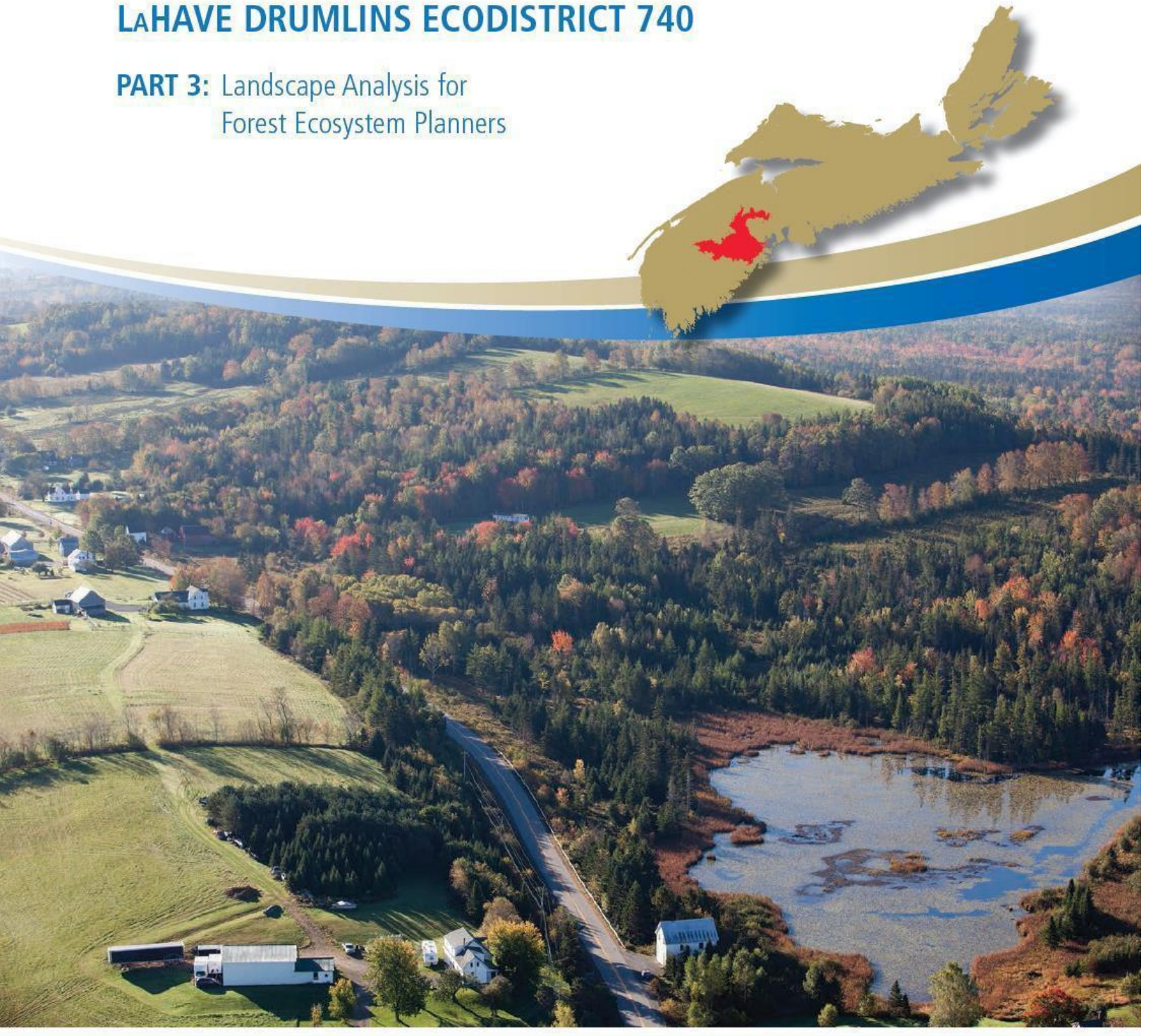
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS
LaHAVE DRUMLINS ECODISTRICT 740

PART 3: Landscape Analysis for Forest Ecosystem Planners



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NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 740: LaHave Drumlins

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos, and resources of the LaHave Drumlins Ecodistrict that can help landowners and planners understand important characteristics of the landscape. The report details the main elements in the ecodistrict and, of particular interest to woodland owners, forest vegetation types.

Ecological Landscape Analysis (ELA) is a first step in developing an ecosystem approach to managing resource values at a landscape level. It supports planning by landowners wanting to understand how their land fits into the landscape ecosystem. Additional direction will be provided by a landscape planning guide and internet-based inventory update system, both of which are currently under development.

The ELAs were analyzed and written from 2005 – 2009. They provide baseline information for this period in a standardized format designed to support future data updates, forecasts, and trends. This document includes Part 1 – *Learning About What Makes This Ecodistrict Distinctive* – and Part 2 – *How Woodland Owners Can Apply Landscape Concepts to Their Woodland.* Part 3 – *Greater Detail for Forest Planners and Analysts* – will be available on request by contacting DNR officials at their regional offices.

Information sources and statistics (benchmark dates) include:

- Forest Inventory (2002) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting 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.

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Part 3: Landscape Analysis of LaHave Drumlins – *For Forest Ecosystem Planners*

This in-depth Ecological Landscape Analysis (ELA) report is a lightly edited version of the original ELA produced by DNR as an internal document to assist with Crown land planning. The report provides information for planners, forest managers, ecologists, technicians, and woodland owners seeking detailed planning resources. In coming years the Department of Natural Resources (DNR) will continue to develop landscape planning approaches and introduce additional tools to support sustainable management and biodiversity conservation. The Department is working with stakeholders to explore novel planning approaches using these methods.

The ELA provides tools to recognize and pursue common goals for sustaining ecosystem values across all ownerships within the province's diverse landscapes. The ELA is not a plan, but instead supports planning by providing a framework of ecosystem mapping, indicators, fine-scaled features, and landscape functions that help describe landscapes as ecological systems. The report comprises the four major sections outlined below, along with theme maps and appendices containing detailed data summaries:

Understanding the Landscape as an Ecological System

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Understanding the Landscape as an Ecological System

(Appendices 1, 2a, 2b; Map 2)

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, which were interpreted through analysis using the ecosection layer of the Ecological Land Classification (ELC) for Nova Scotia. Elements are described by their potential vegetation (e.g. climax forest type) and physical features (e.g. soil, landform). These characteristics help determine historical vegetation patterns and promote an understanding of present distributions and potential habitat

development. Across the province, about three dozen elements were identified in the ELAs and were mapped to show their distribution across ecodistricts and ecoregions.

Elements Within Landscapes (Map 2)

A landscape profile identified and mapped six distinctive landscape elements in the LaHave Drumlins Ecodistrict – one matrix, four patches, and a corridor. 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 Drumlins is the matrix element, made up mainly of red spruce or white pine and red maple, with lesser amounts of red oak and white birch. A considerable amount of this element has been converted to other uses, such as agriculture and urban. There are also large areas in old field forests of white pine and, to a lesser degree, white spruce.

Spruce Hemlock Pine Hummocks and Hills is the largest patch element, which prior to European settlement would have been mainly tolerant softwoods and today contains a considerable amount of red maple. The other patch elements, in order of size, are **Spruce Pine Flats**, **Wetlands,** and **Pine Oak Hills and Hummocks. Valley Corridors** is a corridor element that follows major rivers and inter-connected lakes. *Coastal Beach is a tiny element also found in the ecodistrict.*

Flow – Element Interactions (Appendix 1; Map 2)

Flow phenomena are the features that move across and through landscapes. They can be energy or material, living or non-living. Diaz and Apostol (1992) suggest that the most relevant flows for landscape analysis may include water, wind, fire, animals, plants, and humans. The following flows were considered in the analysis of this ecodistrict and are described in Appendix 1: water, people, forest products, goshawk, flying squirrel, fish, furbearers, colonial seabirds (which breed as a group in colonies), Atlantic Coastal Plain Flora, Blanding's turtle, and ribbonsnake.

The forested landscape of LaHave Drumlins, as a result of settlement, is in places quite fragmented compared to what would exist under natural conditions. It is likely that movement of some species has been adversely effected.

The main purpose in describing flows, and their relationship to the elements, is to provide insight into the role of each element. This will inform understanding of each element's contribution to overall landscape function.

Landscape Connectivity (Appendices 2a, 2b; Map 2)

Connectivity refers to the ease or difficulty that resources, such as water, animals, or even events – such as fires – can move within an area. As a basic ecological requirement, the ability to move without excessive risk is of critical importance for maintaining biodiversity at all levels, including genetic, individual, species, population, community, and ecosystem.

Connectivity takes many forms and operates at a wide range of scales. Among the structural ecosystem components that support movement, three major systems can be identified:


River corridors promote connectivity.

Matrix Ecosystems – Matrix implies large areas of broadly similar habitat in which movement is not constrained to particular routes. The slow spreading and mixing of species through the dominant community characterizes the ecosystem matrix. This "percolation" is dependent on the large patch conditions, which may be vulnerable to fragmentation. Interior habitat is often an important feature of matrix ecosystems.

Patch Ecosystems – The movement of species among patches of suitable habitat is dictated by the arrangement and size of patches and by a number of species' specific measures. Patches of suitable habitat must occur at acceptable distances over time. Some patch habitats have critical functions and must be continuously sustained, such as wetlands for migrating birds, feeding areas for deer, and calving grounds for moose. Other patches may be dynamic, shifting about the landscape as ecosystems evolve. Edge and interior habitat conditions are important features of patch ecosystems, as well as natural isolation.

Linear Corridor Ecosystems – Flow along popular routes is dictated by enduring physical features, such as river valleys. Linear flow often requires continuous connection, such as rivers. Breaks in the connection serve as obstacles. It is a characteristic of continuous linear features that they often serve as connective corridors for some species and barriers for others.

The Tolerant Mixedwood Drumlins matrix element in the LaHave Drumlins Ecodistrict, because of its size, will have an important role to play in connectivity. Historical land use has likely had a large influence on connectivity. Conversion of many of the drumlins to agricultural land or Christmas trees has resulted in a somewhat fragmented landscape.

Large areas, exhibiting interior conditions, are rare. Much of the ecodistrict has many roads, further lessening connectivity. Forest harvesting, particularly clearcutting, has caused a significant increase in the prevalence of shade-intolerant species. The extent of habitat that existed naturally and was provided by shade-tolerant species is not as readily available.

Connectivity among patch elements has likely been compromised because of the fragmented nature of the matrix. Within the patches, the change in species from historical tolerant species to intolerant ones is a common feature. The riparian zone along the many watercourses, besides being important habitat by itself, can be critical connectors of ecosystem elements, particularly in a fragmented matrix.

An additional concern in ecological planning is the maintenance of connectivity among conservation areas such as wilderness, old growth, and ecological reserves.

Appendices 2a and 2b identify management strategies and practices for various features in the ecodistrict. These strategies attempt to increase and enhance connectivity by restoring and sustaining natural patterns within the ecodistrict.

Strategies that might be considered include:

- adopting forest management practices that encourage the development of the appropriate climax species
- mitigating potentially negative barren effects of concentrated land use by restoring natural communities where feasible
- taking measures to maintain and restore connectivity between conservation areas

Links to Neighbouring Ecodistricts (Appendices 1, 2a; Map 2)

The hydrological system provides significant linkages. The Mersey and Medway rivers have headwaters in the South Mountain Ecodistrict and both pass through Rossignol Ecodistrict and South Shore Ecodistrict before emptying into the Atlantic Ocean.

The LaHave River, with headwaters in South Mountain and St. Margarets Bay, also flows into South Shore and the Atlantic Ocean. The Avon River has headwaters at Card Lake before passing through South Mountain, Central Lowlands and touching North Mountain and Annapolis Valley ecodistricts before entering the Minas Basin. Anadromous fish (salmon, gaspereau, smelts) swim from the Atlantic Ocean up some of these rivers to spawn.

People, through their activities, provide linkages with all neighbouring ecodistricts. Activities include recreation (ATVs, snowmobiling, hunting, fishing, canoeing, hiking and camp use) and industrial pursuits (agriculture, forestry, Christmas trees, and support industries).

Major transportation routes provide outside linkages. Highway 103 provides access along the southwestern portion of the ecodistrict and passes into both Rossignol and St. Margarets Bay ecodistricts. Other inland roads, such as Route 8 and Route 10, head north into the South Mountain Ecodistrict, while branches off these routes enter Rossignol. Routes 12 and 14, servicing LaHave's eastern areas, link to South Mountain and St. Margarets Bay. Linkages also occur to the South Shore Ecodistrict.

The forest itself is an obvious connector. Generally, with the possible exception of the ecodistrict's southwestern boundary, adjoining ecodistrict landscapes are a mosaic of connected vegetation communities allowing for the flow or movement of many species in and out of the LaHave Drumlins Ecodistrict.

Future management activities might recognize significant links to neighbouring ecodistricts and manage forests in these areas to enhance and sustain connectivity.

Landscape Indicators (Appendices 3, 6, 7, 8, 9, 10, 11; Maps 3, 4, 5, 9, 10)

Indicators provide standard measures for assessing landscape conditions. Indicators can be used to develop goals, identify priority actions, assess trends, and support the evaluation of scenarios.

Forest Composition Indicators (Appendices 8, 10; Maps 4, 9, 10)

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. A number of additional approaches and planning tools are being developed which will be integrated with objectives defined in the ELA protocol.

Human activities, such as forest harvesting, can shape the structure and composition of the forested landscape and should be planned to help support landscape composition goals.

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 class indicators 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 / Old Forest Policy)

Seral stage indicators 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 (seral score 10 to 23)
- mid (seral score 24 to 37)
- late (seral score 38 to 50)

A look-up table (see Appendix 8) assigns each species in the forest inventory a value from one to five representing its position on the successional scale. These values are applied to the species composition data in the forest inventory to calculate a seral score, which may range from 10 to 50.

Covertype indicators 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%)

Target Ranges for Composition Indicators

Table 7 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. This guidance can be used to assess how land holdings contribute to the overall ecodistrict structure by referring to the element analysis section which summarizes the levels of these indicators.

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 7 - 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%

Forest Vegetation Types for Seral Stages in Each Element

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. Table 8 presents a description of the vegetation types likely to be found within elements, along with the current percentage of each seral stage.

Table 8 – Forest Vegetation Types[1] Within Elements in LaHave Drumlins

Element	Successional Stage					
	Early	%*	Middle	%	Late	%
Pine Oak Hills and Hummocks	IH1, IH4, SP2, SP8	8.0	IH2, IH6, SH9, SP3, SP4, SP6	57.0	SP5, **SP9**, SH4	28.0
Spruce Pine Flats		11.0		41.0	**SP7**	40.0
Spruce Hemlock Pine Hummocks and Hills	IH3, IH4, IH5, IH6, MW4, MW5	14.0	SH5, SH6, MW2	38.0	**SH1, SH2, SH3, SH4,** MW1, MW3	37.0
Tolerant Mixedwood Drumlins[2]	OF1, OF2, OF3, OF4, IH3, IH4, IH5	14.0	IH6, IH7, MW2, MW4, SH5, SH6	37.0	TH1, TH2, TH3, TH4, TH5, TH6, TH8, **MW1, MW3,** SH1, SH2, SH3, SH4	38.0
Wetlands	FP3, WC1, WC2, WC4, WC5, WC6, WC7, WC8, WD1, WD2, WD3, WD4, WD6, WD7, WD8, SP7					

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

Land Use Indicators (Appendices 3, 4, 5; Maps 6, 7)

Two indices (Ecological Emphasis Index and Road Index) have been developed to measure the relative pressure that current human land use exerts on ecosystems.

Ecological Emphasis Index (Appendices 11, 12; Map 3)

A variety of land management practices occur across landscapes, ranging from natural reserve areas to highly modified urban environments. Conserving biodiversity requires a balancing of land use practices to sustain ecological integrity.

To assist in assessing land use intensities and develop appropriate practices, four levels of ecological integrity are defined based on the degree that the conservation of natural conditions is emphasized in the management practices and policies applied to the land:

- Reserve, such as parks or wilderness areas
- Extensive, which are lands managed or restored for multiple values using ecosystem-based techniques
- Intensive, optimizing resource production by management techniques that may reduce biological diversity, such as plantations; but also meet the Wildlife Habitat and Watercourses Protection Regulations (NSDNR, 2002) (http://www.gov.ns.ca/natr/wildlife/habitats/protection)
- Converted, lands altered for agriculture, roads, or other human activities

All lands within the ecodistrict are assessed at the stand level and assigned one of these four ecological emphasis classes (EEC) based on past practices. These classes are mapped over all areas of the landscape using a one hectare grid. The Ecological Emphasis Index (EEI) is determined by assigning a weighting value to each class: Reserve (100), Extensive (75), Intensive (25), and Converted (0). An overall index value may be calculated for any area of interest, such as element, ecosection, ecodistrict, or ecoregion, by averaging the index values within the area to provide a relative indication of land use pressure.

The overall EEI for elements in LaHave Drumlins is 59 to 63 (Appendix 12a). The index is highest, or more natural, in the Wetlands and Pine Oak Hummocks and Hills elements. The EEI is lowest in the Valley Corridors element and the part of the Tolerant Mixedwood Drumlins element that includes islands.

Map 3 gives an indication of the location and size of the various EEC classes.

Approximately 67% of the land falls in the extensive EEC. This indicates the land is managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

About 10% of the ecodistrict is classified as being in the converted class. This is land that has been changed to an unnatural state for human use or where practices have significantly degraded site productivity.

The reserve class accounts for 13,824 hectares, or roughly 5.3% of the land. The reserve class is divided into legal reserves and policy reserves. The legal reserves are those that have legal status under IUCN (the International Union for the Conservation of Nature and Natural Resources) codes I, II, or III, such as wilderness areas, protected beaches, and designated provincial parks. The second type of reserve is one where areas are set aside under various provincial policies, such as the Old Forest Policy.

The intensive EEC class, representing 1.4% of the land, is managed intensively to optimize resource production from sites maintained in a native forested state. Despite intensive practices, these lands are an important component of landscape structure and composition. Management may eliminate or reduce the duration of some development processes, particularly old forest stages and may result in non-natural succession.

Practices may produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations or reduce structure and composition below ecologically desirable levels. Forests are protected from fire, insects, and competing vegetation. Management adheres to environmental regulations and policies, such as the Wildlife Habitat and Watercourse Protection Regulations and the Forest Code of Practice.

DNR will continue to develop and evaluate other measures of conservation risk.

Road Index (Appendices 6, 7; Map 5)

The GIS-based "Road Index" provides a standard assessment and mapping of road distributions across ecodistricts to assist planners to objectively explore options for managing road networks and assess the intersection of road affects with other features of the landscape. Density, distance and type of linear feature (e.g. road types, power lines) are used to calculate index values that indicate relative road pressure. The index value is mapped over all areas of the landscape using a one hectare grid. The overall index may be calculated for any area of interest, such as element, ecosection, ecodistrict, or ecoregion, by averaging the index values within the area to provide a relative indication of land use pressure. The index provides a numerical indicator of road influence that can be used to monitor temporal changes and compare different landscapes.

In discussing road ecology, Forman (2004) describes five distinctive landscape types in North America: city-suburb, agricultural, forestry, arid-grassland, and natural landscape. Each landscape type has a characteristic pattern of road networks with distinctive ecological effects and planning considerations (Forman & Hersperger 1996). These were adapted in Nova Scotia to classify five Road Index Benchmark Ranges associated with particular land use settings:

- Remote Landscape (RI 0 to 6): Unpopulated with few roads, trails, or other linear features
- Forest Resource (RI 7 to 15: Forest access roads are the primary linear feature
- Mixed Rural (RI 16 to 24): Mixed land use of rural settlement, forestry, and agriculture
- Agriculture/Suburban (RI 25 to 39): Suburban settlement and/or open agricultural fields
- Urban (RI 40 to 100): Urban environment with high building densities, roads, and few tracts of undeveloped land outside municipal parks

Road, trail, and utility corridors are vital components of human land use. However, transportation systems are expensive and produce many undesirable environmental effects, such as chronic siltation, invasion routes for exotic species, fragmentation, loss of productive land, and increased human presence.

Low road density areas are important features for biodiversity conservation. Planning should consider block scheduling options, life expectancy, class requirements, decommissioning strategies, and overall landscape function, in order to develop efficient access systems designed to minimize environmental impacts.

LaHave Drumlins has an overall average Road Index Value of 12.6 (Appendix 7) which falls within the forest resource index" of 7 to 15. This value denotes areas without significant settlement where forest resource access roads are the primary type of road.

Near equal amounts of area fall within the forest resource and mixed rural indices (32.1% and 30.9% respectively). The Tolerant Mixedwood Drumlin matrix is in the forest resource category. The highest road index value is associated with settlement along the Valley Corridors while the lowest is in the isolated areas of the Pine Oak Hills and Hummocks patch element.
Issues in the management of roads and trails could include:

- For Crown blocks, development of road and trail plans where the far-reaching

implications of construction on the ecological landscape are considered. Proper planning can reduce the effects of construction on fragmentation, aquatic ecosystems, sensitive sites, and protected areas.
- Development of road and trail maintenance plans to ensure that deterioration does not cause negative ecological effects.
- Road decommissioning. Road systems should be analysed to determine where decommissioning might be implemented. Factors such as resource management scheduling, recreational activities, connectivity, and closeness to reserve areas might be considered. Decommissioning implies returning the road itself to a natural a state as possible, removal of bridges and culverts, restoration of chainage, and establishment of a new forest.
- Minimizing the impact of road and trail construction by ensuring that best management practices are used in all facets of road and trail construction.
- Encouraging the sharing of road networks, which should lessen the amount of road construction required.

Fine Scale Features (Appendices 3, 4, 5; Maps 6, 7)

Data on the status and location of priority species, ecological land classification, representivity analysis, and other landscape characterization themes were used to identify special occurrences, rare ecosections, and ecological representivity. These fine-scale features, which occur at a sub-landscape level, may require special management practices to conserve their uncommon characteristics.

Lindenmayer and Franklin (2002) refer to the importance of identifying "midspatial-scale" features and "patch-level habitats," including: (1) aquatic ecosystems, such as streams, lakes, and ponds; (2) wildlife corridors; (3) specialized habitats, such as cliffs, caves, thermal habitats, meadows, and vernal pools; (4) biological hotspots or places of intense biological activity, such calving sites, over wintering grounds, and spawning habitats; and (5) remnants of old forest.

Priority Species and Other Special Occurrences (Appendix 3; Map 6)

Landscapes and ecosystems comprise many species of plants, animals, and other organisms. Some of these species are given priority in planning, management, and stewardship because they are rare, and/or at risk of going extinct locally or on a larger scale. The status and location of these species are important and data are collected, compiled, and assessed on an ongoing basis.

The primary species data used in this report are from the Atlantic Canada Conservation Data Centre and DNR's Significant Habitat Database. Efforts are made to ensure data are as accurate and up-to-date as possible. Lists and maps indicate what is currently known. Due diligence tied to planning, management, and stewardship may require that surveys be carried out to update information or to fill gaps in our knowledge. Priority species may require special actions in terms of forest management and other activities that alter habitat and the landscape. If more information is required or if management specific to a priority species need to be developed, a regional biologist, Wildlife Division staff, or other species experts should be contacted.

This section includes species at risk (refer to Table 1a, Appendix 3), species of conservation concern (Table 1b, Appendix 3), other conservation features (Table 1c, Appendix 3), and heritage features (Table 1d, Appendix 3, where available). *The list of species at risk and species of conservation concern were obtained from the Atlantic Canada Conservation Data Centre (ACCDC) databases, current to 2013*.

Species at Risk

The term "species at risk" is generally used to describe those species that are, to some extent, protected under provincial or federal endangered species legislation. Usually these species are protected where they occur on provincial, federal, and private lands. In Nova Scotia, the two main pieces of endangered species legislation are the Nova Scotia Endangered Species Act (NSESA) and the federal Species at Risk Act (SARA). Species can be classified as "endangered," "threatened," "vulnerable/special concern," or as "extinct" or "extirpated." In most cases for species at risk, recovery planning and special management are in place, as well as legal protection (http://novascotia.ca/natr/wildlife/biodiversity/at-risk-overview.asp).

Species of Conservation Concern

The term "species of conservation concern" refers to those species that are a high priority for conservation and special attention during planning, management, and stewardship. These species may be rare and/under a variety of threats but the threats do not currently warrant species at risk designation. In some cases, these species could meet the criteria for a species at risk but a formal species at risk assessment has not been done. Species of conservation concern are a priority in landscape planning because a focus on them now can prevent these species from becoming species at risk later.

Species Ranking and Coding Systems

A number of ranking and coding systems identify and convey the status of species at risk and species of conservation concern. Some of this information is provided in Appendix 3 and Map 6 and is routinely used in planning, management, and stewardship activities.

Colour-coded "traffic light" systems are used provincially and nationally. These systems use "red to orange/yellow to green" categories to indicate the most at risk species (red) to the least at risk species (green). Details of these systems are available from the Wildlife Division.

A second system commonly used is NatureServe Conservation Data Centre system. This system uses numbers from one (extremely) to five (widespread, abundant) to denote the relative rarity and conservation concern for species. At the provincial scale, numbers are prefixed with "S" to indicate that this is a state/provincial level rank. Ranks at the National (N) and Global (G) levels are also available for all species. In Nova Scotia, the Atlantic Canada Conservation Data Centre (http://www.accdc.com/) works with partners to provide ranks and data on species' occurrence.

Old Forest

The Interim Old Forest Policy requires a minimum of 8% of Crown land within each ecodistrict be identified and protected. The stands are selected to provide representation of landscape elements with the best old forest and old forest restoration opportunities. *In 2012, DNR released an updated Old Forest Policy, containing new integrated resource management (IRM) decision-making procedures* (http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf).

While more than 8% has been located, opportunities for setting aside black spruce, red maple, red oak-white pine-red pine, and sugar maple-yellow birch-beech species associations should be investigated.

Atlantic Coastal Plain Flora and Other Plants

A significant occurrence of rare species in the LaHave Drumlins Ecodistrict are plant species belonging to a group known as Atlantic Coastal Plain Flora (ACPF). These plants became established in southwestern Nova Scotia by way of a land bridge that connected present day Nova Scotia and Massachusetts between 10,000 and 14,000 years ago. Sea level was likely about 110 metres lower than today, exposing a broad plain along the Atlantic coast (now under water). A rise in sea level from melting glaciers eventually cut off the bridge, isolating populations of plants (and animals), both geographically and genetically, from more southern populations.

Nova Scotia has over 90 species considered to be ACPF with over one-third of these plants found nowhere else in Canada. Ten of these are listed under the Nova Scotia Endangered Species Act (four endangered, three threatened, three vulnerable). Eleven are listed as species at risk under the federal Species at Risk Act and the provincial NS Endangered Species Act; and 25 are listed as at-risk species under the NS General Status Ranks.

The LaHave Drumlins Ecodistrict has 16 ACPF species which are at risk or sensitive in Nova Scotia, six of which are listed under the Nova Scotia Endangered Species Act. The most important sites of occurrence tend to be along gently sloping, gravelly lake shorelines in the Medway and upper Mersey River watershed, an assortment of various wetlands, and the LaHave River estuary.

The lakeshore plant, water pennywort (*Hydrocotyle umbellata*), has been designated endangered in Nova Scotia, and has been assigned rare status (endangered or threatened) nationally by COSEWIC. *H. umbellata* has also been given a G5 ranking globally, which means it is secure worldwide but its S1 ranking means it is in peril nationally or sub-nationally. This plant is only known in Canada from two lakes in southwestern Nova Scotia.

The entire Canadian population of Carolina redroot (*Lachnanthes caroliana*), another ACPF plant, is located along the shores of a small number of lakes in southwest Nova Scotia. This rare plant is listed provincially as threatened.

Another provincially-listed threatened ACPF species is goldencrest (*Lophiola aurea*), a plant associated with wetlands. The entire Canadian population of this species is only known from six wetlands in southwestern Nova Scotia.

Three additional ACPF-listed species are known from the LaHave Drumlins Ecodistrict. Eastern lilaeopsis (*Lilaeopsis chinensis*) is provincially listed as vulnerable and has been found in only four estuaries in Nova Scotia. Long's bulrush (*Scirpus longii*), also listed as vulnerable, is only known from about ten sites. Coast pepperbush (*Clethra alnifolia*) has a vulnerable listing and is known from only six sites in Nova Scotia.

One additional ACPF species – Coastal Plain Joe-pyweed (*Euputorium dubium*) – occurring in the LaHave Drumlins has been assigned red status by DNR but is not yet listed under the Act. Several other ACPF species are listed as yellow and include: brook-side alder (*Alnus serrulata*), hairy swamp loosestrife (*Decodon verticillatus*), red top panicgrass (*Panicum rigidulum* var. *pubescens*), comb-leaved mermaidweed (*Prosperpinaca pectinata*), bog willow (*Salix pedicellaris*), common buttonbush (*Cephalanthus occidentalis*), southern rein orchid (*Platanthera flava*), yellow spike rush (*Eleocharis olivacea*), and Michaux's dwarf birch (*Betula michauxii*).

In addition to the ACPF, several other plant species in the LaHave Drumlins Ecodistrict are listed provincially as red (considered to be at risk) or yellow (sensitive). The red species are showy tick-trefoil (*Desmodium canadense*), large tick-trefoil (*Desmodium glutinosum*), poison sumac (*Toxicodendron vernix*), threadfoot (*Podostemum ceratophyllum*), and marsh mermaid-weed (*Proserpinaca palustris var. palustris*). The six known yellow species are water pimpernel (*Samolus floribundus*), mountain sandwort (*Arenaria groenlandica*), Farwell's water-milfoil (*Myriophyllum farwelli*), yellow nodding ladies'-tresses (*Spiranthes ochroleuca*), wavy-leaved aster (*Symphyotrichum undulatum*), and black ash (*Fraxinus nigra*).

In 2013, black ash was placed on the threatened list under the province's Endangered Species Act.

Two additional rare plants known from this area are thread-like naiad (*Najas gracillima*) and narrow-leaved sundrops (*Oenothera fruticosa*). The status of both is undetermined - data deficient.

This long list of rare plants emphasizes that the LaHave Drumlins Ecodistrict is one of the more important areas in the province for floral species at risk.

Fish

The Atlantic whitefish (*Coregonus huntsmani*) is a species endemic to Nova Scotia, meaning that it breeds nowhere else in the world. In Nova Scotia it is found only in the Tusket and Petite Rivière watersheds and likely has been extirpated from the Tusket River system. Historical records indicate it was once present in the LaHave River and small numbers may still be present. Little is known about this species and no population estimate for the species exists. Past and present threats to the species include hydro-electric development, predation by non-native fish species (e.g. chain pickerel, smallmouth bass), acidification, and over-fishing. In 2002, Atlantic whitefish were listed as endangered under the N.S. Endangered Species Act.

Once more common than at present, Atlantic salmon (*Salmo salar*) utilize the LaHave, Petite Rivière, and Mushamush river systems. This species is now considered to have depleted numbers within this ecodistrict. The Atlantic salmon has been designated endangered nationally by COSEWIC. Acid rain is believed to be the major cause of salmon declines in the rivers of southwestern Nova Scotia and elsewhere in the province. Habitat degradation and loss are also significant contributors to the loss of salmon.

Other fish species using rivers in the LaHave Drumlins Ecodistrict that are considered to be at risk in Nova Scotia include American eel (Anguilla rostrata) which is listed by COSEWIC as threatened. Significant runs of gaspereau (Alosa pseudoharengus), with a yellow designation, and rainbow smelt (*Osmerus mordax*) and American shad (*Alosa sapidissima*) also occur in these rivers.

Mainland Moose

In Nova Scotia, the mainland moose (*Alces alces americana*) has been designated an endangered species under the Nova Scotia Endangered Species Act.

Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy. One of the remnant populations of moose on the mainland is centred in the Tobeatic Wilderness Area, within the nearby Western Barrens Ecodistrict. Moose are known to occur in the western part of the LaHave Drumlin Ecodistrict, with some even venturing to the extreme eastern and southern parts of the ecodistrict on occasion.

Secluded wetland areas with an abundance of emergent vegetation are used by moose for feeding and cooling during the summer. The availability of suitable habitat for mainland moose is crucial in maintaining its future presence.

Presently, the Forestry / Wildlife Guidelines and Standards and the Wildlife Habitat and Watercourse Protection Regulations provide minimum habitat specifications for moose on Crown Land through the 8% retention for old growth, maintenance of a minimum 20 metre buffer zone along water courses, and through the maintenance of a varied age class distribution.

Additional measures to provide for specific habitat needs of moose have been identified and special management practices addressing thermal refugia, aquatic feeding sites, calving areas and clump size, are used on Crown lands where appropriate. These may be required to some extent on Crown land harvests on the western side of the ecodistrict adjacent to the Tobeatic Wilderness Area.

It is important to note that because moose occur in low numbers throughout a wide range in southwestern Nova Scotia, large areas of Crown land have been designated C2 because of a potential need for moose considerations in forest harvesting. The intent is to ensure that considerations for moose enter into management decisions at appropriate locations.

As of July 2012, interim Mainland Moose Special Management Zones have been identified for the province. Land use practices in support of moose are mandatory on Crown lands within these zones.

American Marten

The Cape Breton population of marten is likely less than 50 animals and was designated as endangered under the N.S. Endangered Species Act in 2001. At present, there is little evidence of breeding and there has been extensive loss and degradation of suitable habitat. Marten were trapped extensively throughout Nova Scotia since the 1700s until the season was closed in the early 1900s due to low numbers.

The mainland population of marten was thought to have been extirpated from the mainland and several re-introductions have been attempted, including within Kejimkujik National Park. There have been some very recent records of marten in southwest Nova Scotia. However, the status of the marten on the mainland is considered "data deficient."

In recent years, several projects undertaken by the DNR Wildlife Division have aimed at shedding some light on the current distribution, abundance, and habitat selection of marten in southwestern Nova Scotia. Although historically described as a species of mature softwood, information so far suggests that they are also occupying mixedwood forests and younger-aged softwood stands, possibly related to the relatively moderate winter weather in this part of the province. Primary food sources, such as mice, voles, and red squirrels (*Tamiasciuris hudsonicus*) would be available to marten in these stands, but denning requirements likely have to be met within mature softwood stands.

Many of the ecosections in the LaHave Drumlins likely have the capacity to supply habitat for marten, so it will be important to address marten habitat considerations in Crown land forest management decisions.

American marten in the LaHave Drumlins are most likely descendants of New Brunswick marten released in Kejimkujik National Park in the 1980s. It is also possible that these may have mixed with some remnants of the original southwest Nova Scotia population. More research is required.

Blanding's Turtles and Eastern Ribbonsnakes

Blanding's turtles (*Emyboidea blandingii*) are listed as endangered under the N.S. Endangered Species Act. Most of the LaHave Drumlins Ecodistrict is inside the known distribution area for Blanding's turtles. The Eastern ribbonsnake (*Thamnophis sauritus*) has also been found in a number of areas in the northwestern portion of the ecodistrict. Further field research is needed to fully assess the geographical distribution and abundance of both of these species at risk. Ribbonsnakes are listed as threatened in Nova Scotia.

Southern Flying Squirrels

Southern flying squirrels (*Glaucomys volans*) have been documented in the northwestern area of this ecodistrict. This species at risk has been assigned a provincial yellow status. *G. volans* is associated with mature mixedwood stands having a red oak, beech, and eastern hemlock component. Further field research is needed to fully assess the abundance and geographical distribution of this rare squirrel.

Other Species at Risk

Few field inventories are currently completed for many wildlife species such as bats, rodents, lichens, mosses, amphibians, reptiles, or most invertebrates. Assessing species abundance and geographic distribution is a continual process.

Further field research is needed to fully assess the status of many species at risk that inhabit the LaHave Drumlin Ecodistrict.

Rare Ecosections (Appendices 3, 12b; Map 7)

The Ecological Land Classification for Nova Scotia (Neily et al. 2003) classifies ecosections based on similar characteristics of landform, soils, and vegetation. These are the smallest mapped unit, and they repeat within ecodistricts. Ecosections have characteristic natural disturbance regimes and climax types.

Landscape elements were identified by combining ecosections with similar characteristics. Table 9 provides explanations of ecosections and their relationship to elements.
Ecosections that are rare ($\leq$ 2% of ecodistrict area) or under high land use pressure (> 75% land conversion) are identified in Appendix 3.

LaHave Drumlins contains eight ecosections that are rare at the ecodistrict level: ICSM, WCHO, ICRD, IFHO, IFSM, IMRD, WMKK, and WMRD. Many of these could also be considered rare at an ecoregion level. None of the ecosections is more than 17.3% converted.

Issues in management of the ecodistrict could include:

- conservation of species that are threatened as indicated by DNR's General Status of Species - those yellow and red listed
- conservation of significant habitats
- attempts to restore, where feasible, climax communities in locations where they have significantly declined (e.g. red oak)
- identification and mapping of sites of cultural importance
- identification of habitats that may be of concern in conservation efforts (e.g. treed swamps)
- development of extension programs to inform and educate those who have an impact on rare, uncommon, threatened species, sites, and habitats

Table 9 – Elements, Ecosections, Disturbance Regimes and Climax Types			
740 LaHave Drumlins Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Mixedwood Drumlins (Matrix)	IMDM WFDM WMDM WMKK	Gap	sugar Maple (sM), yellow Birch yB), beech (Be), red Spruce (rS), eastern Hemlock (eH), white Pine (wP)
Spruce Hemlock Pine Hummocks and Hills (Patch)	IMHO WCHO WFHO WMHO IMRD	Infrequent	rS, eH, wP
Spruce Pine Flats (Patch)	ICRD ICSM IFHO IFSM IMSM	Frequent	black Spruce (bS), wP
Spruce Pine Hummocks (Patch)	IMHO IMRD	Frequent	bS, wP
Wetlands (Patch)	WTLD PFHO	Open seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Pine Oak Hills and Hummocks (Patch)	WMRD	Infrequent	wP, red Oak (rO)
Valley Corridors (Corridor)	Various	Various	Various

***Ecosection Explanations**: For example, in **WMHO**, **W** stands for Well-drained under Soil Drainage **M** stands for Medium-textured under Soil Texture and **HO** stands for Hummocky under Topographic Pattern

Soil Drainage: **W –** Well-drained **I –** Imperfectly drained **P** – Poorly drained **WTLD** – Wetland

Soil Texture: **C** – Coarse-textured soils (e.g. gravel) **M** – Medium-textured soils (e.g. loam) **F** – Fine-textured soils (e.g. clay)

Topographic Pattern: **SM** – Smooth or flat **KK** – Hills **HO** – Hummocky **DM** – Drumlinoid **RD** – Ridges **DS** – Canyons and steep slopes

Ecological Representivity (Appendices 4, 5)

Ecological representivity describes the degree that the range of natural ecosystem diversity (elements, ecosections) is secured within reserve systems (e.g. Parks, Wilderness, Old Growth Policy).

The overall goal is biodiversity conservation through protection of natural habitat diversity. Ecological representation is employed as a "coarse scale" ecosystem planning concept. The analysis evaluated and identified the reserve status of the ecosections and climax communities located within the ecodistrict where two levels of reserves were recognized: legally protected reserves, such as Wilderness Areas; and policy protected reserves under the IRM classification to include old forest, Eastern Habitat Joint Venture Sites, non-designated provincial park reserves, and non-designated sites of ecological significance.

Legally protected reserves within the ecodistrict include a portion of Kejimkujik National Park, small pieces of Tobeatic and Lake Rossignol wilderness areas, and Ponhook Lake Nature Reserve, which is designated under the Special Places Act.

Policy protected reserves include those areas under the IRM classification set aside as old forest (C2E), designated provincial Parks and Park Reserves (Card Lake, Wentzells Lake, and Camerons Brook Provincial parks), and Operational Non-Designated Parks and Park Reserves (Pinehurst, Cookville, and Ninevah parks). Areas under reserve are indicated in Appendix 4, Appendix 5 and Map 3.

Opportunities to improve representation might include:

- ecosections that form less than 2% of the ecodistrict or ecoregion with little or no representation, IMRD, ICSM, WCHO, WMKK, WMRD, IFHO, IFSM, ICRD
- all of the other ecosections, each of which appears to be under represented, at least in the ecodistrict
- uncommon climax community types sugar maple-yellow birch-beech (1.9% of ecodistrict, 3.5% or ecoregion), red oak-white pine-red pine (1.2% of ecodistrict, 3.2% of ecoregion)

ELA Summary

Element Interpretation (All appendices and maps)

Perhaps one of the better examples of a drumlinized till plain in eastern North America, the LaHave Drumlins Ecodistrict encompasses an area from New Ross in the east to Kejimkujik National Park in the west. The drumlins show the classic streamlined, tear-drop shaped deposits of glacial till, with the tapered or narrow end pointing in the direction of glacier movement. The ecodistrict slopes in a southeasterly direction towards the Atlantic Ocean with an average elevation of 107 metres above sea level.

The ecodistrict is bounded on the south by the South Shore (830), by the granitic soils of the South Mountain (720) and St. Margaret's Bay (780) to the north and east, respectively. This area of Nova Scotia has early, warm springs and a long growing season, followed by a relatively mild winter. The area receives approximately 1,400 to 1,500 mm of precipitation annually.

Most of the soils can be characterized as well-drained, shallow, sandy loams except those developed on drumlins, which tend to be deeper and less stony. In the eastern portion of the ecodistrict the soils tend to be moderately well-drained, shallow, stony, gravelly sandy clay loams

which are deeper and less stony on the drumlins. Variation does occur in the drumlin field near New Ross where reddish, moderately fine-textured till overlies the granite bedrock and is stony and shallow. Much of the area between the drumlins tends to be shallow, imperfectly drained till where the slate bedrock is just below the surface on hummocky terrain with poorly drained soils in the depressions.

The ecodistrict is dominated by coniferous forests, but tolerant hardwoods will be found on the tops of drumlins and on the upper slopes of well-drained hills. Sugar maple, red oak, and beech are also found on the valley floors of the major waterways. Titus Smith, during his western tour in 1802, reported elm in the LaHave River valley and that this was the first they had seen since leaving Halifax. Hemlock, red spruce, and white pine will be found on the side slopes of the drumlins and on the moist soils of lower slopes. After disturbance, balsam fir is an early component of the coniferous forest in this ecodistrict and has been developed as a significant commercial resource as a preferred species for Christmas tree cultivation.

The natural forest of the drumlins is difficult to interpret since most of the drumlins have been cleared for settlement and agriculture. The fields when abandoned for farming purposes tend to return first to near pure stands of white pine.

Red oak is often a constituent of the forests located on drier sites and will often be associated with white pine. Red oak is also a minor constituent in many early successional forest types following disturbance from harvesting or fire and will be associated with aspen, white birch, and red maple on the drier sites.

Tolerant Mixedwood Drumlins

(Matrix) (IMDM, WFDM, WMDM, WMKK ecosections) (123,382 ha)

Portions of the matrix, either in large drumlin fields or in small isolated drumlins, can be found throughout the ecodistrict. The climax species in much of the area is a tolerant mixedwood (red spruce, eastern hemlock, white pine, sugar maple, yellow birch, beech) although there may be some areas where pure tolerant hardwoods will occur on drumlin tops, pure tolerant softwoods on moister side slopes, and occasionally black spruce in wetter areas.

Currently, many of the drumlins have been converted to agriculture or Christmas tree land. The present forest in the matrix is thus somewhat fragmented. Farmland that has been abandoned usually reverts to white pine, which is often heavily damaged by the white pine weevil. A softwood covertype is most prominent (44.9%) and comprises mostly mature late seral species, such as red spruce or white pine. Some hemlock or balsam fir is also present.

The mixedwood covertype (36.1%) is dominated by mid seral mature or multi-aged communities of red spruce or white pine with red maple.

Hardwoods (2.7%) represent the smallest covertype. There is near equal representation of all of the largely mature seral stages. Red maple is a dominant component of both early and mid seral intolerant / tolerant communities. Late seral hardwoods include sugar maple, yellow birch, and beech.

This element also contains islands in Mahone Bay. These drumlin islands comprising well-drained clay soils have experienced varying degrees of human impact over the years. Approximately 21% of the land has been converted from a forested state. Residences, both full time and seasonal, can be located on some of the islands. Forest harvesting and agricultural activities have occasionally taken place. Some of the islands appear to be in fairly natural state.

Flows

Water; people; forest products; goshawk; flying squirrel; Atlantic Coastal Plain Flora; Blanding's turtle; ribbonsnake.

Composition

LaHave Drumlins Ecodistrict 740 (based on statistics up to 2007)
Composition of Tolerant Mixedwood Drumlins

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	17%	6%	77% (48 Mat + 29 OF)	29%
Seral Stage	Early	Mid	Late	Unclassified
	14%	37%	38%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	45%	16%	36%	3%

Desired Condition

Generally, a mature, uneven-aged, mixedwood forest of late seral red spruce, eastern hemlock, white pine, sugar maple, yellow birch, and beech with large patches of unfragmented interior. Patches of tolerant softwoods and black spruce should show variation in development class.

Issues

Forest management should strive to ensure that the range of development classes, seral stages, and covertypes appropriate to the natural disturbance regime are present. Tolerant mixedwoods, hardwoods, and softwoods are the climax species of this element.

The amount of intolerant hardwood either as pure stands or in mixedwoods is high. Harvesting or silviculture avenues could be investigated to remedy this situation.

Wildlife habitat requires a range of patch sizes based on covertype and successional species. Because large patch size is lacking, patch aggregation could be encouraged.

Spruce Hemlock Pine Hummocks and Hills

(Patch) (IMHO, WCHO, WFHO, WMHO, IMRD ecosections) (69,968 ha)

This element covers the largest area of any of the patches within the ecodistrict. Both large and small areas of this element are present throughout LaHave Drumlins. Most of the terrain is hummocky with the exception of a few areas of ridged topography (near McGowan Lake, Shingle Lake, and north of Molega Lake).

This element is not as heavily farmed as the matrix but there are substantial Christmas tree lots.

The climax species is tolerant softwood (red spruce, eastern hemlock, white pine). A mature or multi-aged condition prevails (approximately 75%). Similar to the matrix, softwood covertype is most common, making up 50% of the area, usually being late seral communities of red spruce, mixed spruce-pine-hemlock, spruce-fir or white pine.

Mixedwoods (about 35% of the area) are dominated by mature or multi-aged mid seral communities of red maple with the tolerant softwoods. The mixedwood covertype has near equal amounts of early seral intolerants and late seral tolerant species.

The hardwood covertype (13.4% of the area) is largely early or mid seral species-red maple or red maple tolerant hardwood mixtures.

Flows

Water; people; forest products; goshawk; furbearers; Atlantic Coastal Plain Flora; Blanding's turtle; ribbonsnake.

Composition

LaHave Drumlins Ecodistrict 740 (based on statisticsup to 2007)
Composition of Spruce Hemlock Pine Hummocks and Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	17%	9%	74% (41 Mat + 33 OF)	33%
Seral Stage	Early	Mid	Late	Unclassified
	14%	38%	37%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	49%	13%	35%	3%

Desired Condition

Primarily mature mid and late seral tolerant softwoods with some representation of younger development classes. Multi-aged and old growth areas should be present.

Issues

Issues to address may include the high amount of intolerant hardwood species. Large areas of some of the patch have been harvested in recent years. Maintaining interior conditions in these areas will be a concern.

Spruce Pine Flats

(Patch) (ICRD, ICSM, IFHO, IFSM, IMSM ecosections) (38,072 ha)

This generally flat, imperfectly drained, low fertility element supports a climax community of black spruce-white pine or black spruce. Wetlands are embedded within the patch. Some ridged topography is present near Milipsigate Lake and Hebb Lake.

The forest is slightly over 50% softwood with the majority being late seral mature and multi-aged. Black spruce occurs most often with white pine showing up as small areas on slightly higher, better-drained sites.

Communities of tolerant softwoods or spruce-fir are also present. Mature mixedwoods dominated by the intolerant red maple with spruce and sometimes pine pepper the area.

Hardwood covertype occurs infrequently on about 10% of the area and is usually mature and dominated by red maple.

Flows

Water (storage, filtering); people (fishing, OHV, trapping); forest products; furbearers; Blanding's turtle; ribbonsnake.

Composition

LaHave Drumlins Ecodistrict 740 (based on statisticsup to 2007)

Composition of Spruce Pine Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	12%	8%	80% (38 Mat + 42 OF)	42%
Seral Stage	Early	Mid	Late	Unclassified
	11%	41%	40%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	52%	10%	37%	1%

Desired Condition

Black spruce and white pine-dominated element in a variety of area sizes and developmental stages. Scattered inclusions of tolerant softwoods and red maple fens close to waterways. Connectivity between wetlands.

Issues

Consider promoting late seral, tolerant hardwood regeneration in mature community types where sufficient tolerant hardwood species are present by using canopy retention techniques (selective harvesting). Thinning in all development classes should favour tolerant hardwoods. Lengthen the rotation age.

Wetlands

(Patch) (WTLD, PFHO ecosections) (5,890 ha)

The Wetlands element is common throughout the ecodistrict. These areas, usually small in size, contain various types of wetlands, most often bogs, red maple fens or wetlands associated with lake shores.

Many times the wetlands form the headwaters of waterways. The slightly higher ground around the various wetlands has a climax forest of black spruce and white pine.

The forest is largely mature or multi-aged black spruce with pockets of mature mid seral mixedwoods, usually black spruce and red maple. The sparse hardwood covertype is generally red maple.

Flows

Water (storage, filtration, percolation, sinks); people (fishing, trapping, nature watching); furbearers; Atlantic Coastal Plain Flora (Long's bulrush).

Composition

LaHave Drumlins Ecodistrict 740 (based on statisticsup to 2007)

Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	12%	14%	74% (35 Mat + 39 OF)	39%
Seral Stage	Early	Mid	Late	Unclassified
	11%	37%	44%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	66%	7%	24%	3%

Desired Condition

Relatively undisturbed and well-connected wetlands amidst a black spruce-dominated forest.

Issues

Wetlands play an important role in water collection, flood control, filtering, and ground water recharge. Wetlands and land immediately adjacent can be biodiversity hot spots. Because of their ecological importance it is important that any types of activity not adversely affect their integrity. Harvesting near wetlands should recognize both the importance of wetlands and adjacent vegetation.

Activities on wetlands must not contravene the DOE Wetland Designation Policy which covers the infilling, draining, flooding, or excavation of wetlands. Many wetlands, particularly wooded

wetlands, have not yet been identified in any type of mapping. The use of new technology, for example WAM (Wet Areas Mapping), could be of use in this regard.

Pine Oak Hills and Hummocks

(Patch) (WMRD ecosection) (3,249 ha)

The well-drained, loamy soils of this ridged element can be found in only a few places in the ecodistrict – southeast of Seven Mile Lake and west of West Whale Lake. Terrain in this element is highly variable with exposed bedrock, boulders, ericaceous vegetation, and generally lower fertility.

The climax forest is reported to be white pine, red oak, and red pine. Unlike most of the elements in the ecodistrict, the mixedwood covertype is most common (53.8%). Largely mature or multi-aged, it comprises mostly a mid seral mixture of red maple with black spruce or white pine. Oak may occasionally occur in the mixture.

Softwood covertype has also mostly mature or multi-aged development classes with mid or late seral species such as black spruce or white pine. Hardwood covertype is usually red maple with occasional stands of tolerant species. Red oak, according to forest covertype mapping, is rare.

Flows

People (deer hunting, OHV, Camping); forest products; Atlantic Coastal Plain Flora (golden crest, mountain sandwort).

Composition

LaHave Drumlins Ecodistrict 740 (based on statisticsup to 2007)
Composition of Pine Oak Hills and Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	8%	11%	81% (30 Mat + 51 OF)	51%
Seral Stage	Early	Mid	Late	Unclassified
	9%	57%	28%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	29%	15%	54%	2%

Desired Condition

A mix of development classes with the majority in a mature forest of mid and late seral species featuring white pine, red oak, and red pine.

Issues

Restoration of climax species on these sites. It could be investigated to determine if pine or oak are present in the understory and if these species would benefit from a release treatment. Area should

be checked to see if opportunities to encourage the climax species (thinnings, crop tree release, modified harvest, planting or under-planting) are present.

Valley Corridors

(Corridor) (Various ecosections) (20,304 ha)

Riparian corridors, of varying widths, are present along waterways. Approximate locations of a few corridors along major waterways have been delineated.

The LaHave Drumlins Ecodistrict contains a large number of streams, rivers, and lakes (10% of the area). The riparian corridors around this water are extremely important for biodiversity and ecosystem function. Many species utilize both aquatic and terrestrial habitats. The ecodistrict has a large number of ACPF, many found along lake shores in riparian corridors.

Historically, forest harvesting often took place in the riparian zone and has had an influence on the species composition within the corridor. Most of the identified corridors passed through elements whose climax species were dominated by tolerant softwoods or mixedwoods. The riparian corridors now pass through elements comprising primarily late seral mature softwoods, such as red spruce and white pine with some hemlock or mid seral mixedwoods, often made up of tolerant softwoods accompanied by red maple. The hardwood present is largely early or mid seral mature species like red maple.

Relatively little of the riparian zone, with the possible exception of portions of the LaHave River, is converted from a forested state. This element has a denser network of roads than all other elements.

(Note: The widths of riparian corridors are estimates only. They have been delineated for the larger waterways in the ecodistrict through the use of Wet Areas Mapping (WAP). Actual corridor width would require field verification.)

Flows

People (power, fishing, camps, hiking, canoe/boating, gold panning); fish (salmon, gaspereau, trout, smelt, bass, shad, eels); Atlantic Coastal Plain Flora.

Composition

LaHave Drumlins Ecodistrict 740 (based on statisticsup to 2007)

Composition of Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	5%	5%	90% (61 Mat + 29 OF)	29%
Seral Stage	Early	Mid	Late	Unclassified
	12%	45%	40%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	25%	36%	1%

Desired Condition

Generally continuous cover of natural forest conditions emphasizing lower impact resource management.

Issues

Beyond its importance to the ecological functioning of waterways, the role of riparian corridors as habitat should be considered. Forested cover should be maintained and forest management practices could consider promoting the climax tolerant softwoods and hardwoods.

Management of communities adjacent to the riparian corridors should consider maintaining the integrity of the corridor. An additional consideration might be the restoration of forested corridors where gaps exist.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the LaHave Drumlins Ecodistrict should focus on forest biodiversity conservation across the range of spatial scales. General principles could include maintenance of connectivity, maintenance of landscape heterogeneity, maintenance of stand structural complexity, and maintenance of the integrity of aquatic systems (Lindenmayer and Franklin 2002). Actions taken toward these principles could consider:

- Managing climax forest communities in relation to the natural disturbance regime, development class, and seral stage.
- Investigating the possibility of increasing the amount of late seral species in elements where the predicted climax is a tolerant species through silvicultural activities, such as partial cuts or thinnings in the appropriate mid seral stands or planting of abandoned agriculture land.
- Benefiting wildlife by increasing the number of large patches.
- Looking for opportunities to decrease the level of fragmentation, particularly in the matrix. Ensuring adequate levels of connectivity exist between wetlands and riparian corridors.
- Recognizing the importance of riparian corridors on all watercourses, both as protectors of aquatic ecosystems and as habitat. Looking into maintaining the integrity of corridors through appropriate management practices (type of harvesting, rate of harvesting) both within the corridor and in adjacent areas.
- Protection of existing wetlands and wetland complexes. Ensuring wetland integrity is not compromised by resource management activity (harvesting, road construction).
- Recognizing the importance of wetland-adjacent land relationships for biodiversity.
- Development of road plans for Crown blocks. Assessing impact of road construction on ecological concerns, such as fragmentation, aquatic ecosystems, sensitive sites, and protected areas. Developing a road maintenance plan to ensure that road deterioration does not cause deleterious environmental effects. Encourage sharing of road networks with adjacent landowners. Consider decommissioning roads where other uses (e.g. ATVs, snowmobiles) are not an issue.
- Recognizing that private landowners are the largest landowners and avenues should be

investigated to elicit their participation in ecological management at the landscape level.

- Improving representivity in the ecodistrict by considering additional ecosections, IMRD, WMKK, WMRD, IFHO, IFSM, WCHO, ICSM, ICRD, and uncommon climax community types of sugar maple-yellow birch-beech and red oak-white pine-red pine.
- Maintaining an acceptable balance between the four ecological emphasis classes.

Appendix 1: Flow - Element Interactions

Element	Water	People	Forest Products	Goshawk	Flying Squirrel	Fish	Furbearers	Colonial Seabirds	Atlantic Coastal Plain Flora	Blanding's Turtle, Ribbonsnake
Matrix Tolerant Mixedwood Drumlins (WMDM, WFDM, IMDM, WMKK)	- first order gravel streams - seepage nutrients	- farms - deer hunting - fishing - OHV - camps - hiking	- Christmas trees - timber, firewood - high quality hardwood	- mature large patches habitat	- mature tolerant hardwood (prime habitat)	- nursery streams for trout	- general habitat	_____	- gravel by sites along lake and stream edges	- part of habitat - nesting substrate
Patches Spruce Hemlock Pine Hummocks and Hills (WMHO, IFHO, WCHO, IMHO, IMRD)	- first and second order streams	- farms - deer hunting - fishing - OHV	- Christmas trees - timber, firewood	- mature large patches (habitat)	_____	- nursery streams for trout	- general habitat	_____	- gravelly sites along lakes and stream edges	- part of habitat - nesting areas
Pine Oaks Hills and Hummocks (WMRD)	_____	- deer hunting - OHV - camping	- timber	_____	- studies being conducted	_____	- general habitat	_____	- Golden crest along north shore of Shingle Lake - Mountain Sandwort (granite outcrops around Shingle Lake - possible Squawroot in oak stands	_____

Appendix 1: Flow - Element Interactions

Element	Water	People	Forest Products	Goshawk	Flying Squirrel	Fish	Furbearers	Colonial Seabirds	Atlantic Coastal Plain Flora	Blanding's Turtle, Ribbonsnake
Spruce Pine Flats (IMSM, ICSM, IFSM, ICRD, IFHO)	- water storage, filtering	- fishing - OHV - trapping	- timber				- habitat		- various species present along lakeshores and wetlands	- present in Kejimkujik National Park, Pleasant River/Shingle Lake
Wetlands (WTLD)	- storage - filtration - percolation - sinks	- fishing - trapping - nature watching				- minnow species (food source for larger organisms)	- habitat for several species		- Long's Bulrush possibly other species	
Islands (Part of Tolerant Mixedwood Drumlins element)		- summer homes, hunting, boating, sailing					- habitat	- nesting habitat		
Corridors LaHave River		- power (Morgan Falls) - fishing - boating - cottages, camps - hiking				- salmon, gaspereau, trout, smelt, smallmouth bass, shad, eels (commercial eel and gaspereau fishery)	- general habitat		- Lilaeopsis, samolus	
Gold River		- tourism (gold panning) - boating - fishing				- salmon, trout, eels	- general habitat		- none known	

Appendix 1: Flow - Element Interactions

Element	Water	People	Forest Products	Goshawk	Flying Squirrel	Fish	Furbearers	Colonial Seabirds	Atlantic Coastal Plain Flora	Blanding's Turtle, Ribbonsnake
Medway River	_____	- fishing - fishing hatchery - camps - boating canoeing	_____	_____	_____	- salmon, trout, smallmouth bass, eels, gaspereau (commercial eel and gaspereau fishery	- general habitat	_____	- Lilaeopsis, samolus, Mudwort	- upper reaches Blanding's Turtle (McGowan Lake)
Mersey River	_____	- power generation - tourism - native artifacts - fishing - canoeing - camping - trapping	_____	_____	_____	- trout, gaspereau eel (commercial eel and gaspereau fishery)	- beaver, mink, otter, wildcat	_____	- some present	_____
Card Lake	- headwaters of Avon River (flows north)	- fishing - boating - picnic park - trapping	_____	_____	_____	- gaspereau, trout, bass	- habitat	_____	_____	_____
Pleasant River	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Drumlins (non-forested)	Matrix	High (agriculture, blueberries, Christmas trees)	Throughout	- landscape - high variability and diversity of conditions - fields and Christmas trees on drumlin and drumlin slopes - farms on toes of Drumlins	Gap	- mixed tolerant softwood and hardwood climax - settlement - simplified lack of overstory - hay fields, young balsam fir		- conversion	- fragmentation - reduction in natural forest conditions - loss of biodiversity (human landscape favours generalist species)	- restoration to climax mature forest on hills and slopes (mixed tolerant softwood and hardwood) in strategic locations (proximity to natural conditions)
Drumlins (forested)	Matrix	Moderate (uncommon occurrence)	Caledonia area (tolerant hardwood)	Landscape	Gap / Infrequent	- mixed tolerant hardwood and softwood climax - now diverse species and age		- proximity to others - conversion	- fragmentation - reduction in natural forest conditions	- favour climax species in management practices
Drumlin Flats (flat areas between drumlins)	Matrix	High	Throughout	Landscape	Infrequent	- mixed tolerant hardwood and softwood climax - red spruce mixedwood - high graded diverse species and age	- drumlin hills, swamps, lakes, first order stream	- lots of logging, high grading - early and mid-successional forests - numerous roads	- reduction in natural forest conditions	- encourage development of climax species through appropriate harvesting (especially in association with intact drumlins)

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Spruce Pine Flats	Patch	Moderate (often headwater collection points, filtration function, small streams)		Landscape	Frequent (fire)	- black spruce - white pine climax - intolerant hardwood on poor and shallow soil - black spruce and larch on imperfectly drained flats - white pine as island patches where drainage improves	- bogs, wetlands	- loss of pine? - fire suppression?	- linkages to streams and river systems - distribution of white pine stand as "patches" at sub landscape scale	- Natural disturbance regime based harvesting
Spruce Hemlock Pine Hummocks and Hills	Patch	High		Landscape	Infrequent	- climax tolerant softwood - lot of intolerant hardwood and mid-succession mixed forest		- impacts of forest harvesting	- reduction in natural forest conditions - fragmentation	- natural disturbance regime-based harvesting, management to promote climax species

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Pine Oak Hills and Hummocks	Patch	Low	- Shingle Lake - West Whale Lake	Local	Infrequent	- oak pine climax - exposed bedrock, rough and rocky/ridge-y - Red Spruce, pine - high-graded mixedwood	Lakes	- isolation (two patches far apart) - change in species composition	- connectivity between patches - Shingle Lake Blanding's turtle, ribbon snake - regeneration of red oak	- appropriate management of intervening elements (between patches) - protection of endangered species habitat - use of harvesting system to regenerate oak
Wetlands	Patch	High - headwaters and source of collection and filtration	- common throughout - bogs - lake edges and fens - Ducks Unlimited Areas - Special places	Landscape	Open seral	- Red maple fens - black spruce, tamarack, open woodlands	Lakes, rivers	- infilling bogs - ditching and diversion through road building - lakeside development	- steady encroachment and development small piece at a time	- use of Wet Areas Mapping to delineate wooded swamps and during forest harvesting

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Mahone Bay Islands (a component of Tolerant Mixedwood Drumlins matrix element)	Island	Moderate	Mahone Bay Islands	local		- tolerant species climax - white spruce (old field) - mixed forests - tolerant hardwood - estates/ fields/ lawns	Saltwater	- land use change - erosion - recreation	- private development loss of natural forest conditions - bird colonies - naturally isolated	- promote conservation and stewardship initiatives
<u>Corridors</u>										
Medway	Corridor	High		Landscape (links ecodistricts) ecoregions	- variable	- mixed forest communities - red maple fens, bogs - seasonally flooded flats		- human settlement on lower reaches	- fragmented riparian zone - rare plant	- identify and restore riparian communities
Mersey	Corridor			Local (links ecodistricts)		- mixed forest communities - numerous fens, bogs		- human settlement on lower reaches	- unnatural riparian zone	
LaHave	Corridor	High		Landscape (links ecodistricts) ecoregions		- mixed forest communities - numerous seasonally flooded flats	- farms, settlement	- human settlements, farms	- loss of riparian corridor, rare plants	

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Pleasant River	Corridor	High		- landscape (links ecodistricts)		- mixed forest communities - numerous bogs, scattered fens, and seasonally flooded flats				
Card Lake	Corridor	High		- local (links ecodistricts)		- mixed forest communities bogs, fens				
Coastal Plain Flora	Patches along lakeshores and wetlands	High (conservation issue)	Medway and LaHave Rivers	Local/landscape	- lakeside wave effects - silt deposits - ice action	- shore and wetland		- disconnected patches - development and reduced abundance - ATV		- conservation programs and practice - riparian management

Appendix 2b: Connective Management Strategies

Structure Type	Attributes	Conditions of Concern	Management Strategies
Matrix	percolation, large patch, interior habitat	fragmentation, excessive edge	1. Promote contiguous forest structure using strategies such as patch aggregation and overstory-sustaining selection cutting 2. Promote large patch structure and interior conditions 3. Mitigate large scale, long term, fragmentation of the matrix that could impede percolation 4. Manage age and structure appropriate to NDR. For gap and infrequently disturbed ecosections maintain 60% mature cover
Patch Ecosystems	patch size, nearest neighbour, edge / interior, intervening habitat condition	undesirable connections, internal composition, excessive separations, threats to key patch	1. Identify and map key patch representatives (high quality or critical link/distance) 2. Maintain natural isolations, as well as necessary "nearest neighbour" distances 3. Identify potential metapopulation habitat dynamics (if applicable)
Linear Corridors	continuous connection	barriers, interruptions, excessive edge	1. Mitigate unnatural barriers 2. Map and Manage along natural boundaries 3. Conserve "interior" conditions where appropriate through strategic management of neighbouring ecosystems 4. Sustain continuity, through management of overstory and interior structure appropriate to NDR 5. Follow habitat regulations for buffer management. Establish wider buffers with natural boundaries along major waterways

Appendix 3: Special Occurrences (Ecodistrict 740)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered	Endangered
Piping Plover melodus ssp	*Charadrius melodus melodus*	Endangered	Endangered	Endangered
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Roseate Tern	*Sterna dougallii*	Endangered	Endangered	Endangered
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Coast Pepper-Bush	*Clethra alnifolia Fraxinus*	Vulnerable	Special Concern	Threatened
Black Ash	*nigra Helianthemum*	Threatened	N/A	N/A
Long-branched Frostweed	*canadense Hydrocotyle*	Endangered	N/A	N/A
Water-pennywort	*umbellata Lilaeopsis*	Endangered	Threatened	Special Concern
Eastern Lilaeopsis	*chinensis*	Vulnerable	Special Concern	Special Concern
FISH American Eel	-			
Atlantic Whitefish	*Anguilla rostrata*	N/A	N/A	Threatened
Atlantic Salmon - southern upland population	*Coregonus huntsmani*	Endangered	Endangered	Endangered
	Salmo salar pop. 2	N/A	N/A	Endangered
GYMNOSPERMS				
Eastern White Cedar	*Thuja occidentalis*	Vulnerable	N/A	N/A
INSECTS	-			
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS	-			
Southern Flying Squirrel	*Glaucomys volans*	N/A	Special Concern	Not at Risk
Eastern Pipistrelle	*Perimyotis subflavus*	Endangered	N/A	N/A
Harbour Porpoise - Northwest Atlantic population	*Phocoena phocoena (NW Atlantic pop.)*	Endangered N/A	N/A Threatened	Endangered Special Concern
MOLLUSKS				
Brook Floater	*Alasmidonta varicosa*	Threatened	Special Concern	Special Concern

Appendix 3: Special Occurrences (Ecodistrict 740)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
_____				
Redroot	*Lachnanthes caroliniana*	Vulnerable	Special Concern	Special Concern
Goldencrest	*Lophiola aurea*	Vulnerable	Special Concern	Special Concern
Long's Bulrush	*Scirpus longii*	Vulnerable	Special Concern	Special Concern
REPTILES	-			
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Leatherback Sea Turtle - Atlantic population	*Dermochelys coriacea (Atlantic pop.)*	N/A	Endangered	Endangered
Blanding's Turtle - Nova Scotia population	*Emydoidea blandingii*	Endangered	Endangered	Endangered
Eastern Ribbonsnake - Atlantic population	*Thamnophis sauritus pop. 3*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS			
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS			
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
American Bittern	*Botaurus lentiginosus*	Sensitive (Yellow)	S3S4B
Least Sandpiper	*Calidris minutilla*	Secure (Green)	S1B,S5M
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3M
Northern Cardinal	*Cardinalis cardinalis*	Secure (Green)	S3S4
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B S3B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3S4B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3B,S4N
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S5N
Red-breasted Merganser	*Mergus serrator*	Secure (Green) Sensitive	S3M
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	(Yellow) Sensitive	S3S4
Gray Jay	*Perisoreus canadensis*	(Yellow)	S3B
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3S4B
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S2B
Scarlet Tanager	*Piranga olivacea*	Undetermined (Undetermined)	S3S4B
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S3B
Common Tern	*Sterna hirundo*	Sensitive (Yellow) May	S3B
Arctic Tern	*Sterna paradisaea*	Be At Risk (Orange) May	S2S3B
Willet	*Tringa semipalmata*	Be At Risk (Orange)	S3S4B
Eastern Kingbird	*Tyrannus tyrannus*	Sensitive (Yellow)	S3S4B
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	
BRYOPHYTES			
a Moss	*Thamnobryum alleghaniense*	Sensitive (Yellow)	S2?
a Moss	*Thelia hirtella*	Sensitive (Yellow)	S2?
DICOTS			
Nova Scotia Agalinis	*Agalinis neoscotica*	Secure (Green)	S3
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Smooth Alder	*Alnus serrulata*	Sensitive (Yellow)	S3
Running Serviceberry	*Amelanchier stolonifera*	Secure (Green)	S3?
Chaffweed	*Anagallis minima*	May Be At Risk (Orange)	S1

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
a Pussytoes Tower	*Antennaria parlinii*	May Be At Risk (Orange)	S1
Mustard Swamp	*Arabis glabra*	Undetermined (Undetermined)	S1
Milkweed Swamp	*Asclepias incarnata*	Secure (Green)	S3
Milkweed Yellow	*Asclepias incarnata ssp. pulchra*	Undetermined (Undetermined)	S2S3
Bartonia	*Bartonia virginica*	Secure (Green)	S3
Michaux's Dwarf Birch	*Betula michauxii*	Sensitive (Yellow)	S2
Swamp Beggarticks	*Bidens discoidea*	.1 Extirpated ()	SH
Small-spike False-nettle	*Boehmeria cylindrica*	May Be At Risk (Orange)	S1
Common Buttonbush	*Cephalanthus occidentalis*	Sensitive (Yellow)	S3
Prickly Hornwort	*Ceratophyllum echinatum*	May Be At Risk (Orange)	S2?
Seaside Spurge	*Chamaesyce polygonifolia*	Secure (Green)	S3
American Cancer-root	*Conopholis americana*	May Be At Risk (Orange)	S1S2
Swamp Loosestrife	*Decodon verticillatus*	Sensitive (Yellow)	S3
Canada Tick-trefoil	*Desmodium canadense*	May Be At Risk (Orange)	S1
Large Tick-Trefoil	*Desmodium glutinosum*	May Be At Risk (Orange)	S1
Purple-veined Willowherb	*Epilobium coloratum*	Sensitive (Yellow)	S2?
Coastal Plain Joe-pye-weed	*Eupatorium dubium*	May Be At Risk (Orange)	S2
Red Ash	*Fraxinus pennsylvanica*	May Be At Risk (Orange)	S1
Blunt-leaved Bedstraw	*Galium obtusum*	May Be At Risk (Orange)	S1S2
Bicknell's Crane's-bill	*Geranium bicknellii*	Secure (Green)	S3
American False Pennyroyal	*Hedeoma pulegioides*	Sensitive (Yellow)	S2S3
Round-lobed Hepatica	*Hepatica nobilis var. obtusa*	May Be At Risk (Orange)	S1S2
Panicled Hawkweed	*Hieracium paniculatum*	Secure (Green) Sensitive	S3
Disguised St John's-wort	*Hypericum dissimulatum*	(Yellow)	S2S3
Large St John's-wort	*Hypericum majus*	May Be At Risk (Orange)	S1
Hairy Lettuce	*Lactuca hirsuta var. sanguinea*	Sensitive (Yellow)	S2
Southern Mudwort	*Limosella australis*	Sensitive (Yellow)	S3
Yellow-seeded False Pimperel	*Lindernia dubia*	Secure (Green)	S3S4
Water Beggarticks	*Megalodonta beckii Minuartia*	Sensitive (Yellow)	S3
Greenland Stitchwort	*groenlandica Myriophyllum*	Sensitive (Yellow)	S2
Farwell's Water Milfoil	*farwellii Oenothera fruticosa*	Sensitive (Yellow)	S2
Narrow-leaved Evening Primrose	*ssp. glauca*	Undetermined (Undetermined)	S2
Horn-leaved Riverweed	*Podostemum ceratophyllum*	May Be At Risk (Orange)	S1
Halberd-leaved Tearthumb	Polygonum arifolium	Sensitive (Yellow)	S2
Stout Smartweed	*Polygonum robustius*	Secure (Green)	S3S4
Climbing False Buckwheat	Polygonum scandens	Sensitive (Yellow)	S3
Marsh Mermaidweed	Proserpinaca palustris	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
Marsh Mermaidweed	*Proserpinaca palustris var. palustris*	May Be At Risk (Orange)	S1?
Comb-leaved Mermaidweed	*Proserpinaca pectinata*	Sensitive (Yellow)	S3
Eastern Cudweed	*Pseudognaphalium obtusifolium*	Secure (Green)	S3S4
Virginia Meadow Beauty	*Rhexia virginica*	Secure (Green)	S3
Swamp Rose	*Rosa palustris*	Secure (Green)	S3
Triangular-valve Dock	*Rumex salicifolius var. mexicanus*	Sensitive (Yellow)	S2
Bog Willow	*Salix pedicellaris*	Sensitive (Yellow)	S2
Meadow Willow	*Salix petiolaris*	Secure (Green)	S3
Silky Willow	*Salix sericea*	May Be At Risk (Orange)	S2
Seaside Brookweed	*Samolus valerandi ssp. parviflorus*	Sensitive (Yellow) Secure	S2
Elliott's Goldenrod	*Solidago latissimifolia*	(Green) Sensitive	S3
Wavy-leaved Aster	*Symphyotrichum undulatum*	(Yellow) Sensitive	S2
Canada Germander	*Teucrium canadense*	(Yellow)	S3
Poison Sumac	*Toxicodendron vernix*	May Be At Risk (Orange)	S1
Forked Bluecurls	*Trichostema dichotomum*	May Be At Risk (Orange)	S1
Humped Bladderwort	*Utricularia gibba*	Secure (Green)	S3S4
Little Floating Bladderwort	*Utricularia radiata*	Secure (Green)	S3
Inverted Bladderwort	*Utricularia resupinata*	May Be At Risk (Orange)	S1S2
Zigzag Bladderwort	*Utricularia subulata*	Secure (Green) Sensitive	S3
Dwarf Bilberry	Vaccinium caespitosum	(Yellow)	S2
Highbush Blueberry	*Vaccinium corymbosum*	Secure (Green)	S3
Blue Vervain	*Verbena hastata*	Secure (Green)	S3
Arrow-Leaved Violet	*Viola sagittata var. ovata*	Secure (Green)	S3S4
FERNS AND THEIR ALLIES			
Cut-leaved Moonwort	Botrychium dissectum	Secure (Green)	S3
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Variegated Horsetail	Equisetum variegatum	Secure (Green)	S3
Acadian Quillwort	*Isoetes acadiensis*	Sensitive (Yellow)	S3
Southern Bog Clubmoss	*Lycopodiella appressa*	Secure (Green)	S3S4
Appalachian Polypody	*Polypodium appalachianum*	Undetermined (Undetermined)	S3?
Little Curlygrass Fern	*Schizaea pusilla*	Secure (Green)	S3
FISH			
Atlantic Salmon	*Salmo salar*	May Be At Risk (Orange)	S2
INSECTS			
Mottled Darner	*Aeshna clepsydra*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
Pepper and Salt Skipper	*Amblyscirtes hegon*	Secure (Green)	S2
Common Roadside-Skipper	*Amblyscirtes vialis*	Secure (Green)	S2
Ocellated Darner	*Boyeria grafiana*	Sensitive (Yellow)	S3
Henry's Elfin	*Callophrys henrici*	Secure (Green)	S2
Bog Elfin	*Callophrys lanoraieensis*	May Be At Risk (Orange)	S1S2
Eastern Pine Elfin	*Callophrys niphon*	Secure (Green) Secure	S2
Hoary Elfin	*Callophrys polios*	(Green) Sensitive	S3S4
Vesper Bluet	*Enallagma vesperum*	(Yellow) Sensitive	S2S3
Prince Baskettail	*Epitheca princeps*	(Yellow) Secure (Green)	S2
Juvenal's Duskywing	*Erynnis juvenalis*	Sensitive (Yellow) Secure	S2S3
Seaside Dragonlet	*Erythrodiplax berenice*	(Green) Sensitive	S3
Harvester	*Feniseca tarquinius*	(Yellow) Secure (Green)	S3S4
Harlequin Darner	*Gomphaeschna furcillata*	Secure (Green) Secure	S3
Northern Pearly-Eye	*Lethe anthedon*	(Green) Secure (Green)	S3
Elfin Skimmer	*Nannothemis bella*	May Be At Risk (Orange)	S3
Compton Tortoiseshell	*Nymphalis l-album*	May Be At Risk (Orange)	S1S2
Riffle Snaketail	*Ophiogomphus carolus*	Sensitive (Yellow)	S3
Maine Snaketail	*Ophiogomphus mainensis*	Secure (Green)	S1
Rusty Snaketail	*Ophiogomphus rupinsulensis*	Secure (Green)	S1S2
Mustard White	*Pieris oleracea*	Secure (Green)	S2
Question Mark	*Polygonia interrogationis*	Undetermined (Undetermined)	S3B
Grey Comma	*Polygonia progne*		S3S4
Aphrodite Fritillary	*Speyeria aphrodite*		S3S4
Carolina Saddlebags	*Tramea carolina*		S1B
LICHENS			
Scaly Fringe Lichen	*Heterodermia squamulosa*	Sensitive (Yellow)	S2S3
Blistered Jellyskin Lichen	*Leptogium corticola*	Sensitive (Yellow)	S2S3
Stretched Jellyskin Lichen	*Leptogium milligranum*	Sensitive (Yellow)	S2S3
Veined Shingle Lichen	*Pannaria lurida*	May Be At Risk (Orange)	S1?
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined (5)	Unranked
MONOCOTS			
Silvery-flowered Sedge	*Carex argyrantha*	Secure (Green) Undetermined	S3S4
Atlantic Sedge	*Carex atlantica ssp. capillacea*	(Undetermined) Secure (Green)	S2
Hidden-scaled Sedge	*Carex cryptolepis*	May Be At Risk (Orange)	S3?
Slender Wood Sedge	*Carex digitalis*		S1

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Hayden's Sedge	*Carex haydenii*	May Be At Risk (Orange)	S1
Houghton's Sedge	*Carex houghtoniana*	Sensitive (Yellow) Secure	S2?
Hop Sedge	*Carex lupulina*	(Green) Sensitive	S3
Swan's Sedge	*Carex swanii*	(Yellow)	S2S3
Tender Sedge	*Carex tenera*	Sensitive (Yellow)	S1S2
Blunt Broom Sedge	*Carex tribuloides*	Secure (Green)	S3?
Sweet Wood Reed Grass	*Cinna arundinacea*	May Be At Risk (Orange)	S1
Early Coralroot	*Corallorhiza trifida*	Secure (Green) Secure	S3
Toothed Flatsedge	*Cyperus dentatus*	(Green)	S3S4
Woolly Panic Grass	*Dichanthelium acuminatum var. lindheimeri*	Undetermined (Undetermined)	S1?
Deer-tongue Panic Grass	*Dichanthelium clandestinum*	Secure (Green)	S3
Narrow-leaved Panic Grass	*Dichanthelium linearifolium*	Sensitive (Yellow)	S2?
Eaton's Witchgrass	*Dichanthelium spretum*	Secure (Green)	S3S4
Slender Panic Grass	*Dichanthelium xanthophysum*	May Be At Risk (Orange)	S1
Yellow Spikerush	*Eleocharis olivacea*	Sensitive (Yellow)	S2S3
Ovate Spikerush	*Eleocharis ovata*	Sensitive (Yellow)	S2?
Downy Rattlesnake-Plantain	*Goodyera pubescens*	May Be At Risk (Orange)	S2
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Sharp-Fruit Rush	Juncus acuminatus	Sensitive (Yellow)	S3S4
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Grassleaf Rush	*Juncus marginatus*	Sensitive (Yellow) May	S3
Secund Rush	*Juncus secundus*	Be At Risk (Orange) May	S1
Southern Twayblade	*Listera australis*	Be At Risk (Orange) May	S2
Thread-Like Naiad	*Najas gracillima*	Be At Risk (Orange) May	S1S2
Fall Panic Grass	*Panicum dichotomiflorum var. puritanorum*	Be At Risk (Orange)	S1?
Redtop Panic Grass	*Panicum rigidulum var. pubescens*	Sensitive (Yellow)	S3
Tuckerman's Panic Grass	*Panicum tuckermanii*	Sensitive (Yellow)	S2S3
Canada Rice Grass	*Piptatherum canadense*	Sensitive (Yellow)	S2
Slender Rice Grass	*Piptatherum pungens*	Sensitive (Yellow)	S2
Southern Rein-Orchid	*Platanthera flava*	Sensitive (Yellow)	S2
Southern Rein Orchid	*Platanthera flava var. flava*	Sensitive (Yellow)	S2
Pale Green Orchid	*Platanthera flava var. herbiola*	Secure (Green)	S1S2
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Spotted Pondweed	*Potamogeton pulcher*	May Be At Risk (Orange)	S1S2
Tall Beakrush	*Rhynchospora macrostachya*	May Be At Risk (Orange)	S1
Torrey's Bulrush	*Schoenoplectus torreyi*	May Be At Risk (Orange)	S1

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1b: Other Species of Conservation Concern (other species that are a priority for planning, management, and stewardship action)

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Eastern Blue-Eyed-Grass	*Sisyrinchium atlanticum*	Secure (Green)	S3S4
Coastal Plain Blue-eyed-grass	*Sisyrinchium fuscatum*	May Be At Risk (Orange)	S1
Round-leaved Greenbrier	*Smilax rotundifolia (Atlantic pop.)*	Secure (Green)	S3
Case's Ladies'-Tresses	*Spiranthes casei*	Sensitive (Yellow)	S2
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	Sensitive (Yellow)	S2S3
Gaspé Arrowgrass	*Triglochin gaspensis*	Undetermined (Undetermined)	S1?
Wild Celery	*Vallisneria americana*	May Be At Risk (Orange)	S2

*Atlantic Canada Conservation Data Centre S-Ranks, where S1: extremely rare; S2: rare; S3: uncommon; S4: usually widespread, fairly common; S5: widespread, abundant; S#S#: A range between two consecutive ranks for a species/community denotes uncertainty about the exact rarity (e.g. S1S2); Consult http://www.accdc.com/en/ranks.html for descriptions of other ranks.

Provincial General Status Ranks as assessed in 2010 (http://www.wildspecies.ca/wildspecies2010).

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Loon Nesting Lakes	Bird Habitat	Significant Habitats of Nova Scotia Database (SHNSD)	Nova Scotia Environment Act Nova Scotia Forests Act (subsection: *Wildlife Habitat and Watercourses Protection Regulations*)
Eagle Nests	Bird Habitat	SHNSD	Nova Scotia Wildlife Act
Osprey Nests	Bird Habitat	SHNSD	Nova Scotia Wildlife Act
Blue Heron Nesting Colonies	Bird Habitat	SHNSD	Nova Scotia Wildlife Act
Westhaver Island – Roseate Tern Colony	Bird Habitat / Species at Risk	SHNSD	NSESA SARA
Wilderness Areas - Lake Rossignol; Tobeatic	Ecosystems / Recreation	DNR Restricted Land Use Database	Nova Scotia Wilderness Areas Protection Act
Wildlife Management Area – Hibernia	Habitat	DNR Restricted Land Use Database	Nova Scotia Wildlife Act
Protected Beach – Westhaver	Ecosystems	DNR Restricted Land Use Database	Nova Scotia Wildlife Act
Nature Reserve – Ponhook Lake	Ecosystems	DNR Restricted Land Use Database	Nova Scotia Wildlife Act
Provincial Park – Card Lake, Fancy Lake, Wentzells Lake, Camerons Brook	Ecosystems / Recreation	DNR Restricted Land Use Database	Nova Scotia Wildlife Act
National Park - Kejimkujik	Ecosystems / Recreation	DNR Restricted Land Use Database	Nova Scotia Wildlife Act
Designated Water Supply – Bridgewater, Lunenburg, Mahone Bay	Ecosystems	DNR Restricted Land Use Database	Nova Scotia Environment Act

Appendix 3: Special Occurrences (Ecodistrict 740)

Table 1d – Heritage Features

Feature	Type	Information Source
Indian Burial Grounds – Kejimkujik Park	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge NSDNR Database
Native Artifacts	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge NS DNR Database
Abandoned Mines	Geological and Cultural Heritage	NS Abandoned Mines Database

Appendix 3: Special Occurrences

Table 2: Comparison of Ecological Emphasis Classification Index by Ecosection (Within Ecodistrict and Ecoregion)

Ecosections that form 2% or less of the ecodistrict and/or ecoregion area or are more than 75% converted are highlighted. The table provides a sense of how unique or uncommon an ecosection and its associated climax communities are within the ecodistrict and across the ecoregion. The EEC Index value conveys an indication of relative land use pressure on the ecosection.

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICRD	bs wP	1,356	0.5	25,710	9.3	70	6.1	7,277	0.4	419,644	24.9	63 to 72	3.4
ICSM	bS wP	1,826	0.7	25,710	9.3	65 to 68	8.9	37,858	2.2	419,644	24.9	76 to 79	2.5
IFHO	bS	3,122	1.1	7,882	2.9	62 to 68	7.2	7,665	0.5	75,102	4.5	62 to 67	8.5
IFSM	bS wP	1,723	0.6	25,710	9.3	64 to 72	3.8	2,423	0.1	419,644	24.9	66 to 72	3.1
IMDM	rS eH wP	15,742	5.7	87,198	31.7	59 to 64	14.5	25,961	1.5	616,727	36.6	64 to 69	9.9
IMHO	rS eH wP	23,233	8.4	87,198	31.7	73 to 78	4.0	222,050	13.2	616,727	36.6	70 to 73	3.0
IMRD	rS eH wP	5,540	2.0	87,198	31.7	77 to 79	1.6	5,948	0.4	616,727	36.6	76 to 79	1.5
IMSM	bS wP	31,847	11.6	25,710	9.3	67 to 71	6.5	92,050	5.5	419,644	24.9	71 to 74	3.7
PFHO	wetlands	126	0.0	0	0.0	54 to 75	0.0	126	0.0	0	0.0	54 to 75	0
WCHO	rS eH wP	1,768	0.6	87,198	31.7	67 to 68	8.7	187,670	11.1	616,727	36.6	73 to 77	3.9
WFDM	rS eH wP sM yB Be	34,307	12.5	105,049	38.2	53 to 60	17.3	37,395	2.2	187,322	11.1	52 to 59	17.7
WFHO	rS eH wP	18,273	6.6	87,198	31.7	60 to 70	6.4	31,687	1.9	616,727	36.6	53 to 60	14
WMDM	rS eH wP sM yB Be	70,742	25.7	105,049	38.2	58 to 63	16.3	132,982	7.9	187,322	11.1	58 to 63	13.5
WMHO	rS eH wP	23,138	8.4	87,198	31.7	65 to 70	8.4	154,580	9.2	616,727	36.6	64 to 69	7.5
WMKK	sM yB Be	5,161	1.9	7,303	2.7	61 to 67	9.5	17,019	1.0	59,619	3.5	60 to 65	9.9
WMRD	rO wP rP	3,251	1.2	3,251	1.2	71 to 74	0.9	5,087	0.3	53,643	3.2	68 to 74	1.0
WTLD	wetlands	6,273	2.3	0	0.0	72 to 75	2.5	87,241	5.2	0	0.0	77 to 78	3

*Area of Climax Type refers to the total area of the climax community in the ecodistrict and in the ecoregion.

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
WMDM	rS eH wP sM yB Be	70,742	8.4	3,145	13	99	0	3,244	4.6	13	0.0	3,257	4.6
WFDM	rS eH wP sM yB Be	34,307	4.2	0	1	108	0	108	0.3	1	0.0	108	0.3
IMSM	bS wP	31,847	22.9	1,754	0	0	0	1,754	5.5	0	0.0	1,754	5.5
XXWA	NONE	27,631	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IMHO	rS eH wP	23,233	31.6	5,206	0	249	0	5,455	23.5	0	0.0	5,455	23.5
WMHO	rS eH wP	23,138	16.1	1,608	1	3	0	1,611	7.0	1	0.0	1,612	7.0
WFHO	rS eH wP	18,273	5.3	0	0	8	0	8	0.0	0	0.0	8	0.0
IMDM	rS eH wP	15,742	4.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	6,272	21.6	419	0	2	0	421	6.7	0	0.0	421	6.7
IMRD	rS eH wP	5,540	51.8	1,058	0	131	0	1,189	21.5	0	0.0	1,189	21.5
WMKK	sM yB Be	5,161	9.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WMRD	rO wP rP	3,251	44.4	0	0	0	0	0	0.0	0	0.0	0	0.0
IFHO	bS	3,122	14.3	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	bS wP	1,826	28.9	0	0	33	0	33	1.8	0	0.0	33	1.8
WCHO	rS eH wP	1,768	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFSM	bS wP	1,723	2.1	0	0	0	0	0	0.0	0	0.0	0	0.0
ICRD	bS wP	1,356	9.1	0	0	0	0	0	0.0	0	0.0	0	0.0
PFHO	wetlands	126	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
XXCB	coastal beach	14	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**275,071**		**13,189**	**15**	**632**	**0**	**13,821**		**15**		**13,803**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act Designation	Area by Ownership		Policy Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	738	0	Operational Non Designated Parks and Reserves	34	0
National Historic Sites and Parks	12,430	0	Old Forest	8,269	0
Areas under the Special Places Act	21	15	Designated Provincial Parks and Park Reserves	131	0
Protected Beaches	0	1			

Source: Crown Lands Forest Model Landbase Classification
Some of these programs may occur in the same area. For example, much of the Old Forest Policy forests are located in the Wilderness Areas.

Appendix 6: Description of Road Density Index

Road, trail, and utility corridors provide the background structure for transporting people and goods and are integral components of human land use. However, transportation systems are expensive and have a wide range of negative environmental impacts including, water course siltation, habitat fragmentation, dispersal obstruction, plant and animal mortality, exotic species invasion, loss of productive land, and an overall increase in human presence (Forman & Deblinger 2000, Reed et. al. 1996, Lindenmayer & Franklin 2002).

In order to reduce conflicts with natural systems and improve transportation safety there is clearly a need to incorporate landscape ecology into the planning of transportation networks (Forman 2004, Forman & Hersperger 1996, Spellerberg 1998). The emerging science of road ecology advocates integrating spatial analysis of the transportation system with ecological landscape analysis as a fundamental step in transportation system planning (Forman 1999, Lindenmayer & Franklin 2002, Diaz & Apostol 1992).

Efficient access systems can be strategically designed to minimize environmental impacts by incorporating factors such as harvest scheduling, life expectancy, location, road class requirements, decommissioning, and mitigation measures (Lindenmayer & Franklin 2002, Forman, 2004). Selection of transportation routes should incorporate knowledge of landscape functions to improve compatibility with natural ecosystem flows and connectivity (Forman & Hersperger, 1996). Furthermore, unroaded and lightly roaded areas are important for biodiversity conservation and should be considered during planning (USDA Forest Service 1999).

The GIS based “Road Index” procedure calculates and maps the spatial influence of the transportation network. It is a management tool designed to help planners gauge the relative influence of man-made linear features within landscapes. It was designed to help integrate the transportation system into an ecological landscape analysis process. In addition to mapping, the index provides a numerical indicator of road influence that can be used to monitor temporal changes and compare different landscapes.

Main Concepts

The influence of the transportation network on the ecological landscape varies with three main factors: 1) the type of transportation feature (e.g. highway, power line, trail, etc.); 2) the density of linear features in a given area; and 3) the distance of an area from transportation features (Forman 2004, Lindenmayer & Franklin 2002, Forman & Deblinger 2000). The Road Index is a weighting of these three factors reflecting their relative influence on ecosystem function.

Road density has a well-documented influence on many factors, including wildlife movements, fragmentation, human access, hydrology, and fire patterns (Forman and Hersperger, 1996). Forman & Deblinger (2000) report great variance in road effect zones, with average cumulative effects extending 300 metres from road edges, and some impacts penetrating up to a kilometre. Consequently, Index values are determined by assessing the transportation network within a one kilometre radius. The Index algorithm is applied to a grid of one hectare squares representing the landscape in question. The calculation provides a measure of the density of the transportation network and the specific distance to the transportation features.

The resulting index values are scaled to provide a potential range of 0 to 100. For the purpose of map interpretation, these values have been grouped into benchmark ranges that reflect characteristic patterns of land use in Nova Scotia.

In Nova Scotia, as in most populated jurisdictions, transportation networks are continuously changing as new roads and utilities are constructed and unused roads and trails deteriorate. As such, any analysis of the current state of these features must be based on reasonably up-to-date data. In this province, the Geomatics Centre, administered by Service Nova Scotia and Municipal Relations, is responsible for mapping transportation features which they include in their 1:10000 topographic series maps.

On a provincial level, this work is updated on a ten-year repeat cycle and includes changes to existing features and the delineation of new features. Before undertaking road analysis, the Geomatics Centre should be contacted to ensure that the most current data is used to calculate the Road Index values. This data should be further updated using Landsat satellite imagery to add significant new roads and utilities that are over 500 metres in length on lands currently with a remote or forest resource index value.

Department of Natural Resources Forestry Branch maintains a table relating the Topographic series attribute coding used by the Geomatics Centre to the feature categories used in the Road Index calculations, along with ArcView programs, allowing the data to be formatted correctly. An inventory of recent Landsat satellite images is also available.

Full report contained in the Ecological Landscape Analysis Guidebook
http://www.gov.ns.ca/natr/library/forestry/reports/Procedural%20Guide%20For%20Ecological%20Landscape%20Analysis.pdf

Appendix 7: Road Density Index Worksheets

Road index values for all tables are benchmarks that will be monitored over time to evaluate trends.

Table 1: Length of Access Systems and Index Weighting for Different Road Types

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	2,947
Utility corridors	3	223
Gravel Roads and active railways	6	1,944
Paved streets and roads collectors	10	834
Highways	15	35

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	37,881	13.8
Forest Resource	7 to 15	88,253	32.1
Mixed Rural	16 to 24	85,125	30.9
Agriculture Suburban	25 to 39	57,643	21.0
Urban	40 to 100	6,166	2.2
Total		**275, 068**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	20,304	20
Tolerant Mixedwood Drumlins	123,382	13
Spruce Pine Flats	38,072	11
Pine Oak Hills and Hummocks	3,249	6
Spruce Hemlock Pine Hummocks and Hills	69,968	9
Wetlands	5,890	13
Total	**260,865***	**13**

*Water is excluded from this table. Rounding, overlapping, and averaging of figures may lead to small differences in tables.

Appendix 8: Development Classes and Seral Stages

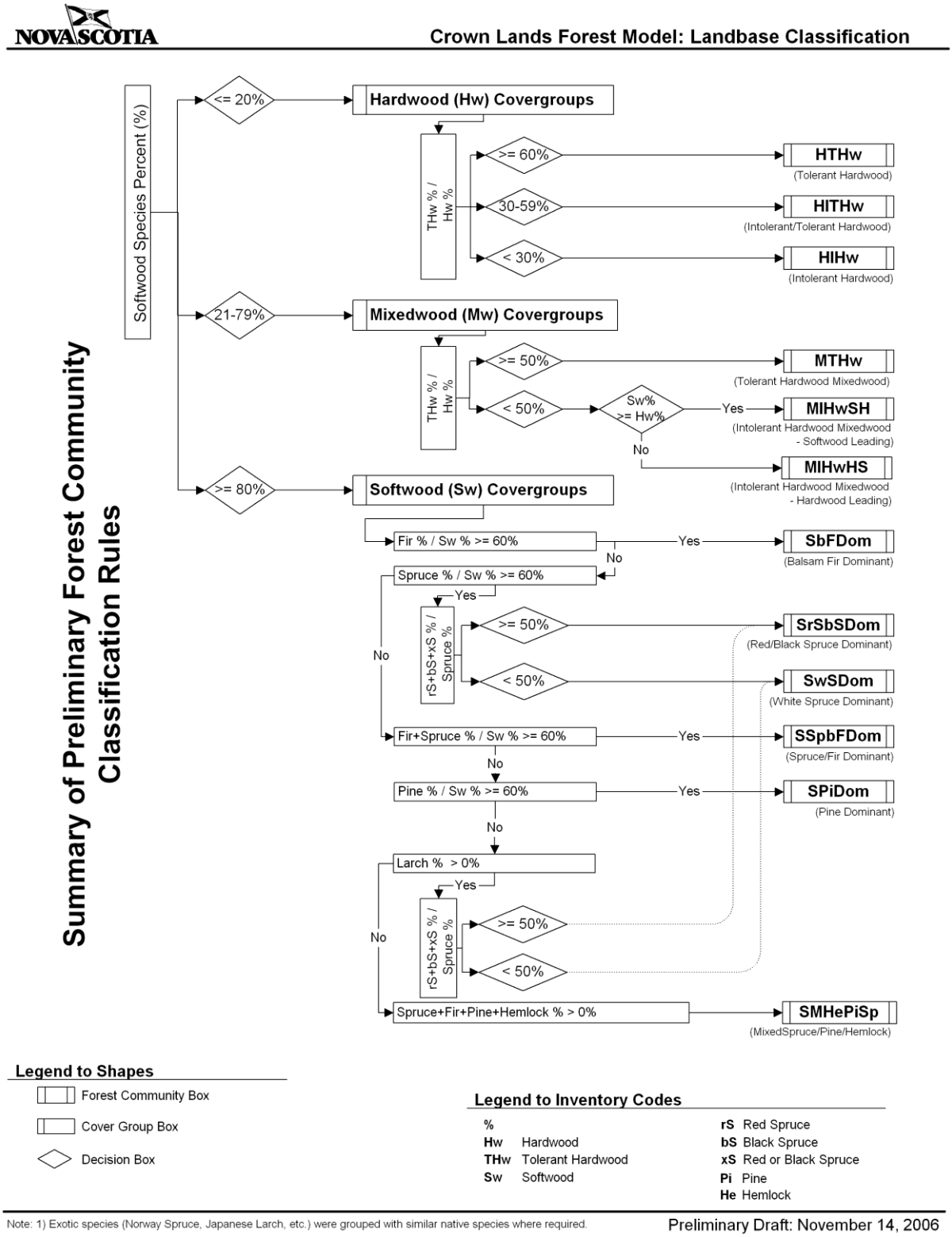
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and shrubs • approximate age 0 to 25 years	Early Seral Species (Score 10 to 23) • new growth dominated by pioneer tree species or unclassified regeneration Mid Seral Species (Score 24 to 37) • regeneration composed of a mixture of pioneer, mid-climax, and climax species Late Seral Species (Score 38 to 50) • regeneration dominated by climax species
2. Young Forest (Height 7 to 11 m) • young forests with developing tree canopies characterized by vigorous self-thinning and crown differentiation • early tree seed production, no understory development • approximate age 25 to 40 years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneer tree species Mid Seral Species (Score 24 to 37) • canopy composed of a mixture of pioneer, mid-climax, and climax species Late Seral Species (Score 38 to 50) • canopy dominated by climax species
3. Mature Forest (Height > 11 m) • stands dominated by upper canopy with full differentiation into dominance classes • self-thinning process reduced • tree seed production prominent and regular • individual tree mortality creates canopy gaps that are soon closed by neighbouring tree growth • increased light initiates regeneration and early understory development • approximate age 40 to 125 years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneer species • over maturity initiates canopy breakup and understory development Mid Seral Species (Score 24 to 37) • climax species in mixture with pioneers in the overstory • often reflecting a transition to climax domination following a period of sub-canopy development Late Seral Species (Score 38 to 50) • canopy dominated by climax species • over maturity initiates gap dynamic processes leading to multi-aged and old growth conditions
4. Multi-aged and old growth forest (Varying height and age and Old Growth ID) • dominant overstory exhibiting a variety of crown sizes and canopy densities • canopy gaps promote development of multi-layered understory and recruitment to overstory	Early Seral Species (Score 10 to 23) • canopy likely to break up and be replaced by developing understory Mid Seral Species (Score 24 to 37) • pioneer dominated overstory with canopy recruitment from a climax species-dominated understory Late Seral Species (Score 38 to 50) • climax species-dominated overstory maintained through gap dynamic processes

Summary of species-level seral score values by ecodistrict (Source: NSDNR - January 2014 revision)

Species		Ecodistrict																																						
Code	**Name**																																							
AS	ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BA	black ash	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BC	black cherry	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BE	beech	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
BF	balsam fir	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	1	1
BP	balsam poplar	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	3	1
BS	black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EC	eastern cedar	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EH	eastern hemlock	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	exotic species	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GB	grey birch	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
IH	intolerant hardwood	3	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
JP	jack pine	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LA	largetooth aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OH	other hardwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
OS	other softwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PC	pin cherry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RM	red maple	3	2	4	2	2	2	2	2	4	2	5	2	2	2	2	2	2	2	2	2	5	3	2	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2	2
RO	oak	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
RP	red pine	3	3	3	3	3	3	3	3	3	4	3	3	3	4	3	3	3	3	4	4	4	4	4	4	4	3	4	3	3	3	4	4	3	4	4	3	3	3	3
RS	red spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SM	sugar maple	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
ST	striped maple	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TA	aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TH	tolerant hardwood	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TL	eastern larch	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
UC	unclassified	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WA	white ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
WB	white birch	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WE	white elm	2	2	4	2	4	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WP	white pine	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
WS	white spruce	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red and black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

A look-up table assigns each species in the forest inventory a value from one to five for its position on the successional scale. The look-up table may change by ecodistrict since climax on the coast or the Cape Breton Highlands differs from inland and lowland districts. This successional value is multiplied by the species' percent in the stand to give a stand successional score. Each stand may have up to four species, and the four percentages add to 10, so the stand successional scores range from 10 to 50. These scores are subdivided into three successional categories: 10 to 23 early, 24 to 37 mid, and 38 to 50 late.

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Hemlock Pine Hummocks and Hills	IMHO (32.3%) WMHO (32.3%) WFHO (25.3%) IMRD (7.7%) WCHO (2.4%) PFHO (0.2%) WFDM (0.0%)	Softwood	rS eH wP bS	Infrequent	69,879; 99.9	Early	511	716	453	422	2,101	30,663; 48.8	EARLY	8,826; 14.1
						Mid	508	1,239	2,070	3,367	7,185			
						Late	428	1,306	9,183	7,096	18,012			
						Uncl	3,365	0	0	0	3,365			
		Mixedwood	rS eH wP sM yB Be	Infrequent	1.3; 0.0	Early	755	842	916	1,179	3,692	21,806; 34.7	MID	23,825; 37.9
						Mid	443	944	5,717	5,889	12,993			
						Late	7	121	1,748	1,559	3,435			
						Uncl	1,687	0	0	0	1,687			
		Hardwood		Gap	0; 0.0	Early	356	283	1,590	561	2,791	8,423; 13.4	LATE	23,034; 36.7
						Mid	133	252	2,485	777	3,648			
						Late	19	51	1,343	175	1,587			
						Uncl	397	0	0	0	397			
		Unclassified				Early	242	0	0	0	242	1,899; 3.0	UNCL	7,106; 11.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1,656	0	0	0	0			
Total					**69,968***	**# ha**	**10,509**	**5,753**	**25,504**	**21,025**	**61,134**			
						%	**17.2%**	**9.4%**	**41.7%**	**34.4%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Drumlins (also see Mahone Bay Islands, a component of this matrix element)	WMDM (56.1%) WFDM (26.9) IMDM (12.8) WMKK (4.1) PFHO (0.0)	Softwood	rS eH wP bS	Infrequent/ Gap/ Frequent	13,528; 11.0	Early	853	768	1,109	990	3,720	44,584; 44.9	EARLY	14111; 14.2
						Mid	575	1,408	3,644	3,791	9,418			
						Late	299	925	16,461	8,686	26,370			
						Uncl	5,075	0	0	0	5,075			
		Mixedwood	rS eH wP sM yB Be	Gap	102,014; 83.1	Early	1,036	892	1,576	1,976	5,480	35,867; 36.1	MID	36,989; 37.2
						Mid	1,341	1,379	9,805	8,449	20,973			
						Late	41	123	3,708	2,488	6,360			
						Uncl	3,054	0	0	0	3,054			
		Hardwood	sM yB Be	Gap	7,244; 5.9	Early	680	358	2,621	758	4,417	16,135; 16.2	LATE	37,184; 37.4
						Mid	249	420	4,795	1,134	6,598			
						Late	66	190	3,655	543	4,454			
						Uncl	666	0	0	0	666			
		Unclassified				Early	479	0	15	0	494	2,722; 2.7	UNCL	11,025; 11.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2,229	0	0	0	0			
Total					**123,382***	**# ha**	**16,643**	**6,460**	**47,389**	**28,816**	**97,079**			
						%	**17.1%**	**6.7%**	**48.8%**	**29.7%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats	IMSM (81.4%) IFHO (7.7%) IFSM (4.1%) ICSM (4.0%) ICRD (2.7%)	Softwood	bs wP,bs, rS eH wP	Frequent	30,658; 80.5	Early	176	199	257	314	945	16,987; 51.5	EARLY	3,582; 10.9
						Mid	264	811	1,015	2,040	4,130			
						Late	117	709	5,216	4,624	10,666			
						Uncl	1,245	0	0	0	1,245			
		Mixedwood				Early	234	193	332	557	1,316	12,192; 37.0	MID	13,649; 41.4
						Mid	269	535	2,965	4,126	7,895			
						Late	20	49	879	1,201	2,147			
						Uncl	834	0	0	0	834			
		Hardwood	rM		614.1	Early	87	154	563	442	1,246	3,364; 10.2	LATE	13,228; 40.1
						Mid	26	151	989	458	1,623			
						Late	4	7	342	61	414			
						Uncl	81	0	0	0	81			
		Unclassified				Early	76	0	0	0	76	445; 1.3	UNCL	2,529; 7.7
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	370	0	0	0	0			
Total					**38,072***	**# ha**	**3,800**	**2,807**	**12,558**	**13,823**	**32,619**			
						%	**11.7%**	**8.6%**	**38.5%**	**42.4%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Pine Oak Hills and Hummocks	100.0%	Softwood				Early	0	0	7	7	14	905; 29.2	EARLY	287; 9.3
						Mid	23	74	27	207	331			
						Late	15	67	174	274	529			
						Uncl	31	0	0	0	31			
		Mixedwood	rO wP rP	Infrequent	3,247; 100.0	Early	3	14	39	113	169	1,663; 53.8	MID	1,774; 57.3
						Mid	38	122	328	677	1,164			
						Late	4	19	78	158	259			
						Uncl	71	0	0	0	71			
		Hardwood				Early	7	32	54	11	103	463; 15.0	LATE	867; 28.0
						Mid	4	16	153	105	278			
						Late	0	0	63	17	80			
						Uncl	1	0	0	0	1			
		Unclassified				Early	0	0	0	0	0	63; 2.0	UNCL	166; 5.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	63	0	0	0	0			
Total					**3,249***	**# ha**	**260**	**344**	**923**	**1,568**	**3,031**			
						%	**8.6%**	**11.4%**	**30.4%**	**51.7%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Wetlands	WTLD (99.8%)	Softwood	bS wP		2,940; 49.9	Early	22	40	34	69	164	2,267; 66.5	EARLY	378; 11.1
						Mid	11	147	81	377	616			
						Late	48	242	535	510	1,336			
						Uncl	151	0	0	0	151			
		Mixedwood				Early	11	10	35	39	95	811; 23.8	MID	1,253; 36.8
						Mid	5	36	244	265	550			
						Late	0	5	64	47	117			
						Uncl	49	0	0	0	49			
		Hardwood				Early	7	6	89	5	107	239; 7.0	LATE	1,496; 43.9
						Mid	0	6	66	14	86			
						Late	0	0	39	4	43			
						Uncl	3	0	0	0	3			
		Unclassified				Early	11	0	0	0	11	89; 2.6	UNCL	281; 8.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	78	0	0	0	0			
Total					**5,890***	**# ha**	**396**	**492**	**1,187**	**1,332**	**3,329**			
						%	**11.9%**	**14.8%**	**35.7%**	**40.0%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Mahone Bay Islands (a component of the matrix Tolerant Mixedwood Drumlins element)	WFDM (100.0%)	Softwood				Early	3	3	71	117	194	301; 82.9	EARLY	248; 68.4
						Mid	0	0	4	0	4			
						Late	0	0	51	9	60			
						Uncl	42	0	0	0	42			
		Mixedwood	rS eH wP sM yB Be	Gap	595; 100.0	Early	0	0	16	33	48	56; 15.4	MID	9; 2.4
						Mid	0	2	0	2	4			
						Late	0	0	0	2	2			
						Uncl	1	0	0	0	1			
		Hardwood				Early	0	0	3	3	6	6; 1.7	LATE	62; 17.1
						Mid	0	0	0	0	6			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0.3; 0.1	UNCL	44; 12.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**595***	**# ha**	**47**	**5**	**145**	**166**	**368**			
						%	**12.7%**	**1.4%**	**39.3%**	**45.1%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 1: Forest Landscape Composition Worksheet (LaHave Drumlins 740)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	WMDM (8.4%) IMSM (4.1%) IMHO (3.3%) WFDM (3.3%) WFHO (2.8%) WMHO (2.8%) WTLD (2.1%) ICRD (1.6%) ICSM (1.4%)	Softwood	rS eh wP bs wP	Infrequent Frequent	3,107; 5.5	Early	17	22	20	20	79	1,812; 37.9	EARLY	592; 12.4
						Mid	11	58	171	144	384			
						Late	8	31	857	379	1,274			
						Uncl	75	0	0	0	75			
		Mixedwood	rS eH wP sM yB Be	Gap	2,352; 11.7	Early	17	7	44	41	109	1,749; 36.6	MID	2,125; 44.4
						Mid	14	24	670	461	1,169			
						Late	8	3	305	117	434			
						Uncl	38	0	0	0	38			
		Hardwood	rM		116; 0.6	Early	20	42	274	67	403	1,185; 24.8	LATE	1,907; 39.9
						Mid	3	41	404	125	403			
						Late	1	1	182	16	573			
						Uncl	11	0	0	0	199			
		Unclassified				Early	1	0	0	0	11	37; 0.8	UNCL	159; 3.3
						Mid	0	0	0	0	1			
						Late	0	0	0	0	0			
						Uncl	35	0	0	0	0			
Total					**20,304***	**# ha**	**259**	**229**	**2,927**	**1,368**	**5,151**			
						%	**5.0%**	**4.4%**	**56.8%**	**26.6%**	**100.0%**			

Left side of table refers to "potential" forest, interpreted from the Ecological Land Classification. Right side refers to "current" forest condition, summarized from inventory in the Forest Model. All multi-aged stands can be considered mature and added to mature totals. *Total area of element.

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Drumlins	WMDM WFDM IMDM WMKK	Gap (occasionally infrequent or frequent)	rS, eH, wP, sM, yB, Be rS, eH, wP, sM, yB, Be bS	S	SrSbSDom	20,805	21.5%	L	**Well-drained** Early: WMDM, WFDM, WMKK: -aspen, rM, wB, rO, bF, wS, wP IMDM: -aspen,rM, wB, rO, bS, bF Mid: WMDM, WFDM, WMKK: - rS, bF, wP, rO, rS, rM IMDM: - rS, bF, wP, rO, rM, bs Late: - yB, sM, Be, eH, rS, wP **Moist** Early, mid, and late edaphic communities of black red spruce, wP, rS, wA, maple, larch. (excluding IMDM)
				S	SMHePiSp	7,892	8.1%	L	
				S	SSpbFDom	7,141	7.3%	M	
				S	SPiDom	4,551	4.7%	L	
				S	SbFDom	2,698	2.8%	E	
				S	SwSDom	1,540	1.6%	E	
				M	MiHwSH	19,677	20.3%	E	
				M	MiHwHS	12,104	12.5%	E	
				M	MTHw	4,162	4.3%	L	
				H	HiHw	8,269	8.5%	E	
				H	HTHw	4,942	5.2%	L	
				H	HiTHw	2,983	3.1%	M	
Total						**96,764**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant	SpiDom-Pine Dominant	MTHw-Tolerant Hardwood Mixedwood
	SwSDom-White Spruce Dominant	SMHePiSp-Mixed Spruce Pine Hemlock	HIHw-Intolerant Hardwood
	SspbFDom-Spruce Fir Dominant	MIHwSH-Intolerant Hardwood Mixedwood S	HTHw-Tolerant Hardwood
	SbFDom-Balsam Fir Dominant	MIHwHS-Intolerant Hardwood Mixedwood H	HITHw-Intolerant Tolerant Hardwood

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Hemlock Pine Hummocks and Hills	IMHO WMHO WFHO IMRD WCHO	Infrequent	rS, eH, wP	S	SrSbSDom	17,078	28.1%	L	**Well-drained** early WMHO, WFHO, WCHO, IMHO - aspen, rM, wB, rO, bF IMRD - aspen, rM, wB, rO, bS, bF mid WMHO, WFHO, WCHO, IMHO - rS, bF, wP, rO, rM IMRD - rS, bF, wP, rO, rM, bS late WMHO, WFHO, WCHO, IMHO - rS, eH, wP IMRD - yB, sM, Be, eH, rS, wPne **Moist** early, mid, and late edaphic communities of bS, wP, rS, rM, larch, wA
				S	SSpbFDom	4,895	5.2%	M	
				S	SMHePiSp	3,205	5.2%	L	
				S	SPiDom	3,204	3.1%	L	
				S	SbFDom	1,874	0.6%	M	
				S	SwSDom	396	0.6%	E	
				M	MIHwSH	12,354	20.3%	E	
				M	MIHwHS	7,463	12.2%	E	
				M	MTHw	1,966	3.2%	L	
				H	HIHw	4,957	8.1%	E	
				H	HTHw	1,754	2.8%	L	
				H	HITHw	1,684	2.8%	M	
Total						**60,830**	**100.0%**		

*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant	SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H	MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Flats	IMSM IFHO ICSM ICRD IFSM	Frequent		S	SrSbSDom	8,996	27.6%	L	**Well-drained** early IMSM, ICSM, IFSM, ICRD - aspen, rM, wB, rO, bF IFHO - aspen,rM, wB, rO, bF mid IMSM, ICSM, IFSM, ICRD - rS, bF, wP IFHO - rS, bF, wP, rO, rM, bS late IMSM, ICSM, IFSM, ICRD - rS, eH, wP IFHO - yB, sM, Be, rS, eH, wP **Moist** early, mid, and late - edaphic communities of bS, wP, rS, rM, bS **Wet** IMSM, ICSM, IFSM, ICRD - wetlands red maple
				S	SspbFDom	2,623	8.1%	M	
				S	SMHePiSp	2,505	7.7%	L	
				S	SPiDom	1,943	6.0%	L	
				S	SbFDom	598	1.8%	M	
				S	SWSDom	322	1.0%	E	
				M	MIHwSH	7,449	22.9%	E	
				M	MIHwHS	3,969	12.2%	E	
				M	MTHw	774	2.4%	L	
				H	HIHw	2,375	7.3%	E	
				H	HITHw	510	1.6%	M	
				H	HTHw	480	1.5%	L	
Total						**32,543**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant	SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H	MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Pine Oaks Hills and Hummocks	WMRD	Infrequent	rO, wP, rP	S	SrSbsDom	553	18.2%	L	**Dry** early, mid, and late - bS, wP, rP, wB, rM **Well-Drained** early - bS, wP, rP mid - rO, wP, bS
				S	SspbFDom	152	5.0%	M	
				S	SPiDom	104	3.4%	M	
				S	SMHePiSp	49	1.6%	L	
				S	SwSDom	27	0.9%	E	
				S	SbFDom	20	0.6%	E	
				M	MIHwSH	865	28.6%	E	
				M	MIHwHS	619	20.4%	E	
				M	MTHw	179	5.9%	L	
				H	HIHw	244	8.1%	E	
				H	HITHw	138	4.5%	M	
				H	HTHw	81	2.7%	L	
Total						**3,031**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant	SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H	MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Mahone Bay Islands (a component of matrix element)	WFDM	Gap	rS, wP, eH, sM, yB, Be	S	SwSDom	226	62.6%	E	**Well-Drained** early - aspen, rM, wB, rO, bF, wS, wP mid - rS, bF, wP, rO, rM late - yB, sM, Be, eH, rS, wP **Moist** - edaphic communities of bS, wP, rS, rM, tL, wA
				S	SrSbSDom	72	19.9%	L	
				S	SbFDom	2	0.4%	E	
				M	MIHwSH	42	11.6%	M	
				M	MIHwHS	14	3.85	M	
				H	HIHw	6	1.7%	E	
Total						**361**	**100.0%**		
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H			MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood		

Appendix 10: Table 2: Composition of Forest Communities (in LaHave Drumlins Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Valley Corridors	ICRD ICSM IFHO IFSM IMDM IMHO IMSM WCHO WFDM WFHO WMDM WMHO WMKK WMRD WTLD	All types	Variable - depending on ecosection	S	SrSbDom	686	14.55	L	Corridors pass through many elements. See descriptions of ecosection successional types under the various elements
				S	SPiDom	478	10.1%	L	
				S	SMHePiSp	346	7.3%	L	
				S	SSpbFDom	197	4.2%	M	
				S	SbFDom	101	2.1%	E	
				S	SwSDom	5	0.1%	E	
				M	MIHwSH	757	15.9%	E	
				M	MIHwHS	744	15.7%	E	
				M	MITHw	248	5.2%	L	
				H	HIHw	769	16.2%	E	
				H	HTHw	210	4.4%	L	
				H	HITHw	206	4.3%	M	
Total						**4,747**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant	SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H	MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood

Appendix 10:
Table 3: Summary of "Potential Climax" Forest Abundance
(Based on ELC Interpretations)

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
rS eH wP sM yB Be	105,049	38.2%	187,322	11.1%
rS eH wP	87,198	31.7%	616,727	36.6%
bS wP	25,710	9.3%	419,644	24.9%
bS	7,882	2.9%	75,102	4.55
sM yB Be	7,303	2.7%	59,619	3.5%
rO wP rP	3,251	1.2%	53,643	3.2%
rM	730	0.3%	12,902	0.8%
Total	**237,123**	**86.3%***	**1,424,959**	**84.6%****

*Total does not add up to 100% because wetlands not added.
**Total does not add up to 100% because not all climax vegetation types in region are found in this ecodistrict
Source: Crown Lands Forest Model Landbase Classification.

Appendix 11: Ecological Emphasis Classes and Index Values

The classification includes all upland conditions, both forested and non-forested, under all types of administration and land use practices. It does not include water or other non-terrestrial conditions.

Ecological Emphasis Class	Conservation Factor	Description
Reserve	**1**	• Reserved lands which meet biodiversity conservation goals through preservation of natural conditions and processes. Resource management activities are not usually permitted except where required to perpetuate desired natural conditions. This class is assigned based on the types of laws and policies governing the management (for example: Wilderness, Parks, Conservation Easement, Old Forest Policy)
Extensive	**0.75**	• Lands managed for multiple values using ecosystem-based techniques that conserve biodiversity, and natural ecosystem conditions and processes. • Forestry practices employ ecosystem-based prescriptions which consider natural disturbance regimes, successional trends, structure, and composition. Natural regeneration is favoured to provide the next forest. Practices may include protection from fire and insects. • Management complies with the Forest Code of Practice, and excludes the use of herbicides, exotic tree species, off-site native species, genetically modified organisms, and stand conversion.
Intensive	**0.25**	• Lands managed intensively to optimize resource production from sites maintained in a native state (e.g. forested). Despite intensive practices, these lands are an important component of landscape structure and composition. • Management may eliminate or reduce the duration of some development processes, particularly mature old forest stages, and may result in non-natural succession. Practices may produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels. Forests are protected from fire, insects, and competing vegetation. • Management adheres to environmental regulations and policies such as the Wildlife Habitat and Watercourse Protection Regulations, and Forest Code of Practice.
Converted	**0**	• Land converted to an unnatural state for human use, or areas where practices have significantly degraded site productivity (e.g. agriculture, urban development roads, Christmas trees, seed orchards, forest soil compaction).

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Mixedwood Drumlins	122,787	3,094	83,377	2,305	19,638	14,315	69,781 to 76,939	57 to 63
Spruce Hemlock Pine Hummocks and Hills	69,968	7,774	48,969	612	4,130	8,444	46,765 to 50,987	67 to 73
Spruce Pine Flats	38,072	1,713	30,104	530	2,395	3,318	25,253 to 26,912	66 to 71
Valley Corridors	20,304	842	4,943	31	823	226	4,614 to 4,727	23
Wetlands	5,890	401	5,004	18	142	321	4,239 to 4,400	72 to 75
Pine Oak Hills and Hummocks	3,249	0	2,981	37	29	203	2,295 to 2,396	71 to 74
Mahone Bay Islands (a component of matrix element Tolerant Mixedwood	595	0	199	227	123	46	217 to 240	36 to 40
Total	**260,864**	**13,824**	**175,577**	**3,759**	**27,280**	**26,872**	**153,165 to 166,601**	**59 to 63**

These classes have been given a weighting percentage representing their ecological emphasis level: Reserve (100), Extensive (75), Intensive (25), and Converted (0). These percentages are applied to the area of land in each class to determine the "effective area" which is divided by "total area" to calculate the index.

The Unclassified land is too young to determine if it is being managed extensively or intensively. Therefore, an EEI range is reported based on it being all one or the other.

Water was not included as an element type. Areas were rounded to the nearest hectare.

EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
ICRD	1,356	0	1,260	0	83	11	948 to 953	70
ICSM	1,826	33	1,494	26	162	110	1,188 to 1,243	65 to 68
IFHO	3,122	0	2,419	92	226	385	1,934 to 2,126	62 to 68
IFSM	1,723	0	1,394	0	65	264	1,111 to 1,244	64 to 72
IMDM	15,742	0	11,978	45	2,282	1,437	9,354 to 10,072	59 to 64
IMHO	23,233	5,455	14,509	118	927	2,223	16,922 to 18,033	73 to 78
IMRD	5,540	1,189	3,970	10	89	283	4,239 to 4,381	77 to 79
IMSM	31,847	1,754	25,004	415	2,075	2,599	21,260 to 22,560	67 to 71
PFHO	126	0	74	0	0	52	68 to 94	54 to 75
WCHO	1,768	0	1,554	0	154	60	1,180 to 1,211	67 to 68
WFDM	34,307	108	21,764	1,288	5,939	5,208	18,055 to 20,659	53 to 60
WFHO	18,273	8	13,412	140	1,166	3,545	10,987 to 12,760	60 to 70
WMDM	70,742	3,257	47,630	1,149	11,509	7,196	41,066 to 44,664	58 to 63
WMHO	23,138	1,612	16,872	349	1,937	2,367	14,945 to 16,128	65 to 70
WMKK	5,161	0	3,981	71	491	618	3,158 to 3,467	61 to 67
WMRD	3,251	0	2,984	37	29	202	2,297 to 2,398	71 to 74
WTLD	6,273	421	5,354	22	154	322	4,522 to 4,683	72 to 75
Total	**247,426**	**13,837**	**175,651**	**3,761**	**27,287**	**26,883**	**143158 to 148054**	**61 to 63**

For an explanation of calculations and other information to help better understand this table, please refer to the bottom of Appendix 12a.

Appendix 13:

Glossary B: Terms in Parts 1, 2, and 3

Aspect	The direction of a downhill slope expressed in degrees or as a compass point.
Atlantic Coastal Plain Flora (ACPF)	A group of 90 species of taxonomically unrelated wetland plants that inhabit lake and river shores, bogs, fens, and estuaries and which are found primarily in southwestern Nova Scotia. The distribution of this group of plants extends down the eastern coast of the USA with isolated populations in Nova Scotia and along the Great Lakes.
Biodiversity	The diversityof 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.
Coarse Woody Debris (CWD)	Dead tree stems greater than 7.5 centimetres in diameter and laying horizontally at 45 degrees or less. Provides habitat for many species and is a source of nutrients for soil development.
Commercial thinning	Silviculture treatment that “thins” out an overstocked stand by removing trees that are large enough to be sold as products, such as poles or fence posts. This treatment is carried out to improve the health and growth rate of the remaining crop trees.

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 the Ecological Landscape Analysis 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.
Ecological integrity	The quality of a natural unmanaged or managed ecosystem in which the natural ecological processes are sustained, with genetic, species, and ecosystem diversity assured for the future.
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.
Ecozone	The first of five levels in the Ecological Land Classification for Nova Scotia Volume 1. Ecozones are continental ecosystems characterized by the interactions of macroclimate, soils, geographic and physiographic features. The entire province is contained within the Acadian ecozone, one of 15 terrestrial ecozones in Canada.
Edge effect	Habitat conditions (such as degree of humidity and exposure to light or wind) created at or near the more-or-less well-defined boundary between ecosystems, as, for example, between open areas and adjacent forest.

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.
Extensive land use	Lands managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and processes.
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).
Fine filter approach	An approach to conserving biodiversity that is directed toward individual species and critical ecosystems that are typically rare or threatened. This approach is usually combined with the coarse filter approach to conserving natural ranges of habitat.
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.
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.
Intensive land use	Lands managed intensively to optimize resource production from sites maintained in a forested state.
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.
Long range management frameworks	A strategic, integrated resource plan at the subregional level. It is based on the principles of enhanced public involvement, consideration of all resource uses and values, consensus-based decision making, and resource sustainability.

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 growth. Mature forests include multi-aged and old growth. 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 growth.
Memorandum of understanding (MOU)	An agreement between ministers defining the roles and responsibilities of each ministry in relation to the other or others with respect to an issue over which the ministers have concurrent jurisdiction.
Mixed stand	A stand composed of two or more tree species.
Multiple use	A system of resource use where the resources in a given land unit serve more than one user.
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.)
Precommercial thinning	A silviculture treatment to reduce the number of trees in young stands before the stems are large enough to be removed as a forest product. Provides increased growing space and species selection opportunities to improve future crop tree growth.

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.
Road deactivation	Measures taken to stabilize roads and logging trails during periods of inactivity, including the control of drainage, the removal of sidecast where necessary, and the re-establishment of vegetation for permanent deactivation.
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 which 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.
Threatened species	A species that is likely to become endangered if the factors affecting its vulnerability are not reversed. A species declared as threatened under the federal or Nova Scotia species at risk legislation (NS Endangered Species Act or federal SARA).
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.
Vernal pool	A seasonal body of standing water that typically forms in the spring from melting snow and other runoff, dries out in the hotter months of summer, and often refills in the autumn.

Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

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