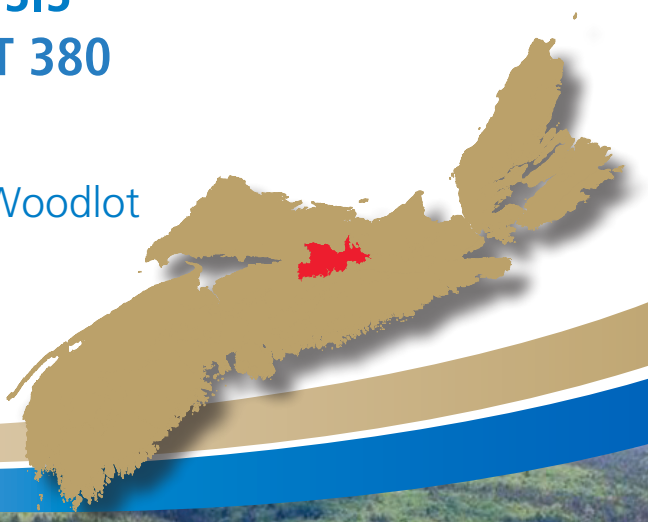
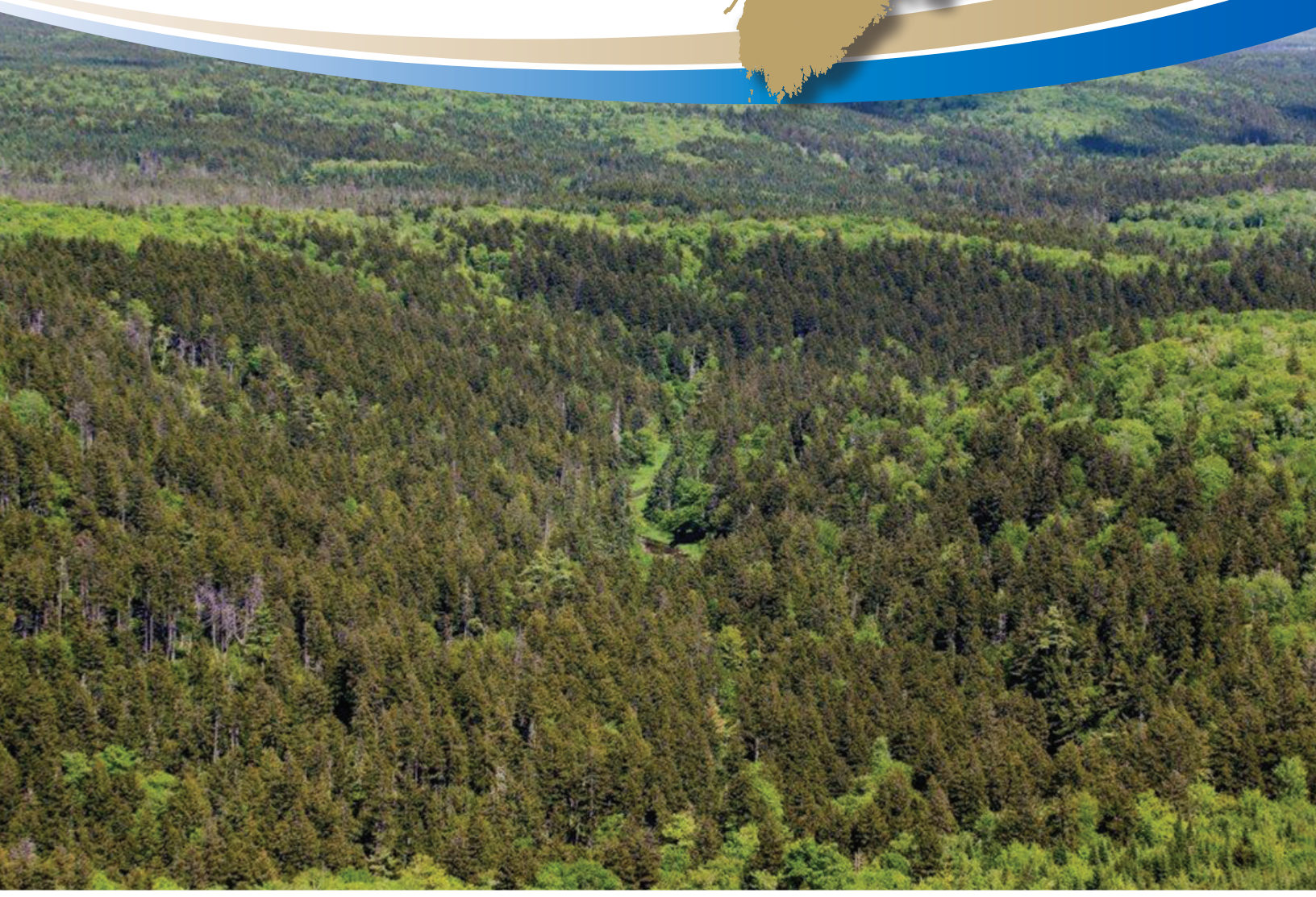
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CENTRAL UPLANDS ECODISTRICT 380

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





ELA 2015-380

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 380: Central Uplands

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

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

Information sources and statistics (benchmark dates) include:

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

Conventions

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

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

REPORT FOR ELA 2015-380

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A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 380: **Central Uplands**

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 Central Uplands Ecodistrict 380. 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.

This upland extension of the St. Marys fault block has some of the most productive red spruce forests in Nova Scotia. Red spruce is the dominant forest species in the ecodistrict and occupies many of the moist sites, which in other ecodistricts could be covered by black spruce. Pure stands of shade-tolerant hardwoods, such as sugar maple and yellow birch, are present on the crests and upper slopes of hills and steeper hummocks.

Partially wedged between the Cobequid Hills Ecodistrict 340 to the north and the Pictou Antigonish Highlands Ecodistrict 330 to the east, this ecodistrict occupies the gently rolling uplands of central Nova Scotia. Elevations average 300 metres above sea level.

Central Uplands contains the headwaters of several rivers. The Stewiacke and Calvary rivers flow into Cobequid Bay. The East, Middle, and West rivers of Pictou County empty into the Northumberland Strait. The Musquodoboit River flows into the Atlantic Ocean.

The geology is somewhat similar to that of the St. Marys River 370 and Cobequid Slopes 350 ecodistricts. Soils are predominantly well-drained to moderately well-drained with finer textured soils imperfectly drained.

First, second, and third order streams with a trellised drainage pattern and a few small shallow lakes cover less than 1% of the ecodistrict.

Red spruce forests near Sheepherders Junction.

Lakes in the ecodistrict are generally shallow, providing habitat for many species of wildlife, including beavers, fish, amphibians, reptiles, waterfowl, and osprey. Loons have been recorded breeding at Perch, Grant, and West Branch lakes.

Old growth hemlock- red spruce forest at West Branch Lake.

Private land ownership accounts for 83% of the total Central Uplands Ecodistrict area of 129,118 hectares. Only 15% of the ecodistrict is under provincial Crown management. Less than 1% is considered Aboriginal lands. Theremaining lands are in transportation corridors and inland waters.

About 87% of the Central Uplands is forested. Wetlands at 4% and agriculture at 3% are the other main land uses.

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

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

Spruce Hemlock Pine Hummocks and Hills is the matrix element, representing 47% of the ecodistrict. This is a softwood dominated element with climax forests typical of the Acadian Forest, including red spruce, hemlock, and yellow birch.

Tolerant Mixedwood Hills, representing nearly one-third of the ecodistrict, is the largest patch element. As a mixedwood element that supports climax species of the Acadian Forest, common species include sugar maple, beech, yellow birch, red spruce, and hemlock.

Other patch elements, in order of size, are **Tolerant Hardwood Hills, Tolerant Hardwood Drumlins and Hummocks, Tolerant Mixedwood Drumlins, Tolerant Mixedwood Slopes, Wetlands**, and **Floodplain**.

Valley Corridors features strong linear river corridors that dissect the ecodistrict in several locations. Salmon River, Murray Brook, Pembroke River, Stewiacke River, Calvary River, West River, and branches of the East River are among the most prominent corridors.

Forest Ecosystem Management
For Central Uplands 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 Central Uplands Ecodistrict 380. 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 Central Uplands Ecodistrict was up to 2006. These baseline measurements can be used to assess trends through comparison with present and future inventories.

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

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

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

Part 1: An Overview of Central Uplands – *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 Central Uplands Ecodistrict, located east of Truro, is wedged between Cobequid Hills Ecodistrict to the north and the Pictou Antigonish Highlands Ecodistrict to the east. Elevations average about 300 metres above sea level.

The area contains the headwaters of the Stewiacke and Calvary rivers, which flow toward the Cobequid Bay.

Red spruce, yellow birch, and sugar maple will form mixed stands on the finer textured soils, but following harvesting may revert to stands of balsam fir and red spruce.

In Central Uplands, stand-initiating natural disturbances occur infrequently. Disturbance agents include hurricanes, fire, and insects. However, the infrequency of stand-level disturbances creates a climax Acadian Forest of tolerant hardwoods and softwoods occurring as pure and mixed associations. Many of these stands develop into old growth with gap dynamics providing breaks in the canopy and allowing the development of uneven-aged stands and older forests.

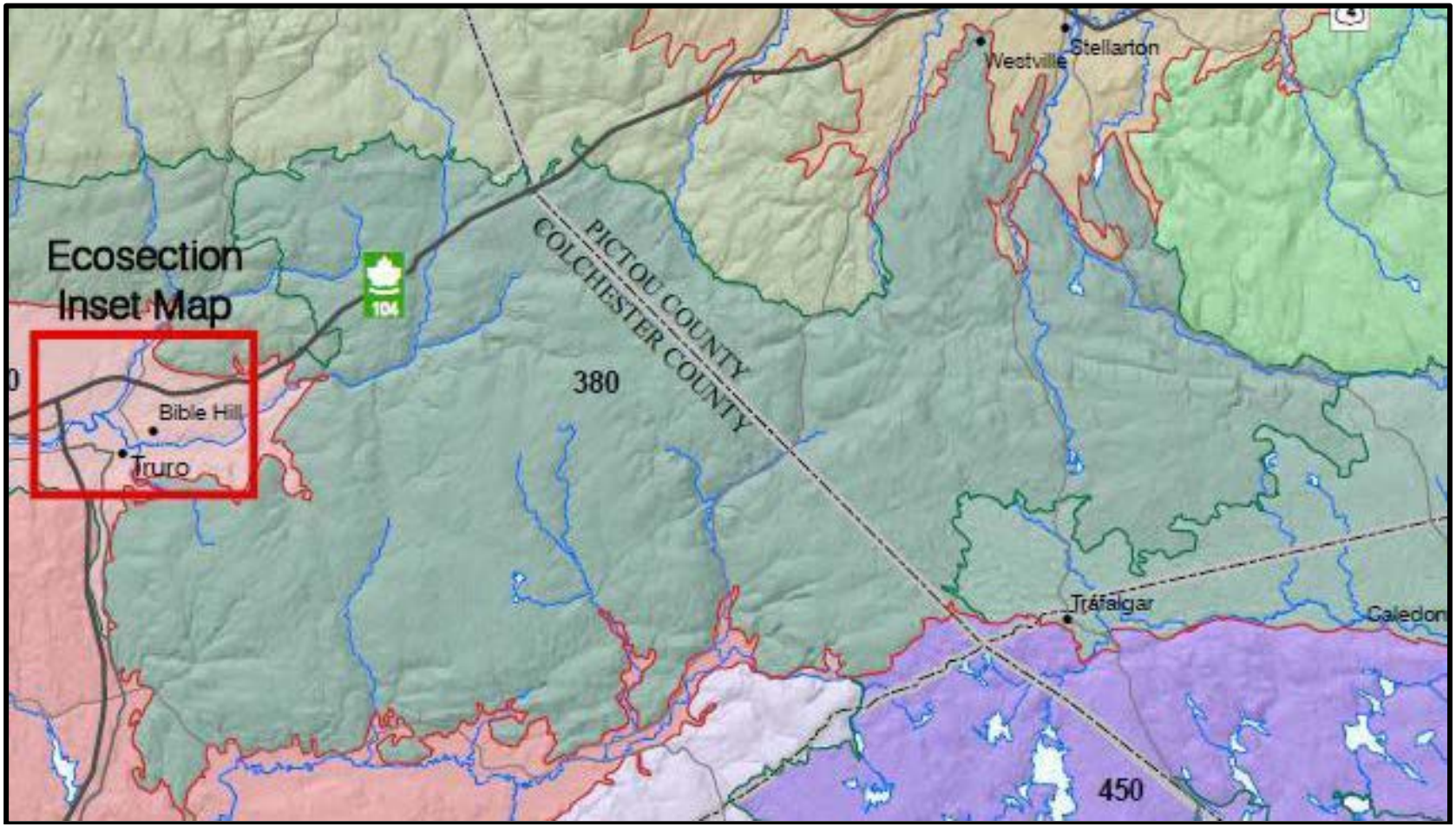
The occurrence of hurricanes in this ecodistrict may be the most significant of the stand-initiating disturbances. However, the infrequency of hurricanes here has allowed, at least in the past, large areas of older forest to develop.

The geology is somewhat similar to that of St. Marys River and Cobequid Slopes ecodistricts. The ecodistrict receives above average precipitation for the province with 1,373 millimetres annually.

Central Uplands shares, with the Pictou Antigonish Highlands and St. Marys River ecodistricts, the lowest mean annual temperature at 5.4°C and the second coldest mean winter temperature of -5.9°C. The mean summer temperature is near average for the province at 16.5°C.

Historically, insect epidemics were unlikely to have caused extensive damage to the forests of the Central Uplands due to the mixedwood nature of the forest. Populations of spruce budworm and tussock moth have recently defoliated significant areas of the uplands – most notably in stands of balsam fir. The eastern spruce bark beetle has also caused damage in older stands of red spruce.

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



The Central Uplands Ecodistrict 380 covers much of eastern Colchester County and western Pictou County.
(From Ecodistricts of Nova Scotia map 2007)

Land Area

Central Uplands is rural and predominately under private ownership, with only 15% under the administration of provincial Crown (Table 1).

Table 1 – Land Area by Ownership in the Central Uplands Ecodistrict*

Ownership	Area** (hectares)	Percent of Total Area
Provincial Crown land	19,309	15
Private	107,424	83.2
Federal	0	0
Aboriginal	56	<0.1
Other (Includes inland water bodies and transportation corridors)	2,329	1.8
Total	**129,118**	**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 29,924 hectares, representing 10.9% of total area. Ownership of private and other lands decreased to 245,154 hectares, representing 89.1% of total area.*

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	17,595	91.1
C2 – Multiple and Adaptive Use	1,675	8.7
C3 – Protected and Limited Use	0	0
Unclassified	39	0.2
Total	**19,309**	**100**

The categories C1 (91%) and C2 (9%) account for virtually all the Crown lands. There are no C3 lands and only a tiny area is unclassified.

The DNR has few formal licenses or lease commitments within this ecodistrict. There are a few camps in the Riversdale area, plus several in southern Pictou County.

The Snowmobilers Association of Nova Scotia (SANS) has a license to use, groom, and maintain trails, which are usually logging roads in this area.

Forests

Within this ecodistrict, 112,579 hectares, or 87%, is forested (Table 3). This exceeds the provincial average of 72%.

Within the non-forested categories, wetlands (4%) and agriculture (3%) are the two largest sectors, accounting for about 9,400 hectares combined.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	112,579	87.2
Wetland	4,952	3.8
Agriculture	4,431	3.4
Barrens	132	0.1
Urban	1,300	1
Road, Trail, Utility	1,995	1.6
Other	3,729	2.9
Total	**129,118**	**100**

A variety of tree species, many of them shade-tolerant and long-lived, such as red spruce, sugar maple, and yellow birch, grow in an ecodistrict that is 87% forested.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 5.3 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.

Given the above-average land capability of this area, this ecodistrict has a high level of forest management activity. The majority of forest management work is conducted on private land, which accounts for 83% of the ecodistrict.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	1,291	1.1
3	3,086	2.7
4	13,671	12.2
5	47,640	42.4
6	38,030	33.8
7 or more	8,861	7.8
Total	**112,579**	**100**

*Based on growth potential for softwood species.

The current forest comprises a mixture of softwood (58%), hardwood (12%), and mixedwood forests (21%). Unclassified is 9%. Red spruce and balsam fir are the most common softwood species. Balsam fir stands or balsam fir and spruce communities are found on moist or imperfectly drained medium to fine-textured soils.

This ecodistrict has seen an increase in harvest activity over the past 10 to 15 years. This is reflected in the abundance of early and mid-successional stands dominated by intolerant tree species, such as white birch, grey birch, red maple, and aspen.

These species are found throughout the ecodistrict on well-drained sites, as both pure stands of hardwood and as a minor component of most softwood stands. Hardwood and mixedwood covertypes combined account for over 33% of the forest cover.

Water Resources

There are only a few freshwater lakes in the ecodistrict and they tend to be small and fairly shallow. Some of the largest lakes are Deyarmont and Twin in Colchester County and Forbes, West Branch and McKinnon lakes in Pictou County.

The ecodistrict is a unique geographic phenomenon with watersheds flowing to the three major saltwater bodies surrounding Nova Scotia. The Stewiacke and Salmon rivers flow to the Bay of Fundy, the East, Middle, and West rivers of Pictou County flow to the Northumberland Strait, and the St. Marys River flows to the Atlantic Ocean.

Four primary water supply areas occur in the ecodistrict.

A small section of the New Glasgow-designated water supply area is located around the Forbes Lake area in the northeast corner of the ecodistrict.

Non-designated water supply areas within Central Uplands include Truro, Stellarton, and New Glasgow.

Rivers, such as the Salmon, are an important water resource in the Central Uplands Ecodistrict.

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

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

Minerals, Energy and Geology

The Central Uplands Ecodistrict lies in the centre of Nova Scotia within Colchester and Pictou counties. Central Uplands comprises mostly Carboniferous age sedimentary rocks (280 to 350 million years old) that contain significant mineral resources, particularly along the Cobequid-Chedabucto Fault System.

The structural geology is influenced mainly by the fault system that runs east to west near the centre of the ecodistrict. Along this fault system there are numerous mineral occurrences and good potential for mineral deposits, particularly iron-oxide, copper, and gold deposits. Several faults run southeast to northwest, south of the fault system, although in the northeast part of the ecodistrict the structural geology is more complex.

The southern half of the Central Uplands comprises terrestrial sedimentary rocks of the Horton Group that have hydrocarbon potential. Marine sedimentary rocks of the Windsor Group and sedimentary rocks of the Mabou Group host significant resources of coal, salt, gypsum, and base metals.

The northern portion of the ecodistrict is predominantly underlain by sedimentary rocks, including those of the Windsor, Mabou, Cumberland, and Pictou groups. These Carboniferous rocks are important hosts for coal, salt, gypsum and, to a lesser extent, base metals.

The western end of the ecodistrict contains Arisaig Group rocks, up to 440 million years old, which were mined in the 1800s and early 1900s for iron ore. There are also areas underlain by rocks of the Georgeville Group, up to 620 million years old, which contain numerous base metals.

Meguma Group strata, which are up to 515 million years old, can host gold deposits. The high sulphide content of many of the Meguma Group slates represents a significant risk for acid drainage if they are disturbed.

Exploration and development drilling for conventional oil and gas and for coalbed methane is ongoing in the Carboniferous rocks of the Central Uplands, which have been explored by seismic surveys.

The Cumberland Group rocks contain numerous coal seams and may provide a future source for coalbed methane gas. The sandstones and shales of the Horton Group are of particular interest in oil and gas exploration in this part of the province since they provide a source of hydrocarbons and in areas of structural traps, where overlain by Windsor Group salt and gypsum, provide a geological caprock for them.

There are over 27 kilometres of the Maritimes and Northeast pipeline running southeast to northwest in the western end of the ecodistrict and approximately 33 kilometres of the lateral pipeline running southwest to northeast in the centre.

Since 2003, there have been over 15,000 mineral claims issued along the Cobequid-Chedabucto Fault Zone based on the iron-oxide, copper, and gold exploration model. This interest arose from the development of a new geological model based on characteristics of giant deposits being explored and mined in other parts of the world. During this same time, world petroleum prices have increased significantly.

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

Parks and Recreation / Protected Areas

The Central Uplands Ecodistrict is located at the eastern end of the *Bay of Fundy Thematic Region* identified in DNR's Provincial Parks Concept Plan. There are no provincial parks, park reserves, or wilderness areas in this ecodistrict. However, the area is considered a "core area" for traditional outdoor recreation pursuits, such as fishing, hunting, and hiking.

Freshwater lakes are few, small, shallow, and scattered across the ecodistrict. Deyarmont, Twin, Hay, Grant, McKinnon, and Dryden lakes are some of the busiest for sport fishing. Several lakes are stocked annually with rainbow or speckled trout.

Winter enthusiasts can catch rainbow trout at Gairloch Lake. The ecodistrict also contains the headwaters of several rivers and streams. Anglers enjoy the Stewiacke River for gaspereau, shad, speckled and brown trout, while the North and Salmon rivers are good trout streams. The East, Middle, and West rivers of Pictou have excellent salmon runs and are popular for trout fishing. The Stewiacke is also a popular river for canoeing.

Lansdowne Outdoor Recreation Development Association (LORDA) features a wheelchair-accessible recreation park offering stocked fish ponds and trails.

Hunting for deer, bear, ruffed grouse, and other upland game is popular in fall and early winter. Trapping for furbearers occurs in all accessible areas. Many camps are used by hunters, anglers, and motorized trail users.

Outdoor recreation pursuits in this ecodistrict include hiking, horseback riding, and photography of wildlife and natural landscapes. Maple Lake Falls (near Centredale) is a well-known hiking destination and is popular for trout fishing. Bird-watching is also growing in popularity as a nature-based recreational activity and is enjoyed by individuals and groups.

There is an International Biome Project (IBP) site at Kemptown on the Salmon River, north of Highway 104. The river intervale has a unique, high concentration of rare plants.

Organized snowmobiling is a popular winter time activity in an ecodistrict featuring many kilometres of marked and groomed trails. Trails are operated and maintained by several organized snowmobile clubs. These form part of the provincial network of licensed and unlicensed trials established under the auspices of SANS. ATV riding is also common with many riders belonging to organized clubs.

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 Central Uplands 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 Central Uplands and other ecodistricts comes from a number of sources, including surveys, harvest statistics, hunter and trapper reports (abundance rankings), annual bird counts, forest management plan reviews and naturalists' reports, 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. The current tally for the Central Uplands is a little under 5%. 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.

Landscape management for wildlife strives to create and maintain representation of successional stages and covertypes within the ecodistrict by species, species association, and area patch size.

Several goshawk nests are known from the area. These birds require relatively undisturbed large tolerant mixedwood areas for successful breeding.

Central Uplands is the source of headwaters for the West River St. Marys, which flows east and south to the Atlantic Ocean, the East, Middle, and West rivers, which flow north into Pictou Harbour on the Northumberland Strait, and the Stewiacke and Salmon rivers which empty into Cobequid Bay, part of the Bay of Fundy.

The rivers that flow into the Northumberland Strait still have runs of Atlantic salmon, an endangered species, as does the St. Marys. The rivers that empty into the Bay of Fundy no longer support viable salmon runs.

The wood turtle, a threatened species, can be found in the East, the St. Marys, and Stewiacke river systems. Brown trout are known from the Stewiacke, Middle, and East rivers.

The rich alluvial soils associated with river floodplains provides habitat for many plants, especially some of the more rare interval plants, such as hepatica, found near the Stewiacke, foamflower along the Salmon, blue cohosh and yellow lady slipper on the East, and Canada lily on the West.

Lakes are not common across this landscape and those that exist are generally shallow, providing habitat requirements for many species of wildlife, including fish, amphibians, reptiles, waterfowl, osprey, and beavers.

Shallow lakes provide important habitat for many species, including amphibians, beavers, and fish.

Loons, which may be at risk in Nova Scotia, have been recorded breeding at Perch, Grant, and West Branch lakes.

The Stewiacke River is one of several river corridors that provide important routes for wildlife in the ecodistrict.

In years when deep snow forces deer off higher elevations, the deer congregate in wintering areas and remain there until spring break in late March. These areas are generally characterized by the presence of mature softwood stands near water and a food source on south or southwest facing slopes. Such deer wintering areas can be found at Kemptown, Otter Brook, Little River, and West and East rivers.

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

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

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

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

Forest Disturbances and Succession

Forest Disturbances

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

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

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

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

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

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

i. assessing the potential for old forest stands and development class distributions
ii. determining appropriate patch sizes and species composition to emulate natural structures and processes

iii. prescribing the appropriate rotation age and development class structure across a forested landscape
iv. projecting future changes to the forest due to climate change and human disturbances
v. maintaining and conserving biodiversity

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

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

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

Natural Succession

Succession refers to the changes in vegetation types (communities) following disturbance which, over time, often leads to a climax stage. Most changes follow a course of vegetation community development (seral stages) for a particular disturbance regime.

Climax vegetation refers to vegetation communities that are relatively long-lasting and self-replacing. Three types of climax vegetation can be described as follows:

Climatic climax– Vegetation types that are mainly a function of regional climate conditions; these occur on sites with average (mesic) moisture and nutrient conditions.

Disturbance climax – Vegetation types which, due to frequency of disturbance, do not progress to the climatic climax.

Edaphic climax – Vegetation types that are mainly a function of soil and site conditions (i.e. low or excess moisture, low or high fertility) which do not progress to the climatic climax.

Another Definition of Succession

Succession, as defined by Odum (1971), is an orderly process of community development that involves changes in species structure and community processes with time; it is reasonably directional and, therefore, predictable.

Successional development generally proceeds through a number of distinct seral stages (e.g. early, middle, late) that replace one another in a predictable sequence and which culminates in a relatively stable and self-perpetuating community condition called a climax.

– From *Part 1: Vegetation Types (2010) of Forest Ecosystem Classification for Nova Scotia* http://www.gov.ns.ca/natr/forestry/veg-types

Central Uplands – Elements Defined

Landscapes are large areas that function as ecological systems and respond to a variety of influences. Landscapes are composed of smaller ecosystems, known as elements. These elements

are described by their physical (e.g. soil, landform) and ecological features (e.g. climax forest type). These characteristics help determine vegetation development. Elements promote an understanding of historical vegetation patterns and present disturbances.

A landscape profile identified and mapped nine distinctive elements in the Central Uplands 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.

Spruce Hemlock Pine Hummocks and Hills is the matrix element, representing 47% of the ecodistrict. This is a softwood dominated element with climax forests typical of the Acadian Forest, including red spruce, hemlock, and yellow birch.

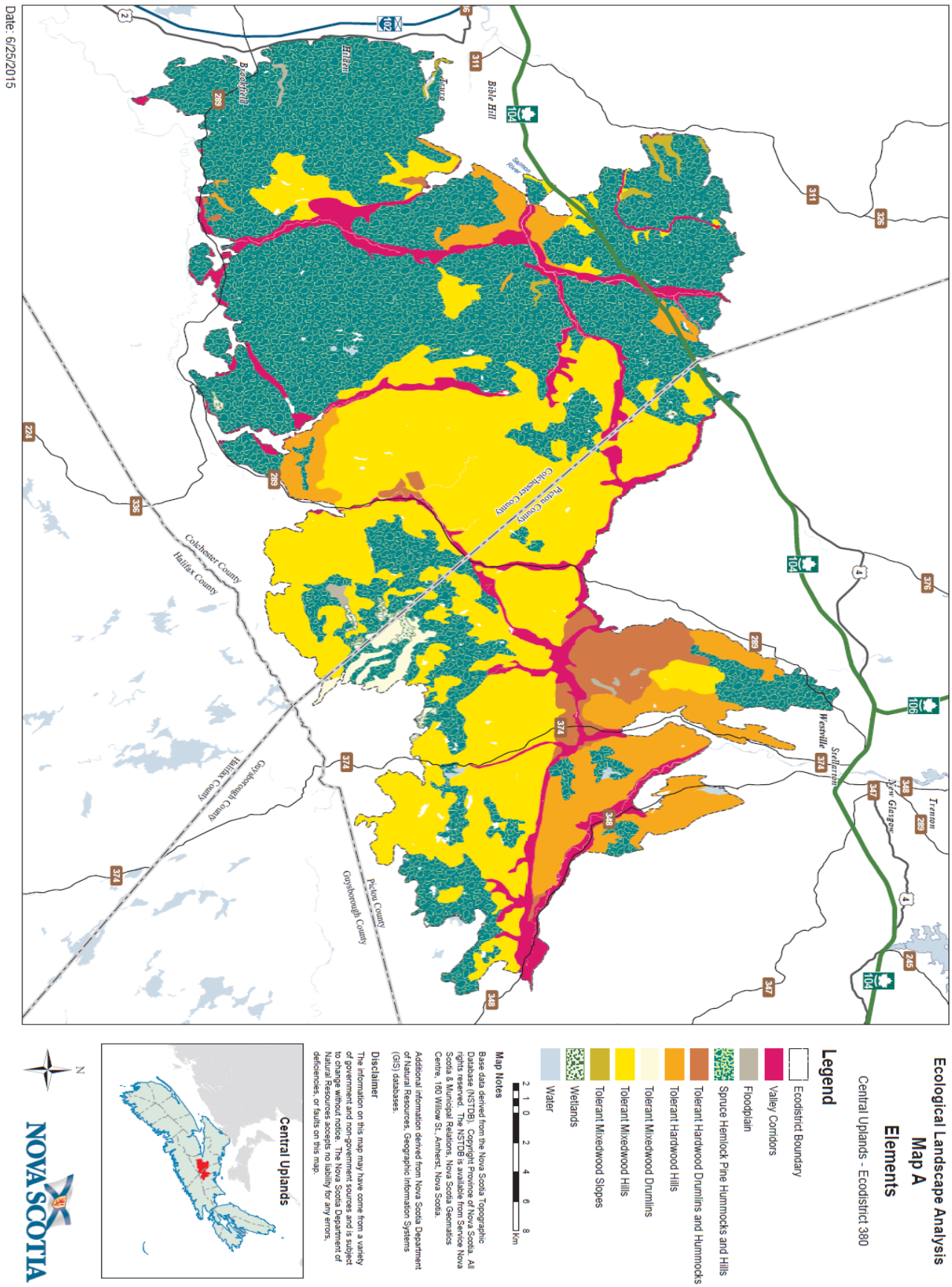
Tolerant Mixedwood Hills, representing nearly one-third of the ecodistrict, is the largest patch element. As a mixedwood element that supports climax species of the Acadian Forest, common species include sugar maple, beech, yellow birch, red spruce, and hemlock.

Other patch elements, in order of size, are **Tolerant Hardwood Hills, Tolerant Hardwood Drumlins and Hummocks, Tolerant Mixedwood Drumlins, Tolerant Mixedwood Slopes, Wetlands**, and **Floodplain**.

Valley Corridors features strong linear river corridors that dissect the ecodistrict in several locations. Salmon River, Murray Brook, Pembroke River, Stewiacke River, Calvary River, West River, and branches of the East River are among the most prominent corridors.

The bark beetle is causing extensive damage in the ecodistrict.

Map of Elements in Ecodistrict



Forest Stands Within Elements

Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)*** (http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp) is helpful in identifying forest plant communities.

Viewed online or available in print through DNR, woodland owners can learn about the characteristics of a particular forest community. Refer to Table 5a for descriptions of elements and Table 5b for forest vegetation types that are likely to be found within elements.

Table 5a – Elements Within Central Uplands		
Element	**Size (Hectares)**	**Element Description**
Spruce Hemlock Pine Hummocks and Hills (Matrix)	60,190 46.9%	This is a softwood-dominated matrix element with climax forests typical of the Acadian forest region. This element occurs on hummocky terrain and gentle slopes underlain by medium to fine-textured soils that are moderately well to imperfectly drained. Under a regime of natural disturbances including hurricane, insects, and fire, red spruce and balsam fir occupy all the successional stages with red spruce creating the climax condition. Hemlock is also a component of the late successional forest but is usually confined to ravines and steep slopes and white pine will be found on coarser and drier soils. Yellow birch can be found in these forests and creates a mixedwood condition with red spruce and hemlock on the finer textured soils. With progressively poorer drainage associated with level terrain black spruce, tamarack, and red maple become more prominent.
Tolerant Mixedwood Hills (Patch)	41,421 32.3%	This large patch element extends through the ecodistrict and supports a late successional forest dominated by the shade-tolerant softwood and hardwood species of the Acadian Forest. The element occurs on the slopes of rounded hills and hummocks underlain predominantly by well-drained, sandy loams. On the upper slopes and crests, forests comprise sugar maple, yellow birch, and beech, but at the middle and lower slope positions forests tend to comprise red spruce, balsam fir, and hemlock or are mixed with yellow birch and maple. At toe slope positions, soils are often moister and richer due to the downslope movement of water and nutrients. Often there are seepage sites along the slope where soils are wetter and richer, with trees such as white ash and ironwood indicating this improved condition. Earlier successional species follow after stand-level disturbances and include red maple, aspen, white and grey birch, and balsam fir.
Tolerant Hardwood Hills (Patch)	10,812 8.4%	This patch element occurs on the larger hills that are underlain by well to moderately well-drained fine-textured soils. Forests of tolerant hardwoods, such as sugar maple, beech, and yellow birch, dominate the crests and upper to middle slopes. On the lower slopes, red spruce and hemlock combine with the hardwoods to create mixedwood forests. Where steep slopes follow the larger streams and rivers, mixedwood forests with a strong component of hemlock and yellow birch are common. Much of the element has been converted to other uses, primarily agriculture and settlement. When fields are abandoned, white spruce is quick to reforest the sites but blueberries can be encouraged with management.
Tolerant Hardwood Drumlins and Hummocks (Patch)	3,949 3.1%	Sugar maple, red maple, yellow birch, and beech dominate on most slope positions with red spruce and yellow birch becoming more abundant on the moist lower slopes and on the steeper slopes associated with major streams. Small floodplain forests of sugar maple and white ash are also possible along watercourses which experience annual flooding and the deposition of alluvial sediments. The dominant natural disturbance in the tolerant hardwood component of this element creates small gaps and patches in the canopy due to insects or disease, windthrow, or storm breakage. As such, these tolerant hardwood forests can be uneven-aged and stands can develop old forest characteristics.

Table 5a – Elements Within Central Uplands		
Element	**Size (Hectares)**	**Element Description**
Tolerant Mixedwood Drumlins (Patch)	1,053 0.8%	This small patch element is localized near the eastern end of the ecodistrict with the drumlin landform also occurring in the adjacent St. Marys River ecodistrict. These drumlins comprise unsorted gravelly glacial tills. The well-drained and productive soils and support forests of shade-tolerant hardwood and softwood species occurring as pure and/or mixedwood covertypes. Often the crests and upper slope positions are preferred by the hardwood species with the softwood becoming more dominant in the middle to lower slope positions. Primary species include red spruce, hemlock, white pine, yellow birch, beech, and sugar maple.
Tolerant Mixedwood Slopes (Patch)	495 0.4%	Tolerant Mixedwood Slopes is a small patch element associated with steep slopes and ravines along watercourses scattered throughout the ecodistrict. One of the best examples is along the Calvary River at Riversdale, where 100-year-old red spruce blanket the slopes to the river's edge. Soils are well-drained sandy loams and loams with moister and richer soils at lower and toe slope positions as water and nutrients move downslope to reach the watercourse and/or level terrain associated with riparian zones. Often there are seepage sites along the slope where soils are wetter and richer with plants indicating this improved condition.
Wetlands (Patch)	432 0.3%	The wetlands element is a small patch ecosystem and comprising freshwater bogs, fens, swamps, and poorly drained areas. In this ecodistrict, the element primarily occurs as a wetland complex associated with rivers and lakes. Most of the larger wetlands in this ecodistrict are associated with the imperfectly and poorly drained soils on level terrain near North River Lake and Dickey Lake.
Floodplain (Patch)	206 0.2%	Several significant rivers originate in the upland terrain of this ecodistrict and floodplain forests are possible. Where annual or periodic flooding along these watercourses has deposited alluvial sediments the terrain is generally smooth and level. These are linear, small areas with soils that can be quite gravelly and coarse-textured and most often are imperfectly drained. The climax forest for this element, occurring on the better-drained alluvial soils, is a tolerant hardwood forest of sugar maple and white ash. Elm is more likely to be found further downstream on the larger floodplains of the lowland ecodistricts.
Valley Corridors (Corridor)	9,790 7.6%	These strong linear river corridors dissect the ecodistrict in several locations, including Salmon River, Murray Brook, Pembroke River, Stewiacke River, Calvary River, West River, and branches of the East River. These corridors are historically associated with late successional spruce, hemlock, pine, sugar maple, yellow birch, beech, and elm that were generally found on the knolls and higher slopes. Mature early and mid-successional softwoods now dominate this element. Only 1% of this element has been placed in reserve status. Approximately 18% has been converted to other uses.
Total	**128,348***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Central Uplands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Hemlock Pine Hummocks and Hills	IH1, IH4, IH6, SH8, SH9, SH10	26	IH7, MW4, MW5, SH5, SH6, SH7	26	MW2, **SH1, SH2, SH3, SH4**	21
Tolerant Hardwood Hills	IH3, IH5, IH6, OF1, OF2	35	IH7, OF4, TH7, TH8	24	**TH1, TH2**, TH3, TH4, TH5	15
Tolerant Hardwood Drumlins and Hummocks	IH3, IH4, IH5, IH6, OF1, OF2	30	IH7, OF4, TH7, TH8	18	**TH1, TH2**, TH3, TH4, TH5	22
Tolerant Mixedwood Drumlins	IH3, IH5, IH6, OF1, OF2, SH8	31	IH7, MW4, MW5, OF4, SH5, SH6	17	**MW1**, MW2, **MW3**, SH1, SH3	23
Tolerant Mixedwood Hills	IH3, IH4, IH5, IH6, OF1, OF2, SH8	17	IH7, MW4, MW5, OF4, SH5, SH6	23	**MW1**, MW2, **MW3**, SH1, SH3	29
Tolerant Mixedwood Slopes	IH4, IH5, IH6, SH8	5	IH7, MW4, MW5, SH5, SH6	30	**MW1**, MW2, **MW3**, SH1, SH2, SH3, SH4	44
Floodplain	FP6	28	FP3	26	**FP1**	35
Wetlands	FP3, 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), Mixedwood (MW), Old Field (OF), Open Woodland (OW), Spruce Hemlock (SH), Spruce Pine (SP), Tolerant Hardwood (TH), Wet Coniferous (WC), Wet Deciduous (WD)
Bolded vegetation types indicate typical late successional community
[1] Forest Ecosystem Classification for Nova Scotia (2010)
*Percentage of element in each successional stage. Percentages may not total 100 due to unclassified lands (such as clearcuts and regenerating stands) not being included.

Photos Illustrating Vegetation Types in Elements

The following photos showsome 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 matrix element.

Balsam fir / Wood fern / Schreber's moss (SH8) is an early successional vegetation type found in the Tolerant Mixedwood Hills patch element.

Sugar maple / New York fern – Northern beech fern (TH2) is a late successional vegetation type found in the Tolerant Hardwood Hills patch element.

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

Red spruce – Balsam fir / Schreber's moss (SH5) is a mid-successional vegetation type found in the Tolerant Mixedwood Drumlins element.

Trembling aspen / Wild raisin / Bunchberry (IH4) is an early successional vegetation type found in the Tolerant Mixedwood Slopes patch element.

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

Red maple / Sensitive fern – Rough goldenrod (FP3) is a mid-successional vegetation type found in the small Floodplain element.

Landscape Composition and Objectives

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

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

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

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

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

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

In the Central Uplands Ecodistrict, infrequent stand-initiating disturbances are the predominant natural disturbance shaping the diversity of forest ecosystems. The time between these stand-initiating disturbances is usually longer than the average longevity of dominant species, supporting processes of canopy gap formation and understory development in mature forests.

The disturbance agents in Central Uplands associated with infrequent disturbances include wind and fire.

The forest ecosystems that arise from this disturbance type are spruce, spruce-hemlock-yellow birch, and sugar maple-yellow birch-red spruce. In areas of the ecodistrict where there is a dominant overstory that is sustained through dynamic processes (gap replacement), understory development and overstory recruitment is evident. These forests usually comprise tolerant species of sugar maple, yellow birch, and beech on the well-drained hills and upper slopes and red spruce, hemlock, and pine on the mid to upper slopes.

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%

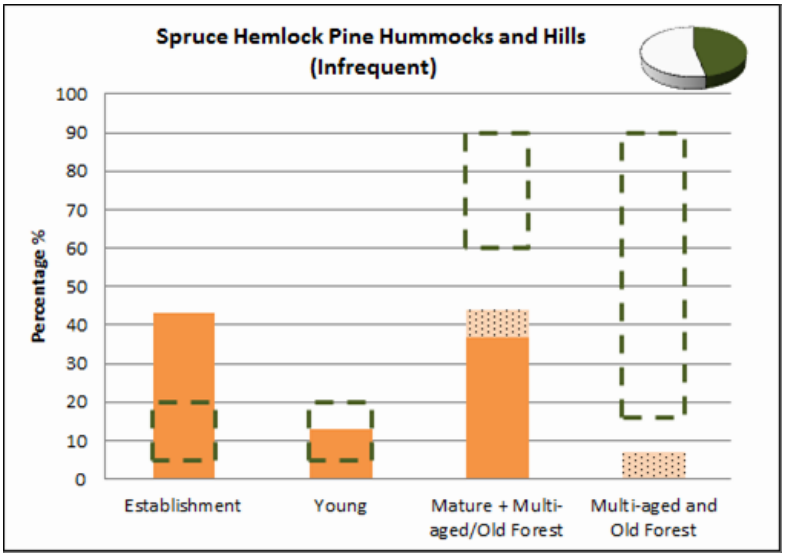
Table 6 indicates that for frequent stand-initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively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

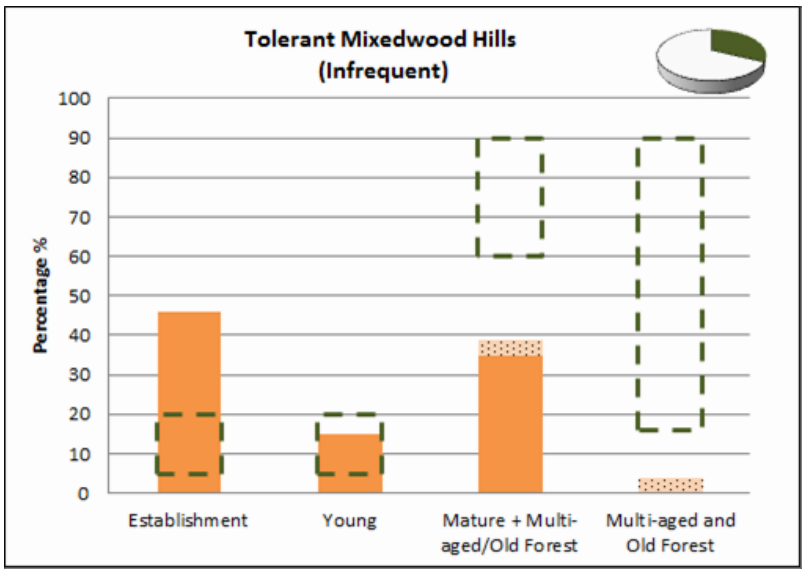
The series of charts that follow combine data on development classes for each element with desired or target percentages, based on the type of natural disturbance regime. The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage 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.

The Central Uplands Ecodistrict has been heavily disturbed during the past 20 years by hurricanes, windstorms, insects (tussock moth and bark beetles), and harvesting. This has placed an extensive percentage of the ecodistrict in the establishment development class with below-target levels for mature and old forest classes. Forest management in all elements should attempt to reduce, where possible, the creation of any additional establishment classes until targets for mature and old forest are within desired ranges.

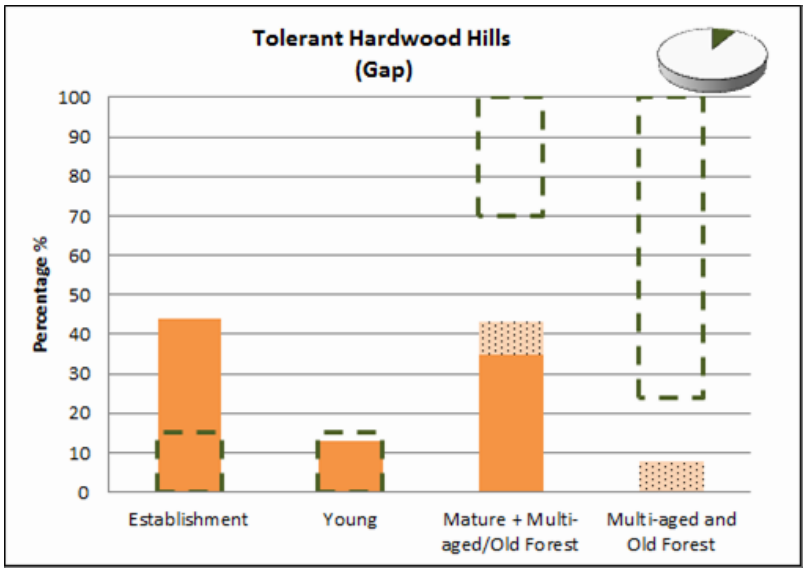
The **Spruce Hemlock Pine Hummocks and Hills** matrix element only meets the target range for young forest. The excess establishment may develop mature characteristics more quickly using silviculture to increase growth and climax species composition. Mature cover can be maintained with partial harvesting and extended rotations. Late seral species, large trees, and natural regeneration are most appropriate.



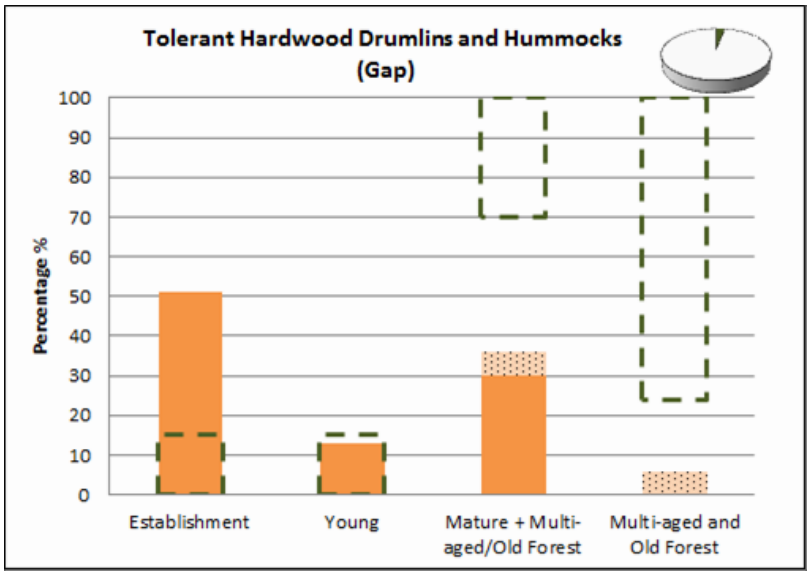
In **Tolerant Mixedwood Hills**, the largest patch element has excessive establishment-stage forest and is below desired levels of mature and multi-aged habitat. Partial harvests to favour climax species and retain large old trees will promote multi-aged forest and maintain mature conditions. Managing immature stands to favour climax species will provide future mature forest opportunities.



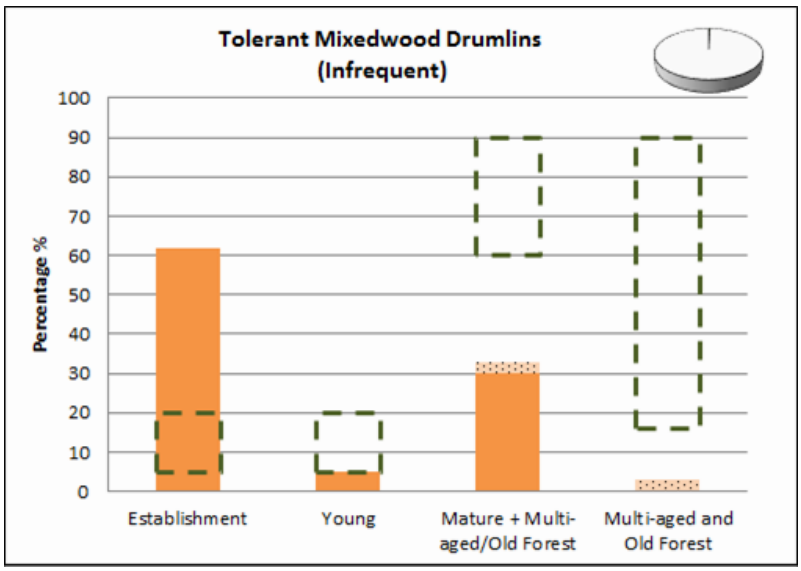
In the **Tolerant Hardwood Hills** element, the multi-aged and old forest classes are below their target ranges. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development, particularly in tolerant hardwood stands. Favouring climax species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



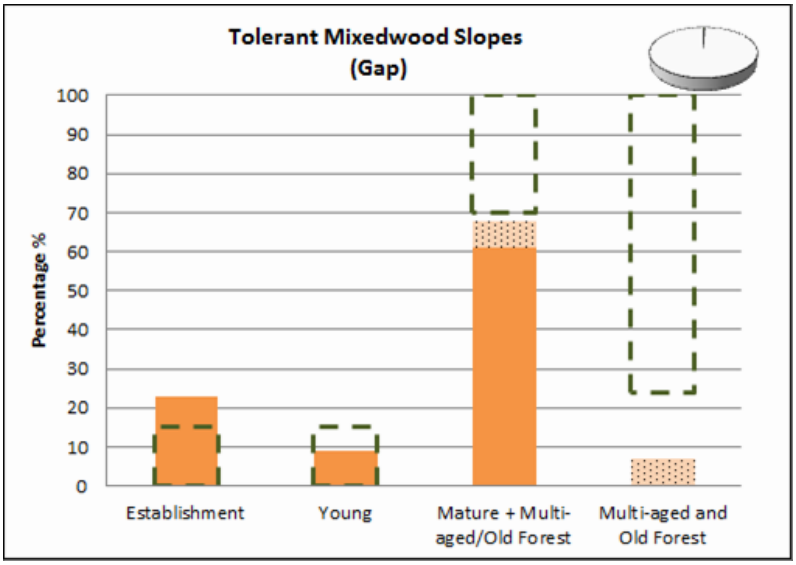
In **Tolerant Hardwood Drumlins and Hummocks,** the multi-aged and old forest classes are below their target ranges. Partial harvests consistent with gap disturbance, including retention of old trees, will promote multi-aged forest development, particularly in tolerant hardwood stands. Favouring climax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



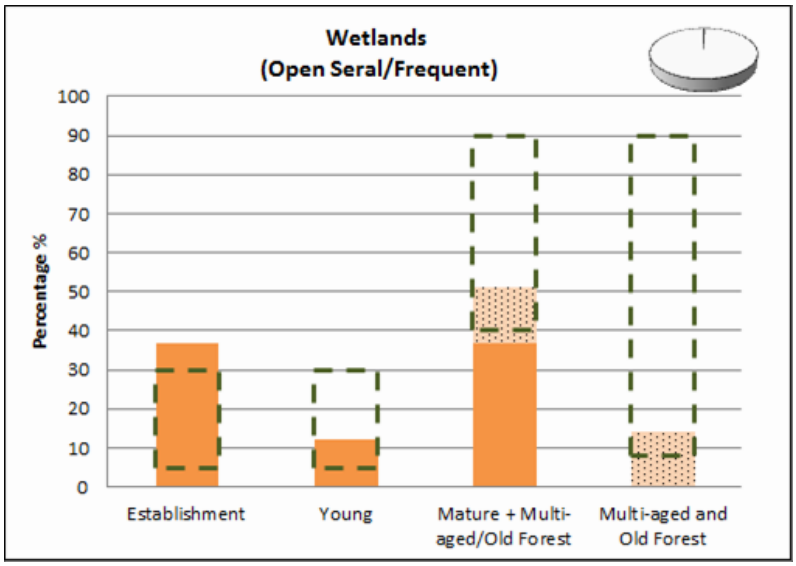
In **Tolerant Mixedwood Drumlins**, multi-aged and old forests are below targets, while establishment levels are high. Partial harvests, including retention of large old trees, will promote multi-aged forest, particularly in tolerant hardwood stands. Managing immature stands to favour climax species will provide future mature forest opportunities.



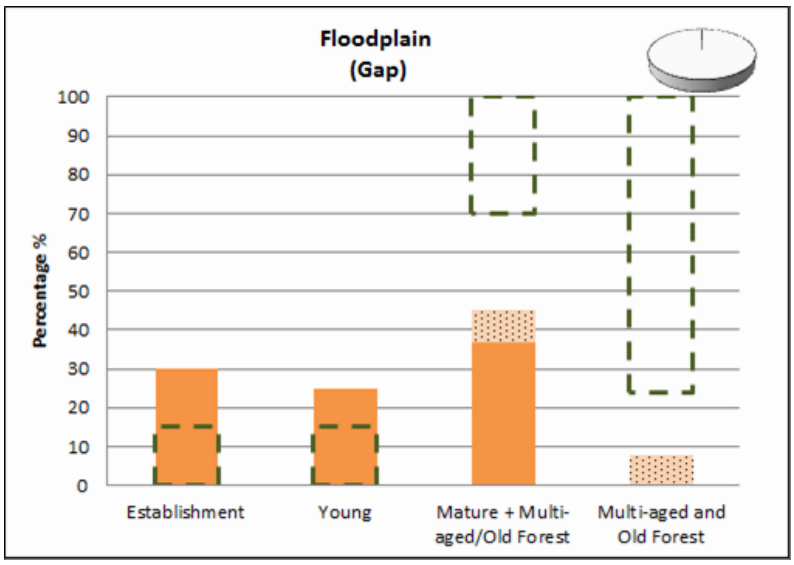
In **Tolerant Mixedwood Slopes** the establishment class currently exceeds target levels for gap disturbed ecosystems, and mature forest and old multi-aged and old forest are below targets. Where opportunities for management exist, partial harvesting in mature forests to maintain canopy and promote mixed ages is appropriate.



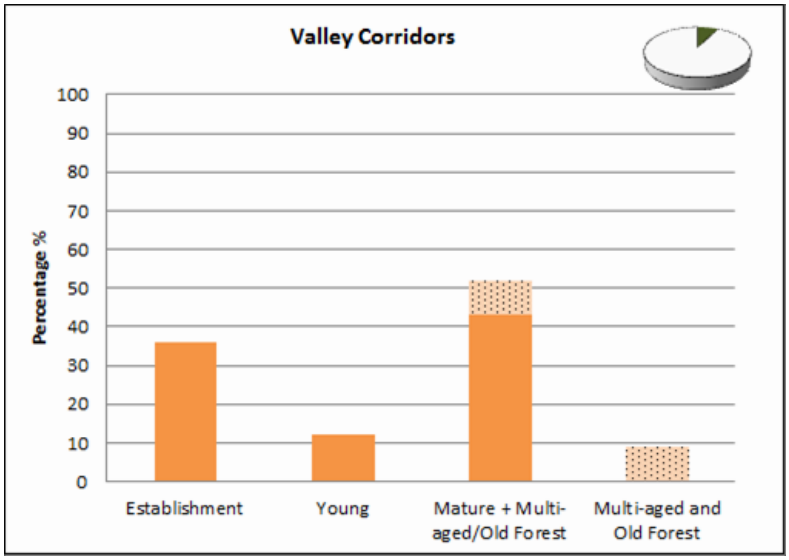
The **Wetlands** element is variably composed of forest, interspersed with woodlands and open wetlands. Disturbances are often patchy, reflecting the diverse structure. The relatively high amount of establishment forest may reflect height growth limitations in poor sites, as well as past harvesting.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



The small **Floodplain** patch element is often associated with the Valley Corridors and the Wetlands elements and provides a habitat interface with the hydrological system. The small size and limited distribution of this element make its composition sensitive to local level disturbance. Maintain mature forest and canopy closure using light, partial harvesting methods.



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. This is particularly valuable in riparian zones, where closed canopies and small openings are most appropriate.



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).