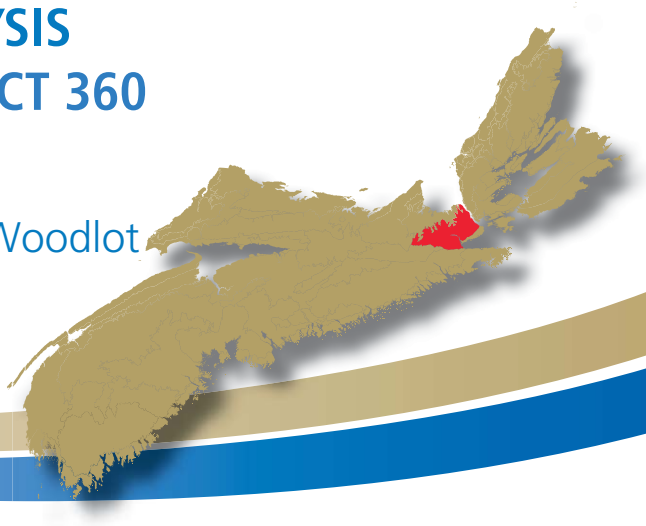
Department of Lands and Forestry

2019 Update

ECOLOGICAL LANDSCAPE ANALYSIS MULGRAVE PLATEAU ECODISTRICT 360

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



ELA 2019-360

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 360: Mulgrave Plateau
2019 Update for Part 1 and 2

Prepared by the Nova Scotia Department of Lands and Forestry
Peter Bush and Courtney Baldo, Forestry Division

This report, one of 38 for the province, provides updated figures and tables to supplement the original Ecological Landscape Analysis documents.

Information sources and statistics (benchmark dates) include:

- Crown Lands Forest Model landbase classification (2017v.1)

Note this geodatabase includes the latest Forest Inventory Databases (FID), forest disturbance information, forest harvesting information, crown land purchases and new protected area designations. Forest harvesting, silviculture, and fire disturbance (including satellite updates) are current as of end of 2015.

As revision and peer-reviewing of Natural Disturbance Regimes mapping in Nova Scotia becomes available, any major changes will be incorporated in future updates.

Selected updated Tables and Figures

This document provides recalculated values for the following:

Table 1 (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 3 (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 5a (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Table 5b (Figures may vary slightly from 2015 ELA because of new Forest Inventory Databases and change in the base geodatabase)
Development Class Targets by Elements – Only major forest elements are reported in the update. Wetlands and Valley Corridors are not reported in this update.

Table 2 was not updated as Integrated Resource Management Land Use Categories have not been updated.
Table 4 was not updated because the land capability for individual polygons has not changed since the original report. Land generally still has that same capability rating now as it did previously, regardless of any management activities at the site.

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A NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES PUBLICATION

Ecodistrict Profile

Ecological Landscape Analysis Summary
Ecodistrict 360: **Mulgrave Plateau**

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 Mulgrave Plateau Ecodistrict 360. The ELA also provides brief summaries of other land values, such as minerals, energy and geology, water resources, parks and protected areas, wildlife and wildlife habitat.

The Mulgrave Plateau Ecodistrict is located west of the Strait of Canso and northwest of Chedabucto Bay. These two bodies of water make the area prone to strong coastal winds. The total area of the Mulgrave Plateau Ecodistrict is 102,772 hectares.

Two plateau portions of the ecodistrict comprise extensive areas of imperfectly drained level to hummocky topography. The steep slopes of these plateaus, approximately 200 metres above sea level, are well-drained and support a mixture of shade-tolerant hardwoods and softwoods.

Low relief drumlins dot the eastern portion of the ecodistrict around Goose Harbour Lake. The Roman Valley River flows toward Chedabucto Bay via the Milford Haven River which, along with Guysborough Harbour, is an example of a drowned estuary in which the mouth of a river is submerged due to a rise in sea level.

Two plateau areas, separated by the Milford Haven River, are forested with black spruce, white spruce and balsam fir on the level to hummocky topography with maple and yellow birch on smaller hills and drumlins such as this one at Clam Harbour Lake.

The granites and associated metamorphic rocks of the Cape Porcupine Complex underlie Porcupine Mountain and are an important source of bedrock aggregate.

Porcupine Mountain is an important source of crushed rock.

The forests on the well-drained, coarse-textured hills that border the Strait of Canso and Chedabucto Bay are similar to the coastal forests of the Atlantic Coastal Ecoregion. On the plateau, red maple and yellow birch dominate the drumlins with scattered sugar maple on the lower slopes. Elsewhere on the gently undulating plateau, a softwood forest of balsam fir, white spruce, and black spruce dominate. But where soils are deeper, better-drained and slightly richer, a mixedwood forest of yellow birch, red maple, white spruce, and balsam fir will occur.

Provincial Crown land ownership accounts for approximately 42% of the total Mulgrave Plateau Ecodistrict area. About 55% of the ecodistrict is under private ownership.

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

Element descriptions promote an understanding of historical vegetation patterns and the effects of current disturbances. This landscape analysis identified and mapped seven key landscape elements – one dominant matrix element and six smaller patch elements – in Mulgrave Plateau.

Tolerant Hardwood Hills is the matrix element, representing 53% of the ecodistrict. This element naturally supports climax forests of long-lived species that generally grow well in shade, such as sugar maple, beech, and yellow birch, which dominate on crests and upper and middle slopes. On lower slopes, shade-tolerant species such as red spruce, hemlock, and yellow birch are found, along with white spruce.

Forests of black spruce, white spruce, and balsam fir are most common in **Spruce Pine Flats**, the largest patch element. The remaining patch elements, in order of size, are **Tolerant Hardwood Hills and Drumlins**, **Wetlands**, **Floodplain** – with the largest floodplain on the Milford Haven River – **Salt Marsh**, and **Coastal Beach**.

Forest Ecosystem Management
For Mulgrave Plateau Ecodistrict

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

This ELA provides detailed information on the resources and descriptions of various components of the landscape for Mulgrave Plateau Ecodistrict 360. 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 represent inventory based off the Forest Inventory Database (FID) current as of the end of 2015 and the Crown Land Forest Model (CLFM) current as of 2017. The update provides a reference to compare to the baseline conditions provided in the ELA 2015, which in the case of the Mulgrave Plateau 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 Lands and Forestry, such as The Path We Share: A Natural Resources Strategy for Nova Scotia 2011 – 2020
(see http://novascotia.ca/natr/strategy/pdf/Strategy_Strategy.pdf).

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

Part 1: An Overview of Mulgrave Plateau – *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 Mulgrave Plateau Ecodistrict is 1,028 square kilometres in size and forms part of the Nova Scotia Uplands Ecoregion, which stretches from Cape Chignecto, Cumberland County, to Kellys Mountain, Victoria County.

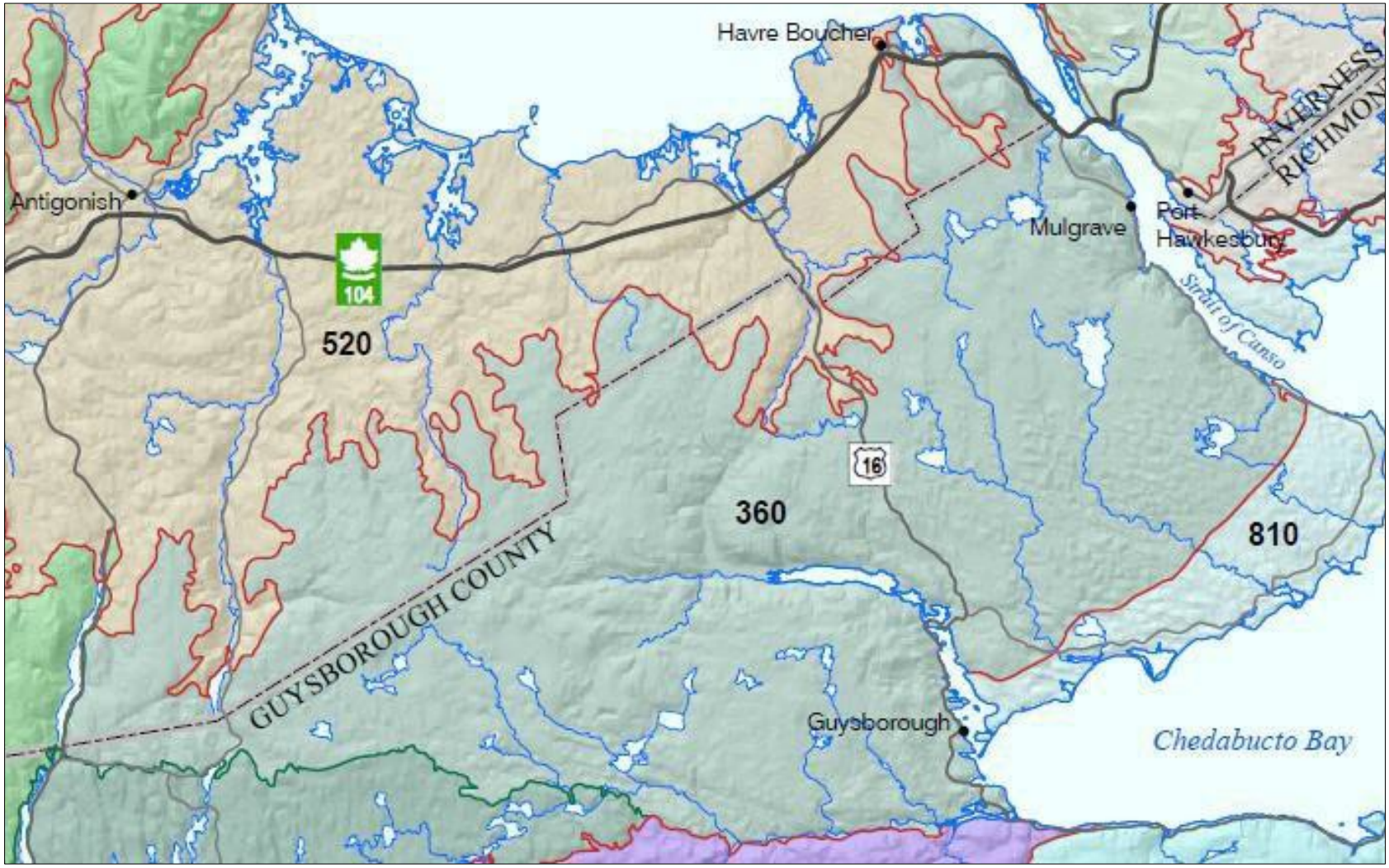
Mulgrave Plateau lies north of the Chedabucto Fault – a continental scale feature. The plateau is further defined and divided by the Roman Valley Fault (following the Milford Haven and Roman Valley River valleys). The fault separates the Guysborough Group of rocks (metamorphosed sedimentary and volcanic) in the southern portion from the Horton Group (conglomerate, sandstone, siltstone, and shale) in the northern portion.

The eastern portion of the ecodistrict is appreciably wetter than the western portion and is drained by the St. Francis Harbour River which flows out of Goose Harbour Lake. This lake has been dammed for use as an industrial water supply in Port Hawkesbury. Two other lakes, Grant and Summers, have also been dammed for water supply for Mulgrave, while another reservoir has been created at Englands Lake for future industrial use. However, only 3% of the ecodistrict is covered in fresh water.

The soils of the ecodistrict are mostly well-drained, gravelly sandy loams except for the eastern portion which is imperfectly drained. Clay loams in the drumlinized till plain are also imperfectly drained.

The forest cover is characterized by a hardwood forest of red maple, yellow birch, and sugar maple on well-drained soils of drumlins and upper slopes. Elsewhere on the imperfectly drained soils of the undulating terrain of the plateau, softwood forests of balsam fir, white spruce, and black spruce are common.

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



Mulgrave Plateau Ecodistrict 360 is located west of the Strait of Canso and northwest of Chedabucto Bay in Guysborough and Antigonish counties. (From Ecodistricts of Nova Scotia map 2007)

Land Area

In the Mulgrave Plateau Ecodistrict, the majority of land is privately owned (55%) or owned by the Crown (42%) with the remainder in other uses (Table 1).

Table 1 – Land Area by Ownership in the Mulgrave Plateau Ecodistrict*

Ownership	Area (hectares)	Percent of Total Area
Provincial Crown land	43,155	42.0
Private	56,329	54.8
Federal	0	0
Aboriginal	0	0
Other (Includes inland water bodies and transportation corridors)	3,288	3.2
Total	**102,772**	**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).

In Mulgrave Plateau, the largest category is C1 (67%), followed by C2 (19%), with the remainder in C3 (14%).

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	25,796	67.0
C2 – Multiple and Adaptive Use	7,162	18.6
C3 – Protected and Limited Use	5,558	14.4
Unclassified	10	0
Total	**38,526**	**100**

Forests

Within the Mulgrave Plateau Ecodistrict, forested land accounts for 87% of the ecodistrict's area (Table 3).

The current forest cover on Crown land in this ecodistrict consists of 35% softwood, 32% hardwood, 19% mixedwood, and 14% unclassified.

The merchantable volume in the ecodistrict is about 3 million cubic metres of softwood and 2.7 million cubic metres of hardwood.

Black spruce, white spruce, and balsam fir are the dominant softwood species, occurring on moderately well to imperfectly drained soils and in areas where soils are shallow over bedrock.

White spruce and, to a lesser extent, red spruce have a more scattered occurrence in mixedwood and hardwood stands. On abandoned farm sites, pure stands of old field white spruce can be found.

Table 3 – Area Distribution by Land Category for All Owners

Category	Hectares	Percent
Forested	89,115	86.7
Wetland	6,107	5.9
Agriculture	2,226	2.2
Barrens	424	0.4
Urban	1,040	1.0
Road, Trail, Utility	839	0.8
Other	3,021	2.9
Total	**102,772**	**100**

Black spruce and balsam fir are common in areas such as Lincolnville.

Where deeper soils occur on drumlins and along slopes, mixedwood stands of balsam fir, white spruce, red maple, and yellow birch occur.

Pure hardwood stands of yellow birch, sugar maple, and red maple can be found on the crest of hills, ridges, and drumlins.

Mature and establishing hardwood stands are found on hills, ridges and drumlins in the ecodistrict.

Stora Enso Port Hawkesbury Ltd. (*now Port Hawkesbury Paper*) has a management agreement with the province and effectively acts as the province's forest management contractor on Crown lands within the seven eastern counties. As part of their requirements under the agreement, Stora prepared a long-term forest management plan.

One of the unique aspects of this ecodistrict is the leasing of approximately 500 hectares of Crown land at Cross Lake for the private operation of a sugar bush.

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

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

Water Resources

The majority of wetlands and lakes which form the headwaters for the major streams within the ecodistrict remain on Crown lands. This is a result of settlement patterns associated with the location of more productive agricultural land.

Table 4 – Area of Forested Land by Land Capability Rating

Land Capability (LC) Rating (m^3/ha/yr)*	Hectares	Percent
2 or less	1,637	1.9
3	2,580	3.1
4	32,161	38.4
5	18,062	21.6
6	23,138	27.6
7 or more	6,137	7.3
Total	**83,715**	**100**

*Based on growth potential for softwood species.

Clam Harbour Lake, in the distance, is one of several lakes in the Mulgrave Plateau Ecodistrict.

Approximately 3% of the ecodistrict is covered with fresh water. The portion of the ecodistrict east of Highway 16 is appreciably wetter than that to the west. East of Highway 16, water utilities exist at Goose Harbour Lake and on Summers Lake, Matties Lake, and Grant Lake. These lakes provide water to the Port Hawkesbury paper mill as well as to the town of Mulgrave.

A water reservoir has also been created at Englands Lake. This reservoir is intended as a water supply for potential industrial development within the Melford Industrial Land Reserve, located on the Strait of Canso. Currently, Englands Lake only services a small hydroelectric plant.

The Crown portions of the watersheds which empty into the previously noted lakes have been classified as C2 lands for water resource values. An additional water utility was planned at Clam Harbour Lake but it was not constructed.

The majority of the fresh water from this ecodistrict enters the ocean along the Atlantic coast through the Salmon, Roman Valley, Clam Harbour, and St. Francis Harbour rivers. However, some water flows northward into the Gulf of St. Lawrence, with the Tracadie River being the largest of these watercourses.

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 Mulgrave Plateau Ecodistrict lies on the southern margin of the Avalon Terrane of the northern Appalachian Mountains, north of the Cobequid-Chedabucto Fault Zone. This major fault system juxtaposes the Avalon Terrane of northern mainland Nova Scotia, which has similar features in New Brunswick and Newfoundland and Labrador that contain significant mineral resources, with the Meguma Terrane, which comprises most of southern mainland Nova Scotia.

The bedrock geology of the Mulgrave Plateau comprises, from north to south, deformed Lower Carboniferous sedimentary rocks – up to 350 million years old – of the Horton and Windsor groups that are in fault contact with an older Devonian sequence of metamorphosed sedimentary and volcanic rocks – up to 400 million years old – of the Guysborough Group. The Chedabucto Fault Complex, a highly faulted sliver of metamorphic rocks, occurs along the southeast margin of the area.

Intruded into the Carboniferous and Devonian sequences are a number of smaller bodies of gabbroic and granitic rocks, the most notable of which is the Cape Porcupine Complex adjacent to the Canso Causeway. The granites and associated metamorphic rocks of the Cape Porcupine Complex underlie Porcupine Mountain and are an important source of bedrock aggregate.

Currently, the only active mining in the Mulgrave Plateau Ecodistrict area occurs at Martin Marietta Materials Canada Ltd.'s Porcupine Mountain tidewater quarry in the Cape Porcupine Complex at Aulds Cove. This quarry provides aggregate to local and international markets. In 2001, this quarry shipped more than 2.5 million tonnes of crushed rock and ranked as one of the 10 largest crushed rock quarries in Canada. Resources in this deposit can sustain production for many years.

The Porcupine Mountain crushed rock quarry at Aulds Cove is the only active mine currently operating in the Mulgrave Plateau Ecodistrict.

Mineral Resources

It is difficult to provide an accurate assessment of the mineral potential of the bedrock found in Mulgrave Plateau. There are numerous known irregular concentrations of base metals (e.g. copper, lead, and zinc) in the rocks of the Guysborough Group, particularly those that have been affected by deformation and fluid flow in the vicinity of the major faults. Some of these occurrences were extensively explored and developed in the late 1800s and early 1900s. This activity included small-scale mining of chalcopyrite and siderite (copper-bearing minerals) near Copper Lake and of specular hematite in the Roman Valley area.

There are also occurrences of gold mineralization in the area that have attracted the interest of prospectors and mineral explorers since their discovery. Most recently, the exploration model used throughout the world for very large deposits of iron oxide-copper-gold has been applied to

the Cobequid-Chedabucto Fault Zone across north-central Nova Scotia, resulting in extensive claim staking that includes the southern margin of the Mulgrave Plateau area.

Several of the intrusive “black granites” near Erinville and South River Lake have been evaluated in the past as sources of dimension stone and monument stock. No development has resulted from these evaluations. Intrusive rocks, particularly those located near deepwater ports, have excellent potential to be developed as sources of crushed rock for local and offshore markets.

Geological Setting

While this bedrock geology is not particularly complex, the abundant faults obscure contact relationships and make interpretation of both the internal stratigraphy of the formations and the relationships between them difficult. The faults, the most important of which are the Chedabucto, Roman Valley and Guysborough, have provided conduits for hydrothermal fluids to migrate through the bedrock. These fluids are responsible for many mineral deposits.

The Cobequid-Chedabucto Fault system is a continental scale feature, comparable to the Great Glen Fault in Scotland that represents a complex terrane boundary with a long history of large movements and thermal and mineralizing events.

Subsurface Resources

Providing a capsule assessment of the mineral and hydrocarbon resources of the Mulgrave Plateau is a uniquely challenging task. By their very nature, economic deposits of minerals and energy are mostly hidden, difficult to find, and quantifiable only at great effort and cost.

A simplistic assessment of mineral potential by analysing the underlying geology, along with known mineral occurrences and current or past levels of exploration activity, is inadequate since it fails to take into account continual change in society’s requirements for minerals. As well, advances in scientific understanding and technological change provide tools to help find new deposits or enhance the economic viability of known occurrences. Development opportunities for minerals are in no way limited to currently known occurrences and resources.

A particularly relevant example is the greatly heightened interest since 2003 by Nova Scotian and Canadian explorers in the Cobequid-Chedabucto Fault Zone, which intersects the Mulgrave Plateau, to host deposits of iron oxide-copper-gold. This interest arose from the development of a new geological model for this deposit type based on the characteristics of deposits being explored and mined around the world and the recognition that the Cobequid-Chedabucto Fault Zone displays many of these characteristics.

Hydrocarbon (Energy) Resources

In other parts of both mainland Nova Scotia and Cape Breton Island, the sandstones and shales of the Horton Group are of interest as a target for oil and gas exploration, as they provide both a source of hydrocarbons and a geological reservoir for them. In the Mulgrave Plateau, however,

the rocks of the Horton Group have experienced considerable metamorphism in the form of high temperatures and pressures, and it is likely that any hydrocarbons originally present have been driven off. To date, there has been little interest expressed in these rocks by the hydrocarbons industry.

Melford Industrial Land Reserve

During the 1970s, approximately 5,700 hectares of land adjacent to the Strait of Canso was expropriated by the provincial government. The intended purpose for these lands is to provide a land base for industrial development adjacent to the deep and sheltered water of the Strait of Canso. Subsequently a water supply reservoir known as Englands Lake was created on Melford Brook within the expropriated area.

The potential for development was further enhanced when the natural gas and liquids pipelines, from Goldboro to Point Tupper, were built through this area in the late 1990s. Over the years there have been numerous proposed developments for the area but to date only a hydroelectric plant has located on these lands.

Half of the expropriated area, including Englands Lake and the natural gas and liquids pipelines, are within the Mulgrave Plateau Ecodistrict. As the primary purpose of the expropriation was to provide an industrial development land base, decisions with regard to land and natural resource use in this area must be made with due consideration for this priority.

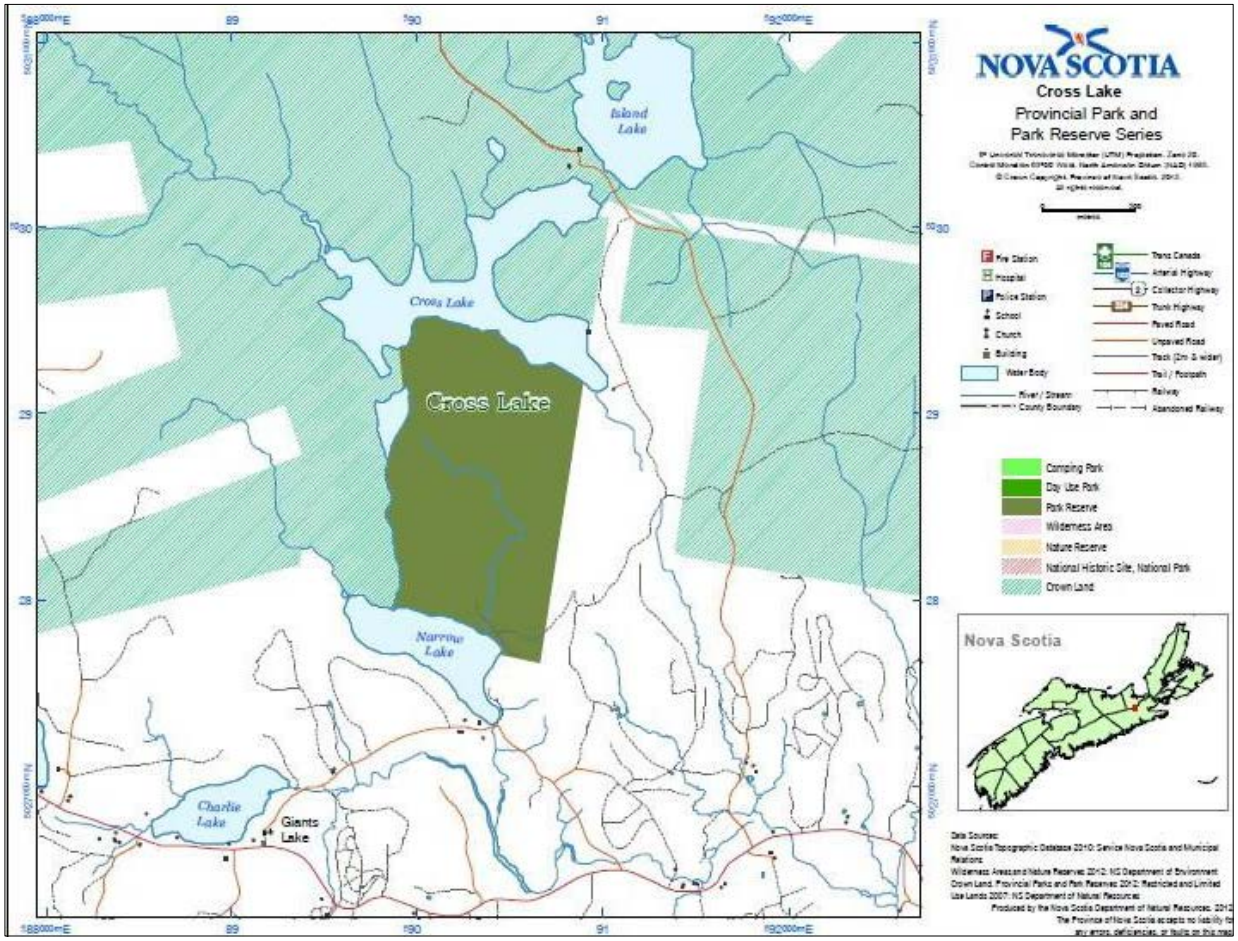
Potential geohazards, such as abandoned mine openings, potential karst areas, flood risk areas, sulphide-bearing slates, and underground coal workings, can be viewed at the following web sites:
http://gis4.natr.gov.ns.ca/website/nsgeomap/viewer.htm
http://gis4.natr.gov.ns.ca/website/mrlu83/viewer.htm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

Parks and Recreation / Protected Areas

For the parks and protected areas within your ecodistrict, please refer to the Park and Protected Areas website (http://novascotia.ca/parksandprotectedareas/plan/interactive-map/) and the Provincial Landscape Viewer, at the following url: https://nsgi.novascotia.ca/plv/

The Ogden Pond Lake Wilderness Area

The Boylston Provincial Park, located between the communities of Boylston and Guysborough, offers campgrounds and picnic areas.



The 142-hectare Cross Lake Provincial Park Reserve, as shown in this Nova Scotia government map, is the largest park property in the ecodistric

Wildlife and Wildlife Habitat

Wildlife in the Mulgrave Plateau 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 Mulgrave Plateau 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 Department of Lands and Forestry staff. Information on important sites is documented by Department of Lands and Forestry 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.

Relatively little is known about the wildlife resources currently found on Crown or private lands within the Mulgrave Plateau Ecodistrict. Therefore, it is important that appropriate survey methodologies be used to complete biodiversity surveys in this area.

Although Mulgrave Plateau supports a wide variety of healthy wild populations, several species at risk are known to inhabit this ecodistrict. These include representatives from mammal, bird, and mollusk groups.

The mainland moose is listed as endangered in Nova Scotia and has been reported in a few scattered locations throughout the ecodistrict.

Wood turtles have been found in at least one site in the ecodistrict.

Wood turtles are recognized as threatened and snapping turtles are recognized as vulnerable to human activities throughout Canada, including Nova Scotia. In this ecodistrict, wood turtles have been reported from at least one site. Snapping turtles are more common in lakes and large rivers in this ecodistrict.

Habitats within the Mulgrave Plateau Ecodistrict offer potential refuge to other provincially endangered species such as Canada lynx and American marten.

Highland areas of the mainland are important genetic corridors that link Cape Breton populations with those from New Brunswick and Maine. Lynx from Cape Breton would use this ecodistrict

as a travel route to other suitable habitats. Marten are not known to inhabit this area at this time; however, much of mainland Nova Scotia was historically marten habitat and mainland populations may someday become re-established.

There is one reported occurrence of a provincially rare plant in the Boylston area – the lance-leaved figwort. Other notable species found in this ecodistrict include Atlantic salmon, brook trout, four-toed salamander, northern goshawk, osprey, common loon, fisher, and little brown bats. Three white-tailed deer wintering areas have been identified in this ecodistrict.

Four-toed salamanders, which have four toes on their back legs instead of the usual five, are sometimes found in the Mulgrave Plateau Ecodistrict. (Photo by Nova Scotia Museum)

Each of these species is sensitive to human land use practices and may have unique habitat requirements that need to be addressed through proper application of regulations and guidelines affecting habitat.

Wildlife habitats available within this ecodistrict are typical for upland regions of Nova Scotia, and are composed of a variety of species associations and seral stages. Old growth habitats are primarily restricted to the Ogden Round Lake Wilderness Area. Hardwoods such as yellow birch, sugar maple, and red maple dominate the hills, with softwood species such as red spruce, white spruce, balsam fir, and hemlock prevailing in more protected ravines, gullies, and slopes that dissect the landscape.

Eastern portions of the landscape are more poorly drained than western areas and have a significantly greater amount of black spruce-dominated wetlands that, like all wetlands, are important wildlife habitats. Mulgrave Plateau contains many of the headwaters, streams and tributaries which drain the ecodistrict and form the basis of major waterways such as the Salmon, Milford Haven, and St. Francis Harbour 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 Department of Lands and Forestry can assist private land stewardship by providing knowledge and information on various management strategies. Legislation such as the Wildlife Habitat and Watercourse Protection Regulations, the Endangered Species Act, and the Environment Act's Activities Designation Regulations address species and habitat concerns within the forest and wetland ecosystems.

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

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

Forest Disturbances and Succession

Forest Disturbances

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

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

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

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

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

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

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

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

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

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

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

Natural Succession

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

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

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

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

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

Another Definition of Succession

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

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

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

Mulgrave Plateau – 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.

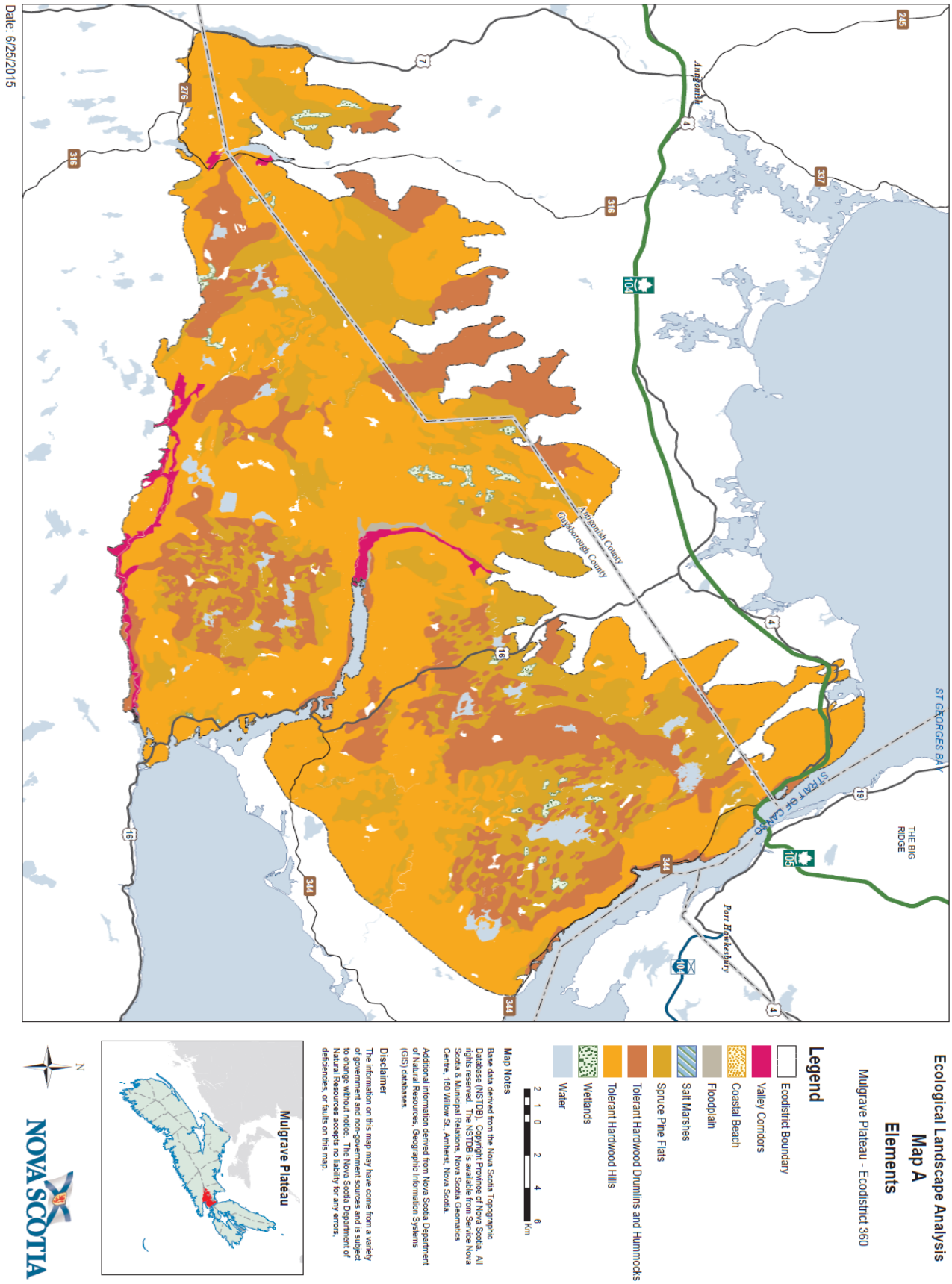
A landscape profile identified and mapped eight distinctive elements in the Mulgrave Plateau Ecodistrict – one matrix, six patches, and a corridor (Table 5a). A matrix is the dominant community type. Patches are smaller yet still distinctive community types. Corridors are natural linear communities,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

Tolerant Hardwood Hills is the matrix element, representing 53% of the ecodistrict. This element naturally supports climax forests of long-lived species that generally grow well in shade, such as sugar maple, beech, and yellow birch, which dominate on crests and upper and middle slopes. On lower slopes, shade-tolerant species such as red spruce, hemlock, and yellow birch are found, along with white spruce.

Forests of black spruce, white spruce, and balsam fir are most common in **Spruce Pine Flats**, the largest patch element. The remaining patch elements, in order of size, are **Tolerant Hardwood Hills and Drumlins**, **Wetlands**, **Floodplain** – with the largest floodplain on the Milford Haven River – **Salt Marsh**, and **Coastal Beach**.

The Tolerant Hardwood Hills and Drumlins patch element, near Clam Harbour Lake, as viewed from the air.

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 Department of Lands and Forestry publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)*** (see http://novascotia.ca/natr/forestry/veg-types/veg- navigation.asp) is helpful in identifying forest plant communities.

Viewed online or available in print through Department of Lands and Forestry, 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 MulgravePlateau		
Element	**Size (Hectares)**	**Element Description**
Tolerant Hardwood Hills (Matrix)	52,386 52.5%	The ecodistrict is defined by the hilly topography that creates the perimeter for the level to hummocky plateau. The slopes of this hilly terrain are underlain by well to moderately well-drained fine to medium-textured soils. Hardwood forests of sugar maple, red maple, beech, and yellow birch dominate the crests and upper to middle slopes. On the lower slopes, red spruce, white spruce, balsam fir, yellow birch, and hemlock combine to create mixedwood forests. Along the Milford Haven and Roman Valley rivers 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 enhanced with management either before the sites reforest or following clear-cutting of the white spruce. Early successional species following stand-level disturbances include red maple and white birch as well as balsam fir which can be enhanced with management to create a softwood-dominated condition. Natural disturbances in this element would be mostly due to infrequent windstorms and hurricanes and insects/disease outbreaks. Stands can develop into uneven-aged forests with old forest characteristics.
Spruce Pine Flats (Patch)	25,262 25.3%	This large patch element occurs primarily on imperfectly drained hummocky terrain and is dominated by forests of black spruce, white spruce, and balsam fir. It also occurs on the level terrain associated with small streams and wetland complexes underlain by imperfectly to poorly drained medium to fine-textured mineral soils and occasionally organic soils. The element also occurs on the level terrain between drumlins where soils are moister. As soils get wetter forests of black spruce, red maple, and tamarack are typical. Shrubs such as alders, false holly, and winterberry are common. There are also several large areas in the vicinity of West and Long lakes where soils are shallow to bedrock and open woodlands of black spruce, tamarack, and reindeer mosses are prevalent. This element is frequently disturbed by windthrow, fire and/or natural senescence which limit the potential for old growth forest development. Earlier successional forests will be of similar species composition to later stages.
Tolerant Hardwood Hills and Drumlins (Patch)	20,865 20.9%	This large patch element occurs on hummocky terrain and drumlin landforms on the plateau. Red maple and yellow birch dominate on most slope positions with sugar maple and white ash becoming more prominent where soils are richer such as along toe slopes and on seepage sites. White spruce, balsam fir, and yellow birch increase in stand abundance on the moister middle and lower slopes. 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. Stand-level disturbance is rare and forest harvesting creates conditions for early successional species such as white birch, red maple, and balsam fir. Mixedwood forests of white spruce, hemlock, and yellow birch are more susceptible to stand-level disturbances. Uneven-aged forests and old forests can develop over time.

Table 5a – Elements Within MulgravePlateau		
Element	**Size (Hectares)**	**Element Description**
Wetlands (Patch)	816 0.8%	The wetlands element is a small patch-level ecosystem and is comprised of freshwater bogs, fens, swamps, and poorly drained areas. In this ecodistrict it primarily occurs as a community of hydrophytic vegetation (sedges, sphagnum moss, false holly, and winterberry) associated with level terrain where drainage is impeded or as a depression in the landscape where water remains in excess year round. The largest wetlands are west of Goose Harbour Lake and are associated with the poorly drained soils on level terrain. Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple.
Floodplain (Patch)	350 0.4%	The largest floodplain occurs on the Milford Haven River. Other smaller floodplains may be found along the Salmon and Roman Valley Rivers. Where annual or periodic flooding along these watercourses has deposited alluvial sediments the terrain is generally smooth and level. These are linear, small patch-level elements 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 the tolerant hardwood forest of sugar maple, white ash, and elm. Small gap disturbances in this climax forest maintain a canopy that provides important ecosystem functions along these watercourses.
Salt Marsh (Patch)	29 <0.1%	The estuaries of the Milford Haven and Salmon rivers both have small salt marshes created by periodic flooding by the tide. These salt marshes have formed from coastal sediments deposited in low-lying, sheltered, intertidal areas. Deposits of silty clay loam sediments with semi-decomposed grasses and sedges trapped in the accumulating layers, formed along the tidal shores.
Coastal Beach (Patch)	10 <0.1%	Several small coastal barrier beaches at the end of Chedabucto Bay have been created by the deposition of sand, gravel, cobbles, and other sizes of sediments. These barrier beaches often enclose lagoons and lakes which in most cases are brackish. Where stable conditions have developed on these coastal beaches a variety of vegetation can establish. Pioneer species such as beach grass and associates occur near the high-water mark.
Total	**99,745***	*Area is not the same as in Table 1 because water has not been included.

Table 5b – Forest Vegetation Types[1] Within Elements in Mulgrave Plateau						
Element	**Seral Stage**					
	Early	**% ***	**Middle**	**%**	**Late**	**%**
Spruce Pine Flats	OW2, SP8	15.3	SP6, SH9	20.9	**SP7**, SH8, **SH10**	33.4
Tolerant Hardwood Hills	OF1, OF2, OF4, IH6	24.7	MW2, SH5, SH6, SH8, SH10, TH7	22.4	MW1, MW3, SH3, **TH1, TH2,** TH3, TH4, TH5, **TH8**	28.9
Tolerant Hardwood Drumlins and Hummocks	OF1, OF2, OF4, IH6	18.2	MW2, SH5, SH6, SH8, SH10, TH7	24	MW1, MW3, SH3, **TH1, TH2, TH8**	32.9
Floodplain	FP6	23.4	FP3	8.1	**FP1**	8.8
Wetlands	FP3, WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8, SP7					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Salt Marsh	Grasslands of *Spartina spp.*					

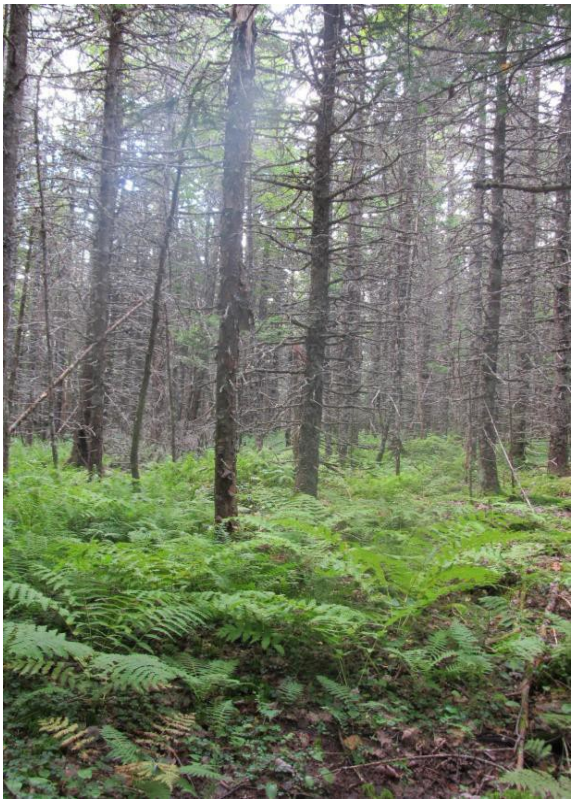
View forest groups and vegetation types at
http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by Department of Lands and Forestry are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (KA), Mixedwood (MW), Old Field (OF), Open Woodland (OW), Spruce Hemlock (SH), Spruce Pine (SP), Tolerant Hardwood (TH), Wet Coniferous (WC), Wet Deciduous (WD)
Bolded vegetation types indicate typical late successional community
[1] Forest Ecosystem Classification for Nova Scotia (2010)
*Percentage of element in each successional stage. Percentages may not total 100 due to unclassified lands (such as clearcuts and regenerating stands) not being included.

Photos Illustrating Vegetation Types in Elements

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

Red maple – Yellow birch / Striped maple (TH8) is a late successional vegetation type found in the Tolerant Hardwood Hills matrix element.

Black spruce – Red maple / Bracken – Sarsaparilla (SP6) is a mid-successional vegetation type found in the Spruce Pine Flats patch element.



White spruce – balsam fir / Broom moss (SH10) is a mid-successional vegetation type found in Tolerant Hardwood Drumlins and Hummocks patch element.

White spruce / Wood goldenrod / Shaggy moss (FP1) is an early successional vegetation type found in the Floodplain element.

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

Black spruce / Lambkill / Reindeer lichen (OW2) is a vegetation type sometimes found in the Coastal Beach 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 Department of Lands and Forestry is employing to try and realize this objective. Department of Lands and Forestry is developing a number of additional approaches and planning tools which will be integrated with objectives defined in the ELA protocol.

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

Natural Disturbance Regimes

Three natural disturbance regimes dominate natural forests:

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

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

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

The gap disturbance regime, the most prevalent in the ecodistrict, is a feature of a tolerant hardwood climax covertype. This regime favours the development of an uneven-aged structure, shade-tolerant species, and formation of old growth conditions. Mortality is commonly by animal or insect predation, disease, lightning, blowdown, or old age, where individual trees or small groups of trees across the landscape succumb to mortality. Regeneration occurs under openings (gaps) where mortality has occurred. Usually shade-tolerant species regenerate in the openings and as gaps in the canopy and share growing space with the surviving old growth trees. Major stand-initiating events do no occur under this regime.

Frequent and open seral disturbance regimes are less common in Mulgrave Plateau.

Frequent regimes are typical of black spruce communities. The interval between stand-initiating events is shorter than the longevity of the climax species. This disturbance is intense enough that there is rapid mortality and a new even-aged forest becomes established. Another disturbance takes place before the stand becomes uneven-aged. Fire and wind are the usual disturbances.

Open seral regimes take place where site conditions restrict or limit tree growth, creating sparse forest cover. The Wetlands element in Mulgrave Plateau, where excessive moisture or thick organic peat layers hinder tree growth, is a good illustration of the open seral regime.

Forest Composition

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

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

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

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

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

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

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

- early
- mid
- late

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

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

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

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

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

Forest Composition Objectives

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

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

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

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

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.

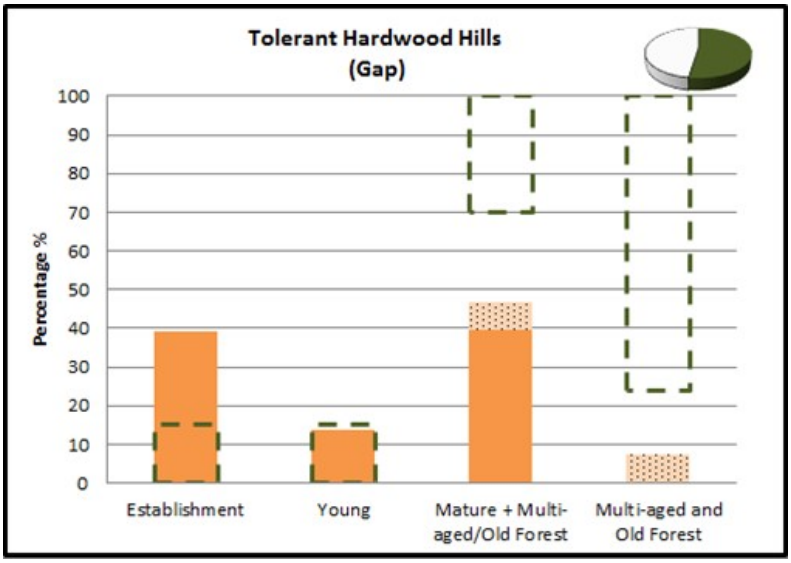
Table 6 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)				
Natural Disturbance Regime	**Development Class**			
	Forest Establishment	**Young Competing Forest**	**Mature Forest (including multi-aged and old forest)**	**Multi-aged and Old Forest**
Frequent Stand Initiating	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%

Development Class Targets by Element

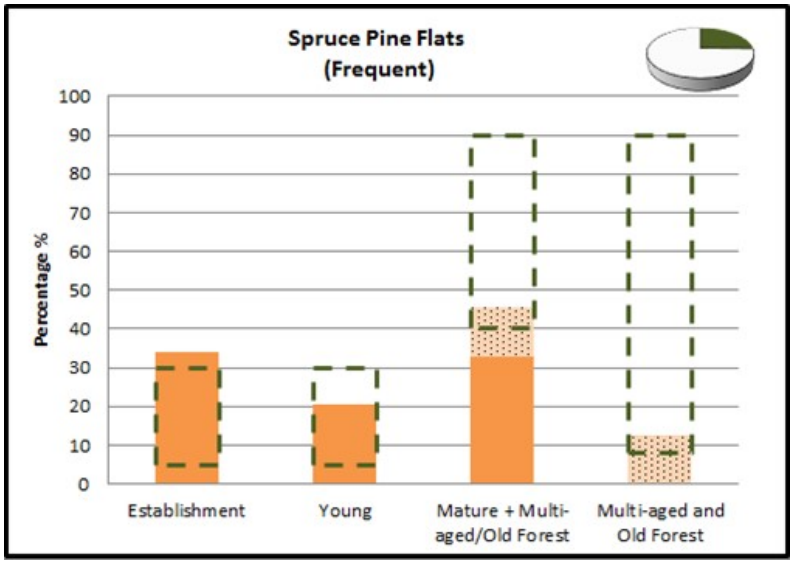
A series of charts that follow combine data on development classes for each element with desired or target percentages, based on the type of natural disturbance regime. The target percentages (from Table 6) are represented by rectangles of broken green lines. The light brown bars show the percentage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

All non-forest elements, (e.g. Rockland, Wetland, Beach, Urban, Marshes/Grasslands, Salt marsh) and the Valley corridor element have not been measured or included in the 2019 update.

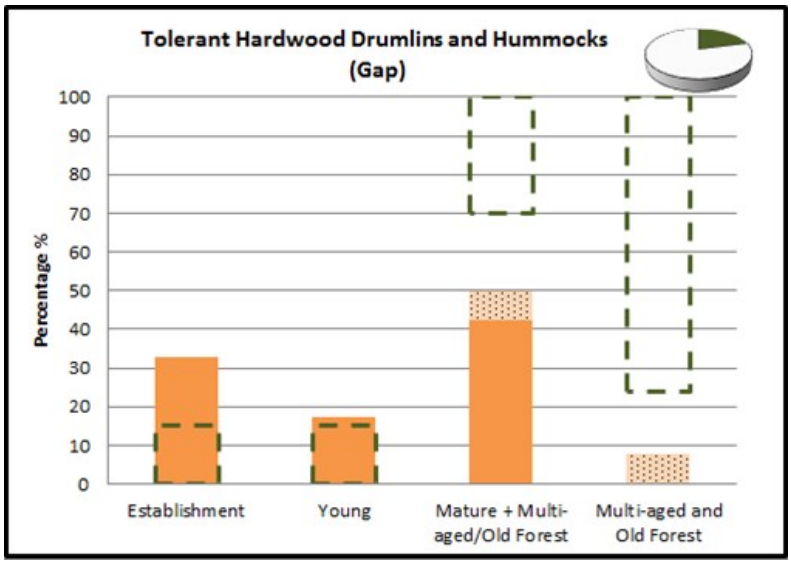
In the matrix element **Tolerant Hardwood Hills**, mature and old forest has been significantly reduced below target levels and replaced with younger establishing forests. Continuing harvest of mature forests can use partial harvesting techniques consistent with gap disturbance ecology to maintain mature forest conditions and promote multi-aged forests.



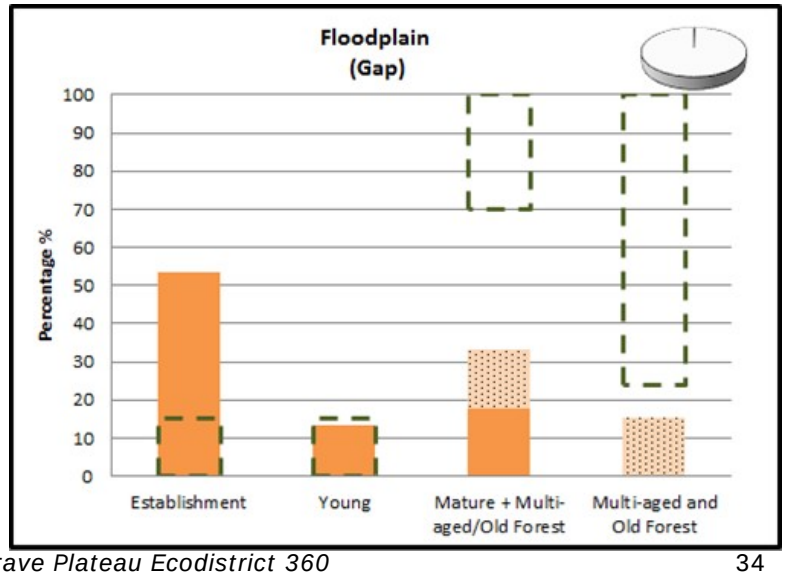
In the **Spruce Pine Flats** patch element, all the classes are within target ranges except for establishment which exceed the maximum range. Forests within a frequent natural disturbance regime forests support stand-initiation events that favour establishment of a dominant, even-aged cohort of mixed seral species. Forest harvesting can mimic natural disturbances by retaining mature survivors, particularly pine, which provide seed trees and mature structure in developing stands.



In the **Tolerant Hardwood Drumlins and Hummocks** patch element, the mature and multi-aged/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 and mixedwood stands. Favouring climax species in establishment and young forests will provide future mature forest opportunities.



The **Floodplain** element provides a habitat interface with the hydrological system. The excessive establishment class represents young forests re-establishing on inactive farmland. Mature forests are sensitive and forestry activity on these forests should be minimized until more of this development class is on the landscape.



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 Department of Lands and Forestry Ecological Land Classification system.
Element	A landscape ecosystem containing characteristic site conditions that support similar potential vegetation and successional processes. Elements were mapped by combining ecosections with similar climax vegetation and natural disturbance interpretations. Depending on their role in the ecosystem, elements may be described as matrix, patch, or corridor.
Endangered species	A wildlife species facing imminent extirpation or extinction. A species listed as endangered under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal Species at Risk Act).
Even-aged	A forest, stand, or vegetation type in which relatively small age differences exist between individual trees. Typically results from stand-initiating disturbance.
Extinct species	A species that no longer exists. A species declared extinct under federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Extirpated species	A species that no longer exists in the wild in Nova Scotia but exists in the wild outside the province. A species declared extirpated under federal or Nova Scotia endangered species legislation (Nova Scotia Species at Risk Act or federal SARA).
Forest management	The practical application of scientific, economic, and social principles to the administration and working of a forest for specified objectives. Particularly, that branch of forestry concerned with the overall administrative, economic, legal, and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection, and forest regulation.
Frequent stand initiating	Disturbances usually occur more frequently than the average lifespan of the dominant species and are of sufficient intensity to destroy most of the existing trees, promoting a new forest within relatively short periods of time.

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

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

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