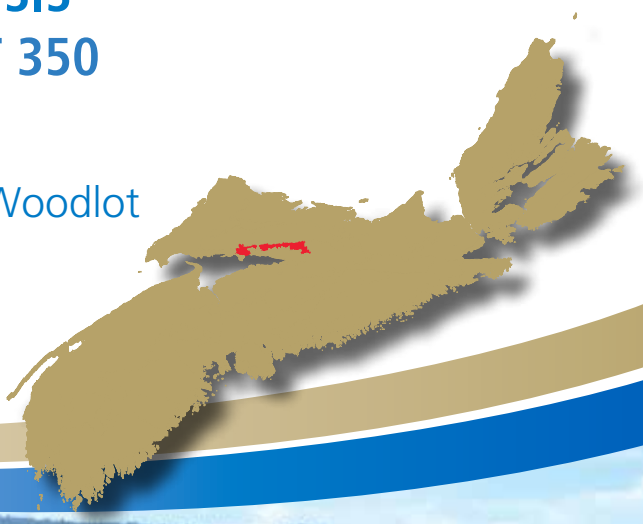
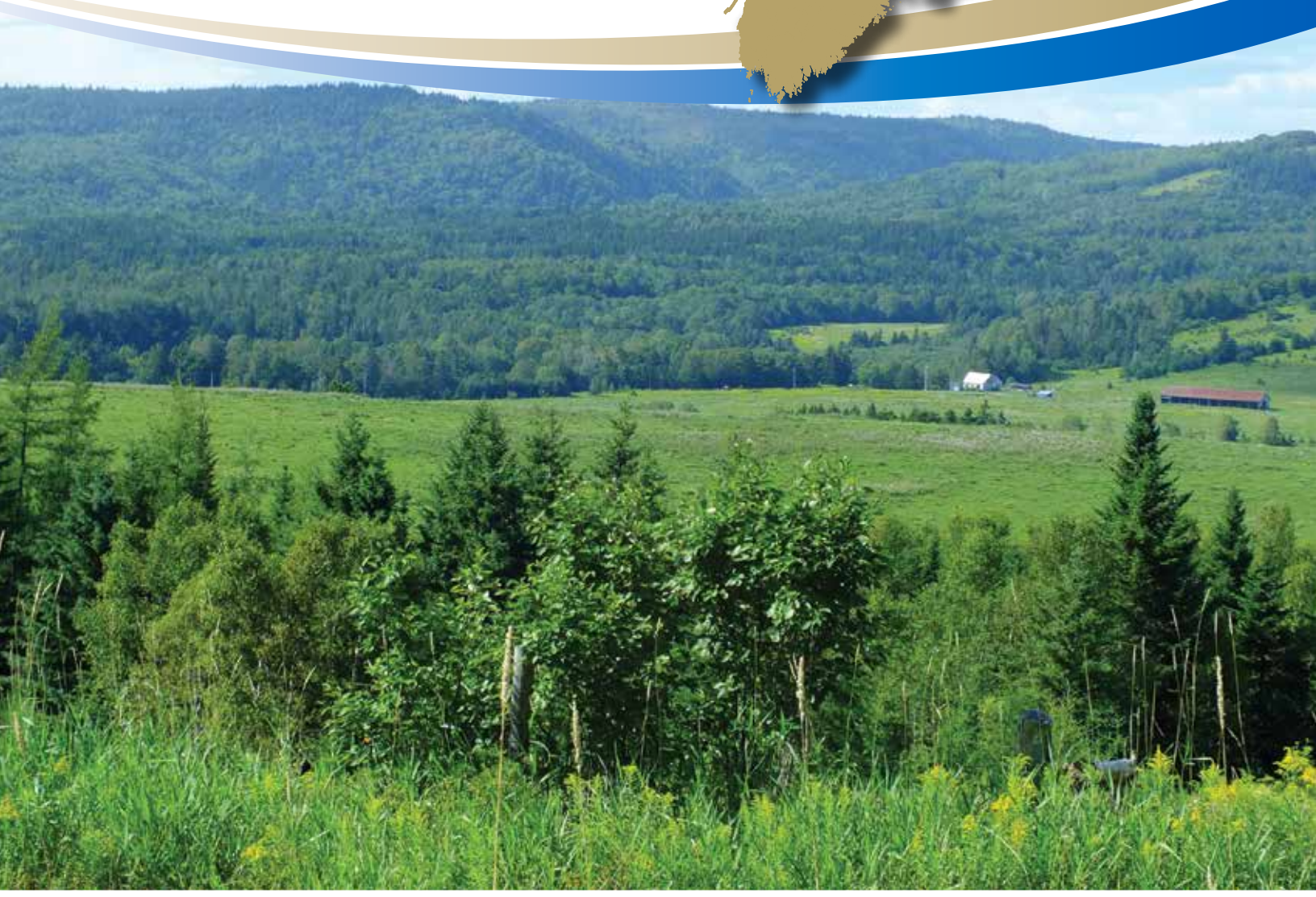
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS COBEQUID SLOPES ECODISTRICT 350

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





ELA 2015-350

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 350: Cobequid Slopes

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Cobequid Slopes 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 2015-350

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Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 350: **Cobequid Slopes**

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 Cobequid Slopes Ecodistrict 350. 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 ecodistrict is wedged between the uplands of the Cobequid Mountains and the lowlands of the Minas Basin and, as such, there are representative forests of both areas in this ecodistrict.

For example, stands of shade-tolerant hardwoods, such as sugar maple, yellow birch, and beech – one of the main types of forest in the ecodistrict – are found on the hills of well-drained, coarse soils between Pleasant Hills and Upper Bass River.

In areas with gentler slopes or fairly level terrain, pure stands of red spruce or red spruce and yellow birch occur as the dominant forest of the slopes. Hemlock occurs on the steeper slopes along streams and rivers.

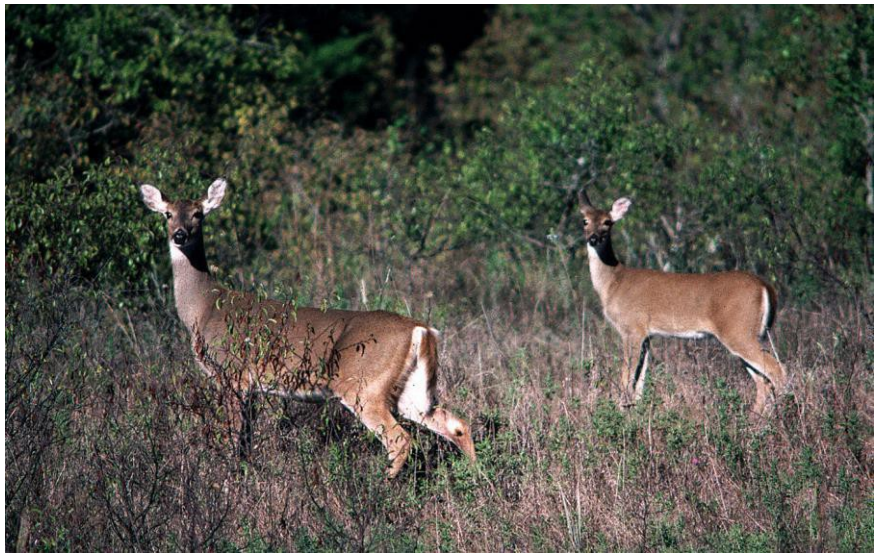
As a narrow band of rolling hills from North River in the east to Economy in the west, the southerly part of this ecodistrict provides significant winter habitat for large populations of white-tailed deer that come down from higher elevations as deep snow restricts movement.

Wetlands are generally absent and lakes few in this ecodistrict. Most of the freshwater, only 0.4% of the area, is found in streams and rivers that flow through the ecodistrict on their way to the Minas Basin.

The upper elevations of the Cobequid Hills are visible in the distance as red spruce forests and yellow birch dominated mixedwoods define the lower slopes of the Cobequid Slopes ecodistrict.

The largest rivers in this ecodistrict include the North, Debert, Portapique, Folly, and Economy.

Private land ownership accounts for about three-quarters of the total Cobequid Slopes Ecodistrict area of 37,087 hectares. About one-quarter of the ecodistrict is under provincial Crown management. The remainder is federal or other lands.



As snow in higher elevations deepens, white-tailed deer, such as this doe and fawn, move into the warmer, south-facing slopes of the ecodistrict.

Natural disturbance agents in the ecodistrict are primarily associated with climate and include hurricanes and wind storms, ice storms, and damage associated with freeze and thaw cycles. Occasional stand-level mortality will occur due to insect and disease epidemics such as the spruce budworm, tussock moth, and birch dieback.

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 five key landscape elements – one dominant matrix element, three smaller patch elements, and a corridor element− in Cobequid Slopes.

Tolerant Mixedwood Hills is the matrix element, representing 58% of the ecodistrict. This element naturally supports shade-tolerant species of the Acadian Forest, such as sugar maple, yellow birch, beech, and red spruce. In areas of stand-level disturbances, early successional species often become established, such as red maple, white and grey birch, aspen and balsam fir.

Red Spruce Hummocks, representing 36% of the ecodistrict, is the largest patch element. The dominant species is red spruce. The two other patch elements, in order of size, are **Tolerant Mixedwood Slopes** and **Spruce Pine Hummocks**.

Valley Corridors, a linear element associated with the major watercourses in the ecodistrict, also includes floodplains.

Forest Ecosystem Management
For Cobequid Slopes 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 Cobequid Slopes Ecodistrict 350. 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 Cobequid Slopes Ecodistrict was up to 2006. These baseline measurements can be used to assess trends through comparison with present and future inventories.

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

Finally, the relationship between inherent structure and existing conditions is used to guide future direction. The ELA is part of an ecosystem approach that will expand to encompass other initiatives of the Department of Natural Resources (DNR), such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011 – 2020 (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 Cobequid Slopes – *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 Cobequid Slopes Ecodistrict is located northwest of Truro, wedged between Cobequid Hills Ecodistrict 340 to the north and Minas Lowlands Ecodistrict 620 to the south.

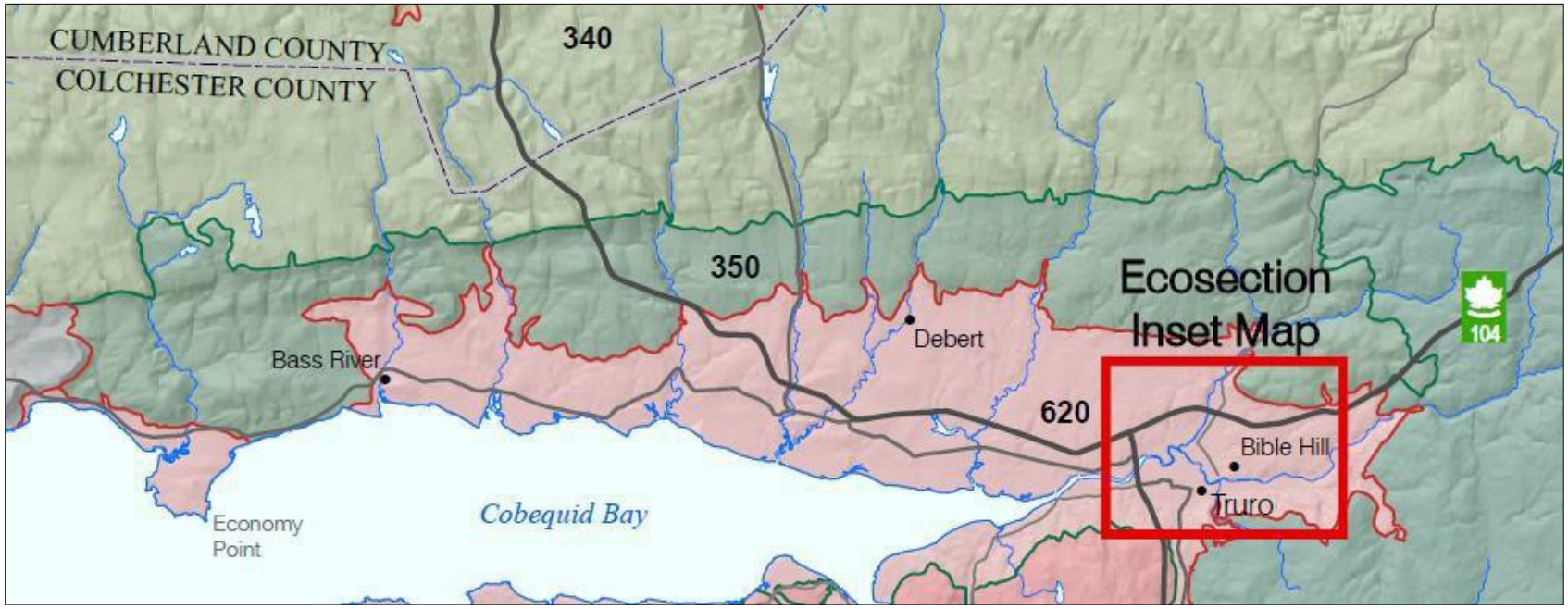
The Cobequid Fault provides the northern boundary of this ecodistrict which separates the older more resistant pre-Carboniferous rocks of the Cobequid Hills from the late Carboniferous siltstone, shale, and conglomerate. The southern boundary is the Portapique Fault which separates the slopes from the Triassic siltstone and sandstone of the Minas Lowlands.

The forests of the Cobequid Slopes Ecodistrict are predominately shade-tolerant species of red spruce, hemlock, sugar maple, yellow birch, and beech. On the gentler slopes, where there are moist, medium-textured soils, pure stands of red spruce or red spruce and yellow birch dominate. Hemlock, and occasionally white pine, stands will be found primarily on the steep slopes along the rivers and streams.

Softwood cover on south-facing slopes is important for deer wintering areas.

DNR fire records do not attribute any fires in the last 40 years to lightning in this ecodistrict. The second growth forest of balsam fir has been extensively damaged by spruce budworm and tussock moth. In the last few years, white spruce stands on the abandoned farmlands have been damaged by the bark beetle.

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



Cobequid Slopes 340 is a relatively small ecodistrict in central Colchester County that curls north of Truro.

(From Ecodistricts of Nova Scotia map 2007)

Land Area

Cobequid Slopes is rural and predominately under private ownership at 74%, with 24% of the ecodistrict under the administration of provincial Crown (Table 1).

Federal and other lands account for the remainder.

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

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	8,816	23.8
Private	27,324	73.7
Federal	257	0.7
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	690	1.8
Total	**37,087**	**100**

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

IRM Resource Classification for Provincial Crown Lands

The Integrated Resource Management (IRM) classification for Crown lands was developed through a public consultation process during the strategic phase of IRM completed in 2002.

Table 2 provides a summary of Crown lands designated as either C1, General Resource Use; C2, Multiple and Adaptive Use (allows most uses, but special management may be required); or C3, Protected and Limited Use (such as beaches and sites of cultural and historic significance).

Table 2 – IRM Land Use Categories for Provincial Crown Lands in Ecodistrict

IRM Land Use Category	Hectares	Percent of Crown Lands
C1 – General Resource Use	1590	18
C2 – Multiple and Adaptive Use	6228	70.7
C3 – Protected and Limited Use	997	11.3
Unclassified	<1	<0.1
Total	**8,815**	**100**

In Cobequid Slopes, the percentages for the various categories of Crown land are C1 (18%), C2 (71%), and C3 (11%).

This ecodistrict has 11 private camps on Crown land, with nine of them concentrated around Newton Lake and Newton Pond, which are inside the Economy River Wilderness Area. The other two camps are further east, one north of Upper Bass River, the other in McCallum Settlement. The camp sites are Crown leases administered by the DNR.

Additionally, Crown lands in the Pleasant Hills area are leased for blueberry production.

The Kenomee Trail Society has a license to build and maintain a hiking trail on the west side of the Economy River. Within the Economy River Wilderness Area, the trail crosses the river and continues north as a wilderness trail system.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	31,719	85.5
Wetland	617	1.7
Agriculture	2,473	6.7
Barrens	0	0
Urban	495	1.3
Road, Trail, Utility	747	2.0
Other	1,036	2.8
Total	**37,087**	**100**

Forests

Within this ecodistrict, 31,719 hectares of land, or 86%, are forested (Table 3). Agriculture accounts for 7%, or 2,473 hectares. Urban areas account for 1%, or 495 hectares.

The covertype of the Cobequid Slopes comprises 54% softwood, 26% mixedwood, and 15% hardwood.

The forests of this area predominantly comprise shade-loving species, such as red spruce, sugar maple, beech, and hemlock. In areas with gentler slopes with moist textured soils, pure stands of red spruce or combinations of red spruce and yellow birch will flourish. Red spruce dominated stands account for 27% of the current forest.

Agriculture accounts for nearly 7% of the land use in Cobequid Slopes and much of the land is for blueberry production.

Pure stands of tolerant hardwoods, with a high beech component, are found on hills of well-drained coarse soils between Pleasant Hills and Upper Bass River.

A significant portion of this landscape is dominated by white spruce, at 12%. These forests originated from abandoned farmlands and recently have begun to deteriorate due to bark beetle attacks.

The average Land Capability (LC) of forested land in this ecodistrict is estimated to be 5.4 cubic metres per hectare per year (m^3/ha/yr), based on the ratings in Table 4. The average forest LC for the province is 4.9 m^3/ha/yr. About two-thirds of the forested land has an LC rating of 6 or higher.

Some areas are not suitable for trees.

There are several small sawmills (hardwood and softwood) in the area.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	127	0.4
3	318	1.0
4	2,760	8.7
5	14,336	45.2
6	12,878	40.6
7 or more	1,300	4.1
Total	31,719	100

*Based on growth potential for softwood species.

Red spruce stands are common in the Cobequid Slopes Ecodistrict.

Water Resources

Wetlands and lakes are few in this ecodistrict. Freshwater, mainly located in the streams and rivers flowing from the Cobequid Hills on their way to the Minas Basin, accounts for 0.4%. The largest rivers in this area include the North, Debert, Portapique, Folly, and Economy.

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:
https://www.novascotia.ca/nse/water.strategy/docs/WaterStrategy_Water.Resources.Management.Strategy.pdf

Minerals, Energy and Geology

In the Cobequid Slopes Ecodistrict, the Cobequid-Chedabucto Fault System comprises several faults generally running east to west, resulting in a significant change in topography between the highlands of the Cobequid Mountains and the lowlands to the north and south.

Along this fault system are numerous mineral occurrences and good potential for mineral deposits, particularly iron-oxide, copper, and gold.

The Cobequid Slopes bedrock geology consists of rocks from 205 to more than 650 million years ago. There are numerous rock types in the area, including sedimentary, plutonic, volcanic, and others.

Overlying the bedrock in many parts of Cobequid Slopes are recent glacial sediments. Most of the slopes are covered with a thin layer of glacial till. These factors contribute to the development of soils. The glacial deposits located along the ridges and valleys are an important source of gravel and sand.

Abundant fault movements in the area give rise to varied geology. There are numerous significant mineral deposits, many of which are related to mineralizing fluids moving along the fault zones.

There has been recent exploration for conventional oil and gas adjacent to and within Cobequid Slopes. Sandstones and shales of the Horton Group are of particular interest in oil and gas exploration since they often contain good source rock and reservoirs for hydrocarbons.

Iron ore was mined at Londonderry up until the early 1900s. Past production of manganese occurred in Manganese Mines.

There is currently no active underground mining in the Cobequid Hills Ecodistrict.

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

Parks and Recreation / Protected Areas

There are no provincial parks or park reserves in the Cobequid Slopes Ecodistrict.

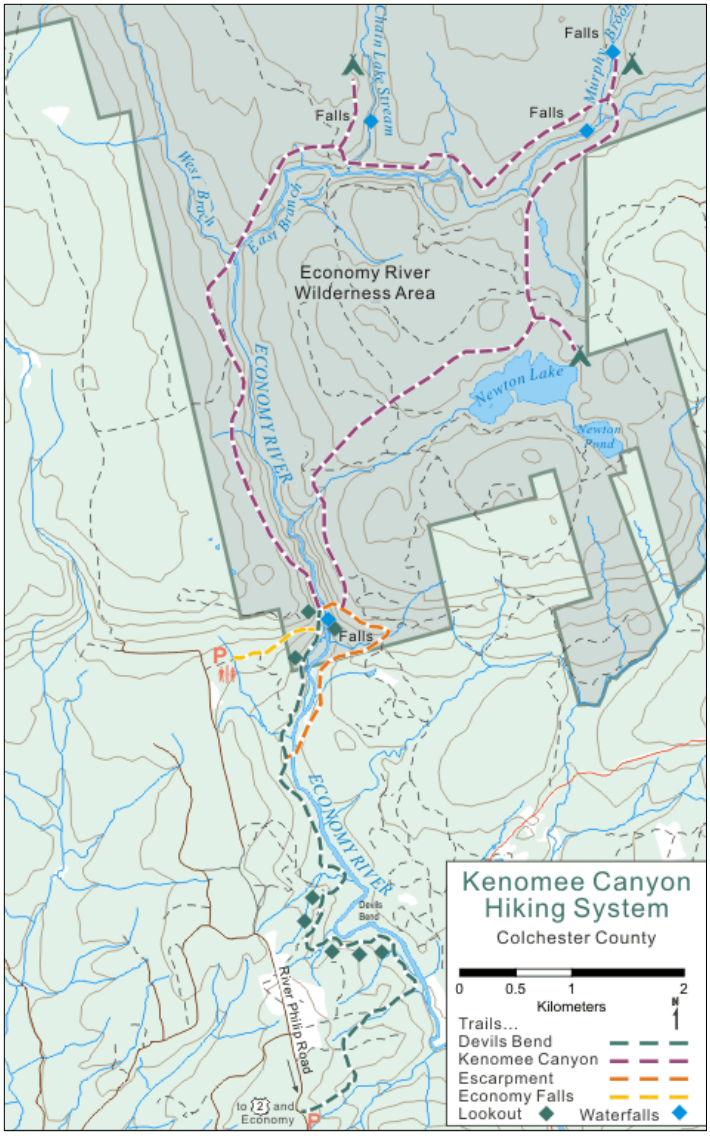
The northern boundary of the ecodistrict cuts along the southern sections of the Economy River Wilderness Area and the Portapique River Wilderness Area.

The Kenomee Canyon Hiking System is located along the Economy River and Newton Lake is found within this ecodistrict. This hiking system has four different trails: the Devil's Bend Trail (6.6 km), Economy Falls Trail (1 km), Cobequid Escarpment Trail (2.5 km), and the Kenomee Canyon Trail (18 km).

Hunting, fishing, hiking, and snowmobiling and ATV are the traditional outdoor recreational pursuits.

Although there are numerous small streams and rivers throughout the ecodistrict there are few freshwater lakes. Newton Lake, Newton Pond, and Harts Lake are the larger freshwater bodies.

Hunting for deer, bear, ruffed grouse, rabbits and pheasant is popular in the fall and early winter.



The Kenomee Canyon Hiking System, as shown in this Nova Scotia government map, has four different trails.

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

Wildlife and Wildlife Habitat

Wildlife in the Cobequid Slopes 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 Cobequid Slopes and other ecodistricts comes from a number of sources, including surveys, harvest statistics, hunter and trapper reports (abundance rankings), biological collections from harvested and road killed animals, and observations and reports from the public and DNR staff. Information on important sites is documented by DNR in the Significant Habitats Database and by the Atlantic Canada Conservation Data Centre in Sackville, N.B.

Old forests are recognized as providing important wildlife habitat. The provincial goal is to have a minimum 8% for old forests on Provincial Crown land. Shade-tolerant hardwoods and softwoods may provide important wildlife structural components, such as cavity trees, and are encouraged across the landscape through appropriate silviculture systems.

The Economy, Portapique, Great Village, Debert, Chiganois, and North are the major river systems flowing through Cobequid Slopes into the Minas Basin and Cobequid Bay.

Waterfalls and steep gorges can be found in association with these rivers and their tributaries. The Economy River Falls is located near the boundary of this ecodistrict and the adjacent Cobequid Hills.

Some rare plants have been found near the falls, including least grape-fern and lance-leaf grape-fern.

The river systems in this ecodistrict are important for connectivity between the Cobequid Hills Ecodistrict 340 and Minas Lowlands Ecodistrict 620 and are important habitats for many species of wildlife.

Atlantic salmon has been designated under federal legislation as an endangered species. These river systems no longer support a heathy salmon population. Special management practices are important to maintain habitat, prevent siltation, and reduce other threats to salmon and other aquatic species.

Newton and Harts lakes both provide good moose habitat, primarily during the summer months as foraging and refuge areas.

Mainland moose were declared endangered species under provincial legislation in 2003 due to a significant population decline. Implementation of special management practices is important to ensure suitable habitat is available to meet the needs of this species.

Most of this ecodistrict is a significant deer wintering area. White-tailed deer come down off the Cobequid Hills to spend the winter on the south-facing slopes.

White-tailed deer come down from the Cobequid Hills during the winter to the south-facing slopes of the Cobequid Slopes.

The abandoned mines in the Londonderry area are found on the boundary of this ecodistrict and the adjacent Cobequid Hills Ecodistrict. These old mine workings are a significant overwintering site for bats. Although the size of the bat hibernacula is not known for certain, it has the potential to be one of the largest in the province. *In 2013, Nova Scotia added three species of bats to its endangered species list due to a fungal infection called white-nose syndrome that has killed more than 90% of the province's bat population.*

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

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

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

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

Forest Disturbances and Succession

Forest Disturbances

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

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

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

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

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

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

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

iii. prescribing the appropriate rotation age and development class structure 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 Cobequid Slopes are primarily associated with climate and include hurricanes and wind storms, ice storms, and damage or mortality associated with freeze and thaw cycles. Occasional stand-level mortality will occur as a result of insect and disease epidemics, such as the spruce budworm and tussock moth.

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

Cobequid Slopes – 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 five distinctive elements in the Cobequid Slopes Ecodistrict – one matrix, three 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.

Tolerant Mixedwood Hills is the matrix element, representing 58% of the ecodistrict. This element naturally supports shade-tolerant species of the Acadian Forest, such as sugar maple, yellow birch, beech, and red spruce. In areas of stand-level disturbances, early successional species often become established, such as red maple, white and grey birch, aspen and balsam fir.

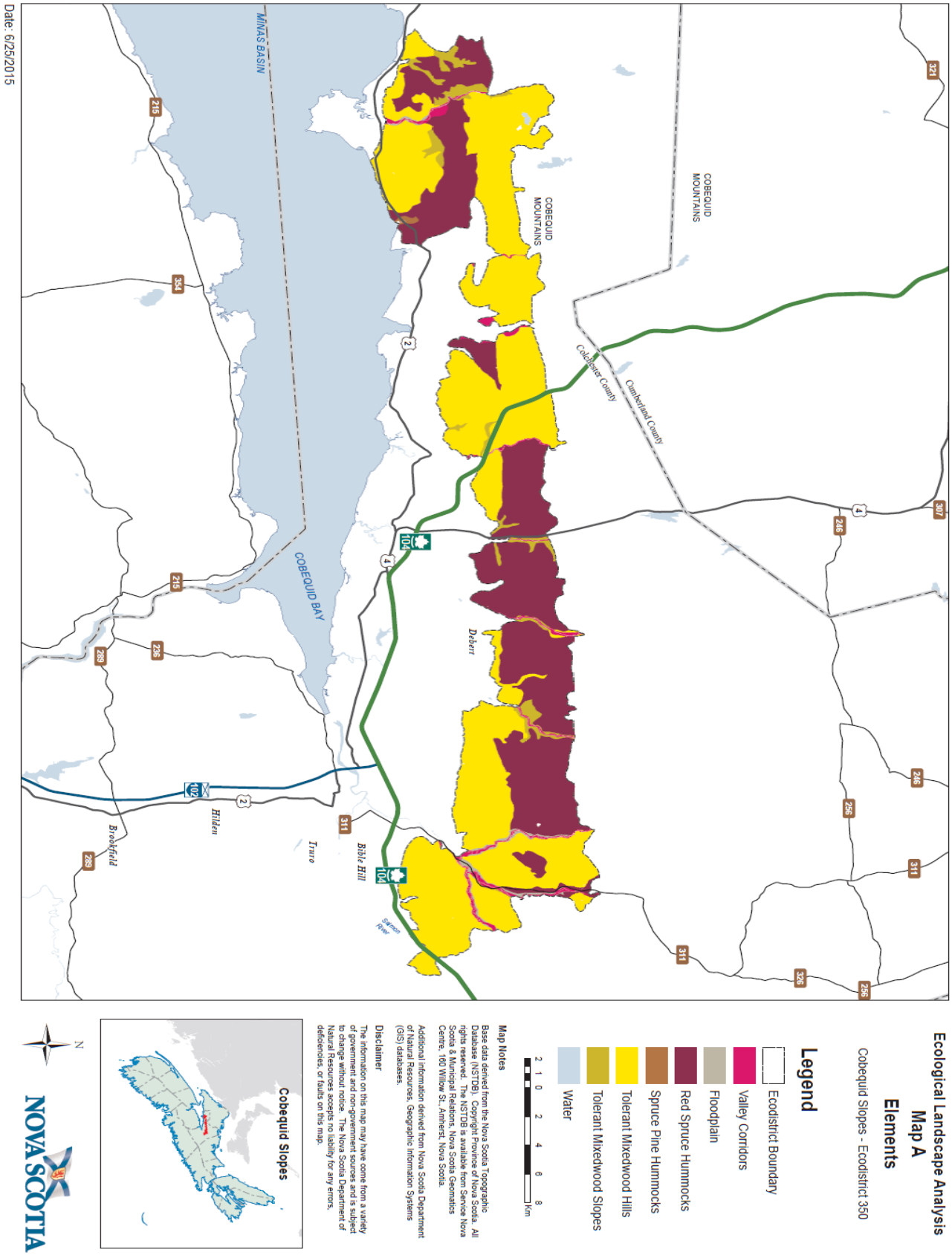
Red Spruce Hummocks, representing 36% of the ecodistrict, is the largest patch element. The dominant species is red spruce. The two other patch elements, in order of size, are **Tolerant Mixedwood Slopes** and **Spruce Pine Hummocks**.

Valley Corridors, a linear element associated with the major watercourses in the ecodistrict, also includes floodplains.

The main corridor systems follow the major river valleys. These systems dissect the ecodistrict but also provide linkages to the Cobequid Hills and the Minas Lowlands ecodistricts.

The forest within some of these corridors, most notably along the Economy River, at the north end of the Great Village River and along the North River, have been significantly altered by human land use, settlement, transportation and utility systems, agriculture, and forestry.

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 Cobequid Slopes		
Element	**Size (Hectares)**	Element Description
Tolerant Mixedwood Hills (Matrix)	21,250 57.8%	This matrix-level element extends through the entire ecodistrict and supports a late successional forest dominated by the shade-tolerant species of the Acadian Forest. The element occurs on the slopes of rounded hills underlain by well-drained soils of varying texture. On the upper slopes and crests forests are comprised of sugar maple, yellow birch, and beech but at the middle and lower slope positions forests tend to be comprised of red spruce and balsam fir mixed with yellow birch and maple. At toe slope positions, soils are often moister and richer as moisture 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 and trees such as white ash and ironwood indicating this improved condition. Slopes underlain by finer textured soils such as those at East Mountain, Onslow Mountain, and Economy Mountain are dissected with many small flow channels. Earlier successional species follow after stand-level disturbances and include red maple, aspens, white and grey birch, and balsam fir. Often a component of residual red spruce is left following both harvesting and natural disturbances.
Red Spruce Hummocks (Patch)	13,371 36.4%	This is a large patch-level element occurring on gently undulating terrain throughout the ecodistrict and is very extensive at several locations on the south-facing lower slopes of the Cobequid Hills. The soils are generally well to imperfectly drained sandy loams and loams but a few scattered areas are underlain by clay creating poorly drained conditions. The dominant forests comprise red spruce but as soils get moist and imperfectly drained, black spruce and the hybrid red-black spruce are more common. Stands with a high component of hemlock and white pine are uncommon. On upper slopes of some of the higher terrain, tolerant hardwood forests are possible and yellow birch can be a significant component of the red spruce on long gentle slopes. With progressively poorer drainage on level terrain, black spruce and tamarack dominate the forest vegetation and small wetlands are embedded in the landscape. Early and mid-successional forests will have red maple, white birch, aspens, and balsam fir.
Tolerant Mixedwood Slopes (Patch)	1,195 3.2%	Tolerant Mixedwood Slopes is a patch element associated with steep-sided slopes and ravines along major watercourses leaving the Cobequid Hills. The most notable are along the Chiganois, Debert, and Economy rivers. Soils are mostly well-drained with moister and richer soils at lower and toe slope positions as water and nutrients move downslope to reach the watercourse and/or the 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. Soils are derived from glacial tills and are primarily sandy loams and loams, although coarse-textured soils are common on excessively steep slopes and are derived from glacial tills. Mixedwood forest of shade-tolerant tree species such as sugar maple, yellow birch, red spruce, hemlock, and white pine are typical.

Table 5a – Elements Within Cobequid Slopes		
Element	**Size (Hectares)**	**Element Description**
Spruce Pine Hummocks (Patch)	54 0.1%	Spruce Pine Hummocks is a small patch level element with imperfectly drained, gravelly, coarse-textured soils associated with glacial fluvial deposits along the Little Bass River. The imperfect drainage conditions expressed in the soils underlying this terrain can be attributed to the gentle slope of the landscape. The inherent low fertility and imperfect drainage of the gravelly sandy soils give rise to forests of black spruce and white pine. With progressively poorer drainage, wet forests of black spruce, tamarack and red maple or shrubby wetlands will occur. Stands may be frequently disturbed by windthrow and are usually even-aged. Early successional forests originating from stand-level harvesting will include red maple, white birch, grey birch, pin cherry, aspens, and balsam fir. The better-drained soils have been cleared for agriculture.
Valley Corridors (Corridor)	908 ha 2.5%	The corridor systems are very strong linear features that dissect the ecodistrict in several locations - Economy, Bass, Portapique, Great Village, Folly, Debert, Chiganois, and North rivers. The climax forests within these systems are a mixture of all three covertypes with frequent to gap disturbances. Red and black spruce dominate the softwood areas. In the mixedwood areas the red spruce, sugar maple, yellow birch, beech along with hemlock and white pine dominate. The inherent hardwood covertype accounts for 30% of the corridors and in this element are found elm, sugar maple, and white ash (Appendix 10). The development classes in the present forest are fairly well balanced but there is a shift toward more softwood and less mixedwood and hardwood covertypes. Only 23% of the forest is in the late seral stage. *Floodplains, which are part of the Valley Corridors element, in this ecodistrict are associated with smooth, level terrain along the Economy River and North River, including both its south and west branches. Alluvial deposits of sediment occur with annual or periodic flooding. These are linear, small patch-level elements with soils that range from sandy loams to loams that can be well to imperfectly drained. The soils are usually stone free. The climax forest for this element occurs on the better-drained alluvial soils is the shade-tolerant hardwood forest of sugar maple, white ash, and elm. Small gap disturbances in this climax forest maintain a canopy that provides important functions along these watercourses. Earlier successional forests include red maple and white spruce. The imperfectly drained soils support a forest comprising black spruce that is subjected to frequent stand-level disturbances such as flooding and windthrow. As the soils get progressively wetter, tamarack, red maple, willows, and alders become more abundant. Where soils could be farmed they have been converted to agricultural use.*
Total	**36,778***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Cobequid Slopes						
Element	**Seral Stage**					
	Early	**% ***	**Middle**	**%**	**Late**	**%**
Tolerant Mixedwood Hills	IH1, IH3, IH4, IH5, IH6, MW4, MW5	30	MW2, SH5, SH6, SH8	25	**MW1, MW3,** SH1	26
Tolerant Mixedwood Slopes	IH6, MW4, MW5	15	MW2, SH5, SH8	32	**MW1, MW3,** SH1	40
Red Spruce Hummocks	IH1, IH3, IH4, IH5, IH6, MW4, MW5	20	MW2, SH5, SH6, SH7, SH8	28	**SH3,** SH1, SH2, SH4	32
Spruce Pine Hummocks	SP8	65	SP4, SP6	17	**SP5,** SP7	0
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.						

A variety of hardwood and softwood species at different stages of successional development are found in the ecodistrict.

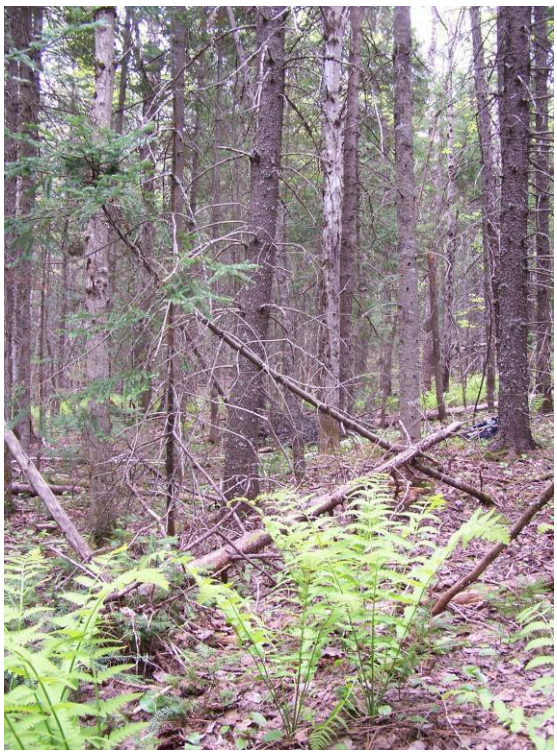
Photos Illustrating Vegetation Types in Elements

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

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

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

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



Black spruce – Aspen / Bracken – Sarsaparilla (SP8) is an early successional vegetation type found in the Spruce Pine Hummocks 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.

On Cobequid Slopes, infrequent stand-initiating disturbances are the dominant natural disturbance regime shaping the diversity of forest ecosystems. The disturbance agents on the Cobequid Slopes associated with infrequent to gap disturbances include wind, ice storms, and damage or mortality associated with freeze and thaw cycles. The forest ecosystems that arise from this disturbance type are red 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, such as gap replacement, understory development and overstory recruitment are evident. These forests usually comprise the most shade-tolerant species of sugar maple, yellow birch, and beech on well-drained hills and upper slopes, with red spruce, hemlock, and pine found in 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).

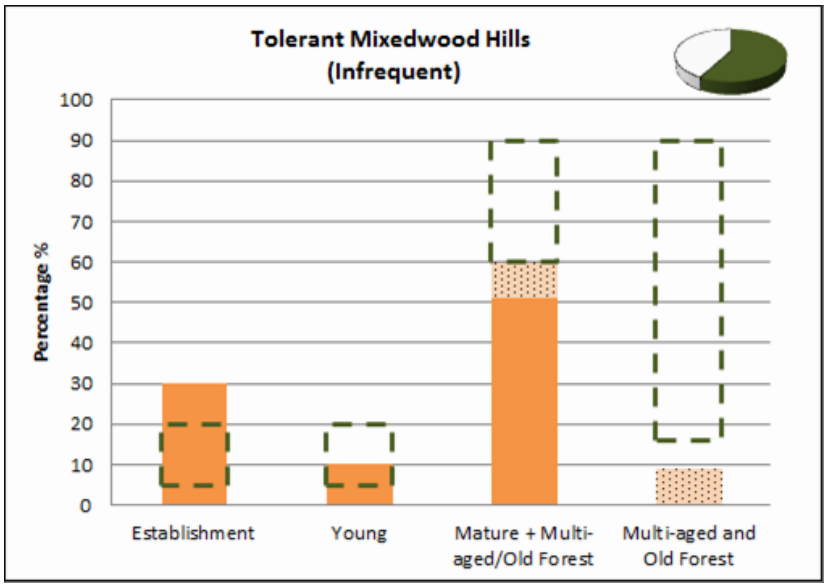
Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)

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%

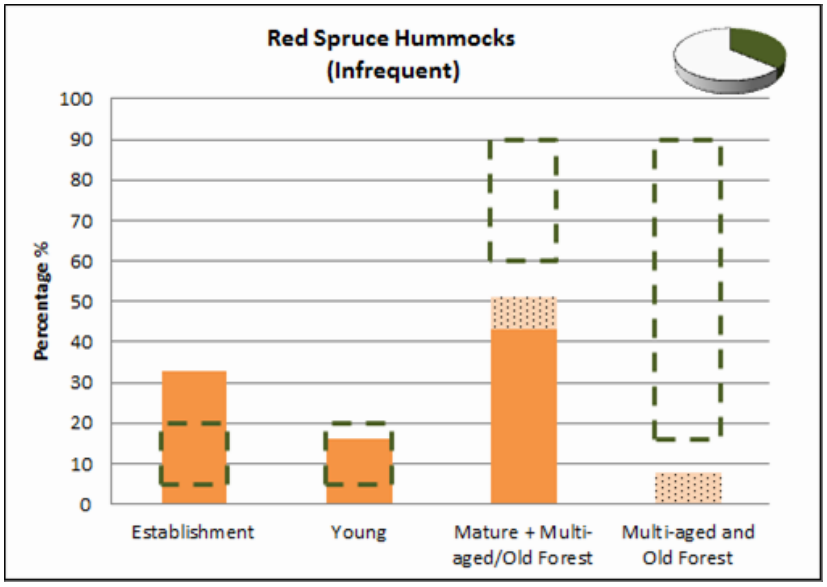
Table 6 indicates that for frequent stand-initiating disturbances, both establishment and young development class forests would typically comprise between 5 and 30% of area, while mature forest – which includes multi-aged and old forest – would cover more than 40%. Mature forest should consist of a relatively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

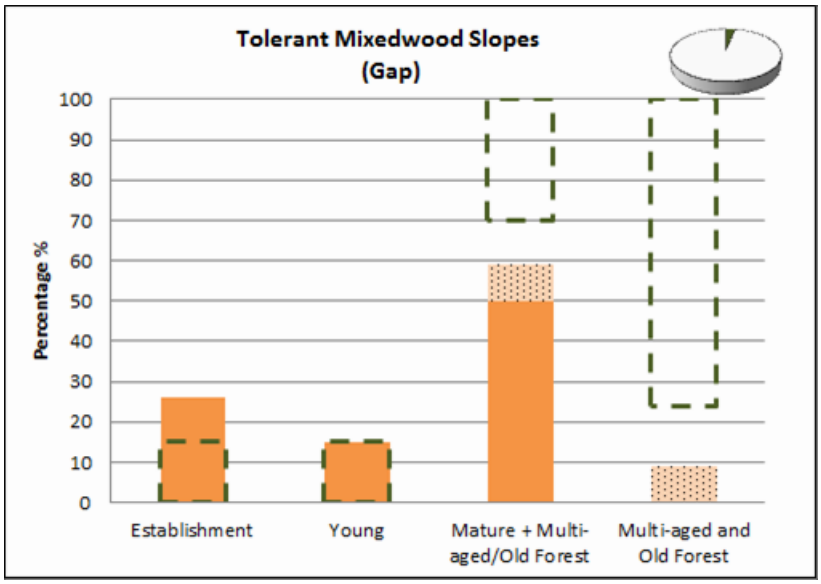


The **Tolerant Mixedwood Hills** matrix element has excessive establishment-stage forest and is below desired levels of mature and multi-aged habitat. Partial harvests to favour climax species and retain large old trees will promote multi-aged forest and maintain mature conditions. Managing immature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

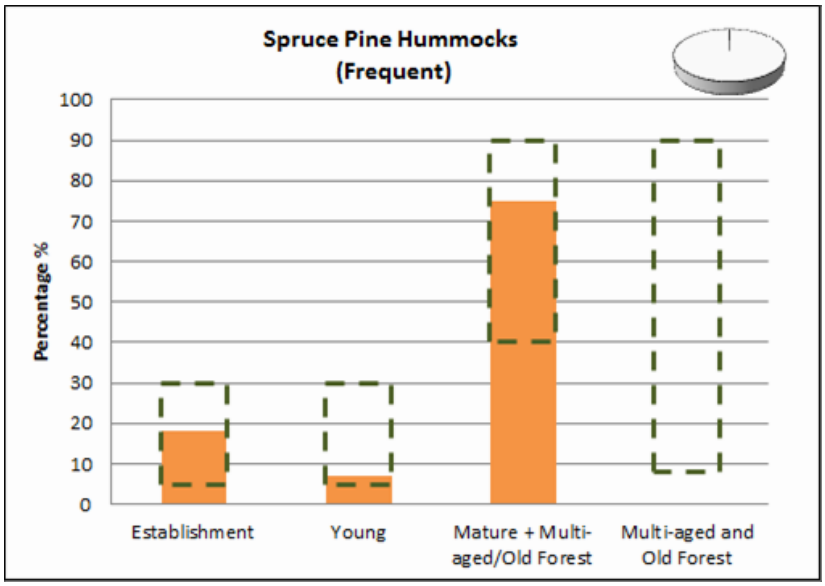


Composition of the **Red Spruce Hummocks** patch element has excessive establishment stage and is below the desired levels of mature and multi-aged forest. Pre-commercial thinning in the young and establishment stages will provide opportunities to restore climax species and increase growth rates to hasten mature forest development.

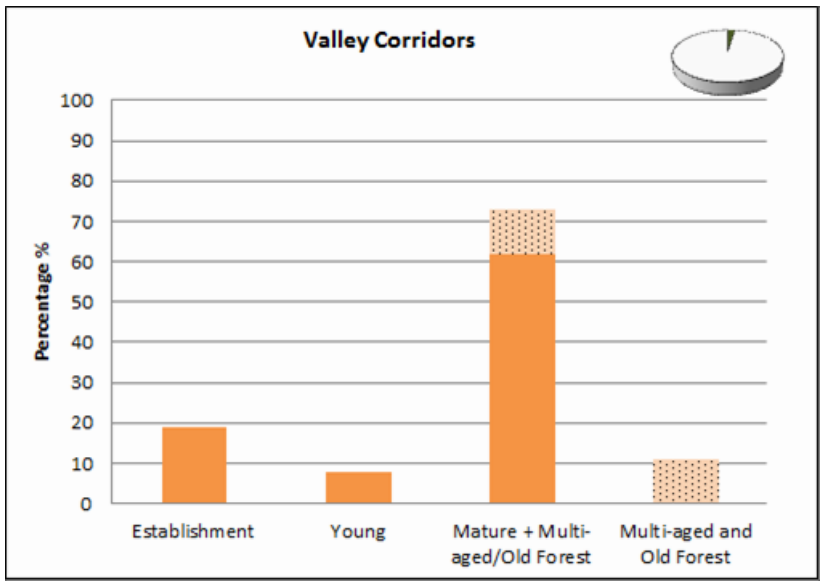
In **Tolerant Mixedwood Slopes** the establishment class currently exceeds target levels for gap-disturbed ecosystems, and mature forest and old multi-aged and old forest classes are below. Much of the area is on steep inaccessible slopes. Where opportunities for management exist, partial harvestingin mature forests to maintain canopy and promote mixed ages is appropriate. Pre-commercial thinning in young stands can favour climax species.



The **Spruce Pine Hummocks** patch element is dominated by mature forest. These forests are frequently disturbed by fire or windthrow creating conditions for the renewal of an even-aged forest. Remnant trees that survive the disturbance, such as pine, provide seed and contribute to stand structure diversity. Old forest conditions can be enhanced by extending the rotation age, but often stand health, especially in black spruce, may limit this option.



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



Summary of Parts 1 and 2

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

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

Glossary A: Terms in Parts 1 and 2

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

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

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

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

Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old 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).