices are most appropriate for infrequent natural disturbance regimes (NDR) when forest conditions are suitable.



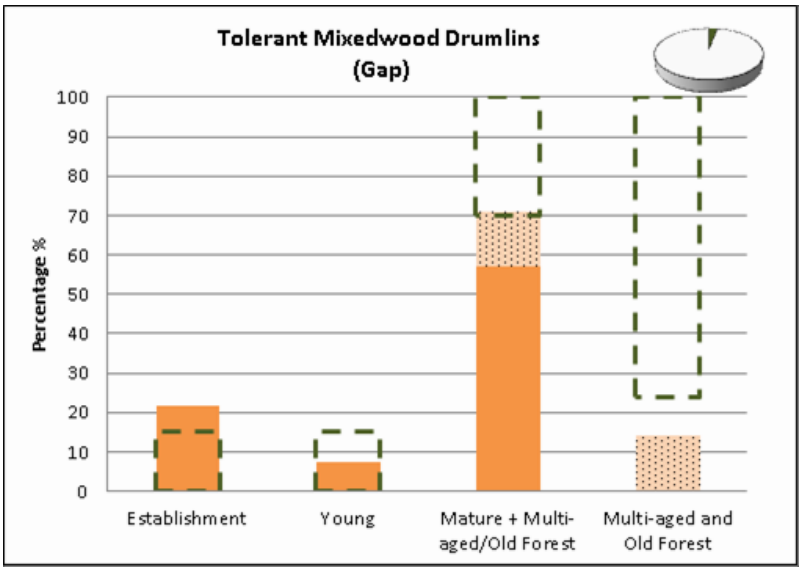
The composition of the largest patch element, **Spruce Hemlock Pine Hummocks and Hills**, is within target ranges. Infrequent NDR means the time between stand-initiating events typically exceeds the average life of the main species, supporting mature forest longevity and regeneration of shade-tolerant understories.



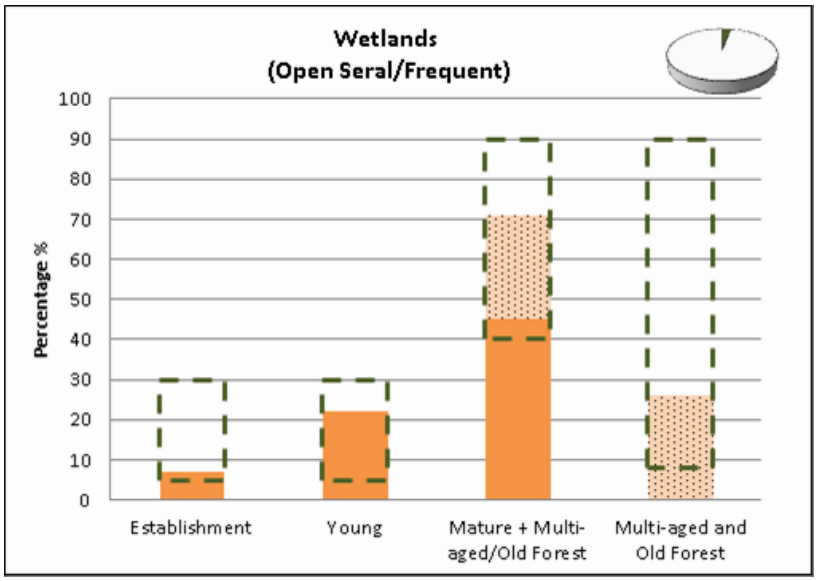
In **Spruce Pine Flats** all the classes are within target ranges, with fairly high levels of mature and multi-aged forests. Frequent NDR forests support stand-initiation events that favour establishment of a dominant, even-aged cohort of mixed seral species. Disturbances typically retain abundant mature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



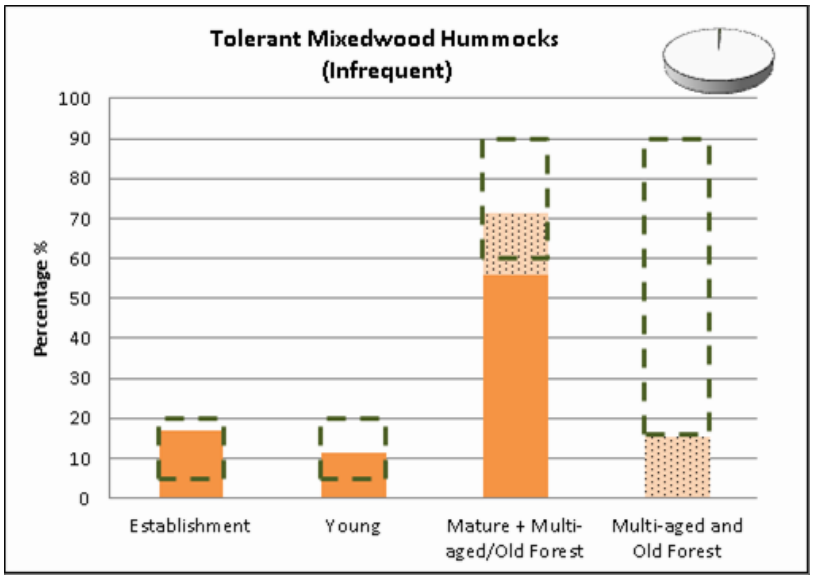
In the **Tolerant Mixedwood Drumlins**, multi-aged and old forest is below target, while establishment levels are excessive. Partial harvests, including retention of large old trees, will promote multi-aged forest, particularly in tolerant hardwood stands. Tending immature stands to favourclimax species will provide future mature forest opportunities.



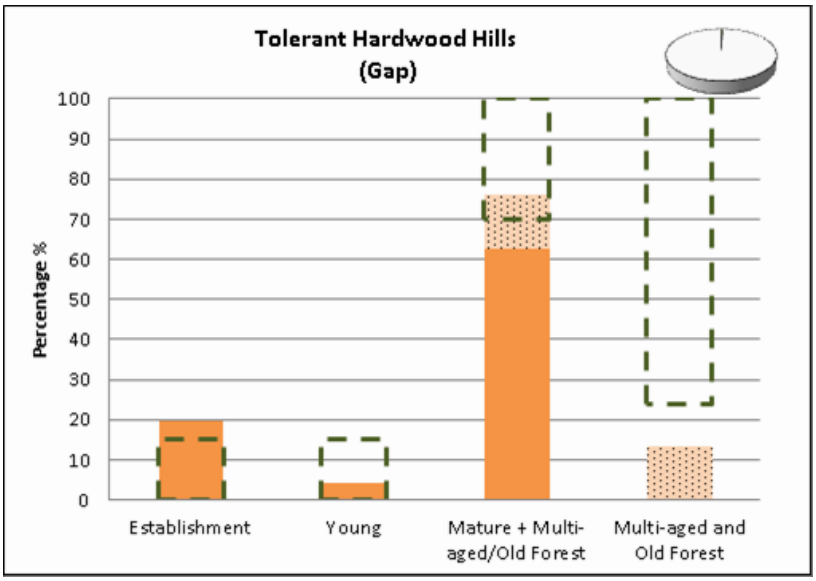
The forested component of the **Wetlands** element is predominately mature and multi-aged. This element is often variably composed of mature forest interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure.



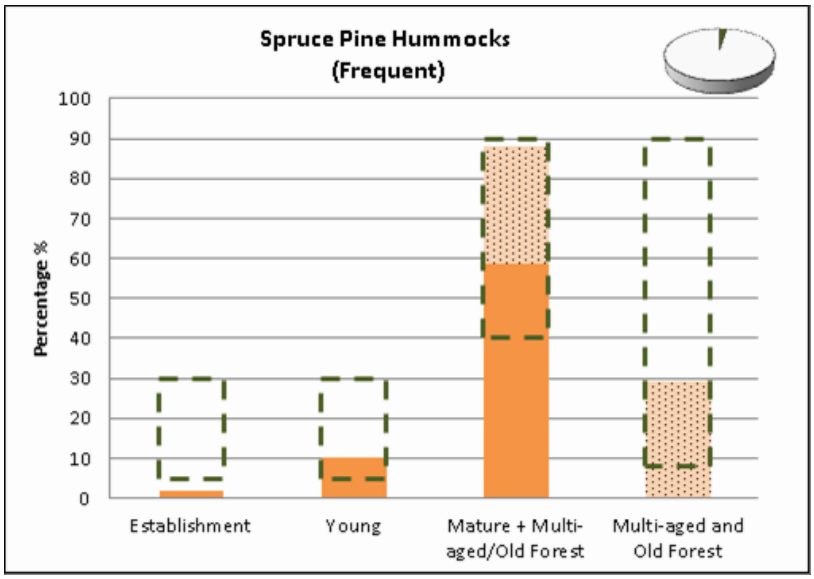
Tolerant Mixedwood Hummocks is a small patch element in which development class ranges are sensitive to local fluctuation. Although currently within target ranges, the long-term balance may be more stable in the neighbouring Clare Ecodistrict 730. Extended rotations, natural regeneration, late seral species, and uneven-aged practices are most appropriate.



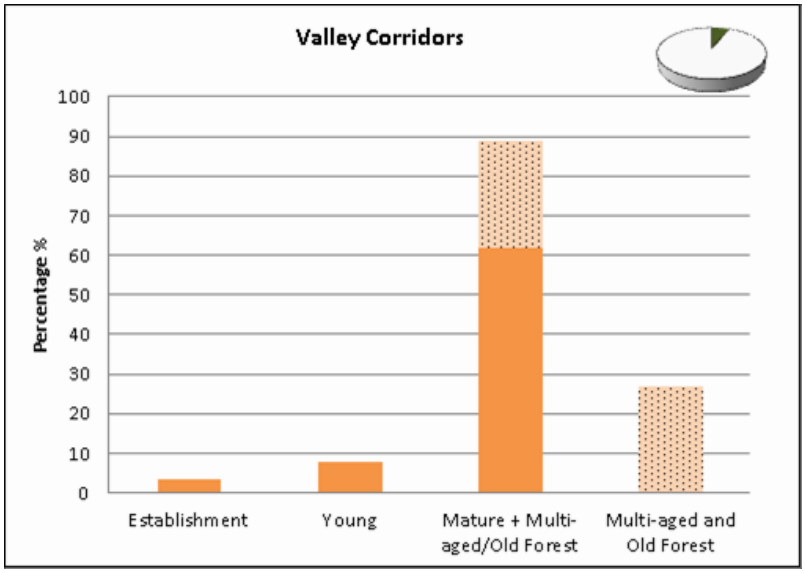
Tolerant Hardwood Hills is a small patch element sensitive to local disturbance. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest. Silviculture that favours tolerant hardwood species will support future opportunities. This is the largest patch element in neighbouring Valley Slope Ecodistrict 710.



Spruce Pine Hummocks is a small element in which development class ranges are sensitive to local fluctuation. It is currently dominated by mature forest, with little establishment class. This element forms the largest patch in St. Margarets Bay Ecodistrict 780 and is the matrix element in Sable Ecodistrict 760, where mature forest also dominates.



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



Summary of Parts 1 and 2

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

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

Glossary A: Terms in Parts 1 and 2

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

Crown land and Provincial Crown land	Used in these Ecological Landscape Analysis reports to include all land under the administration and control of the Minister of Natural Resources under the Forests Act, Section 3; as well as the lands under the administration and control of the Minister of Environment under the Wilderness Areas Protection Act. Also includes Federal Parks in the accounting of protected area representation.
Covertype	Refers to the relative percentage of softwood versus hardwood species in the overstory of a stand. In this guide, covertype classes are: **Softwood:** softwood species compose 75% or more of overstory **Hardwood:** hardwood species compose 75% or more of overstory **Mixedwood:** softwood species composition is between 25% and 75%
Development class	The description of the structure of forests as they age and grow (e.g. establishment forest, young forest, mature forest, multi-aged / old forest).
Disturbance	An event, either natural or human-induced, that causes a change in the existing condition of an ecological system.
Drumlin	A low, smoothly rounded, elongate hill of compact glacial till built under the margin of the ice and shaped by its flow.
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 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).